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Editors:

Dr. W.B. BELLO, Dr. M.A. MOSOBALAJE

Dr. G.O. OYELERE, MR. R.A. AJAO

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ALLEVIATING POVERTY AND INSECURITY THROUGH AGRICULTURE, ARTS, SCIENCE AND TECHNOLOGY

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Introduction

Poverty, the lack wherewithal to meet the essential needs of life, has been exacerbated by the spate of economic downturn in the world, especially in the developing countries where the per capita income of the citizenry is very low. The problem has been compounded by the incidence of COVID-19, Russia-Ukraine war and the spate of insecurity that seem to defy all solutions, especially in Nigeria. Recent economic policies in Nigeria are also of note in exacerbating poverty and vulnerability among people.

Poverty alleviation are measures taken to reduce the effect of poverty on people. Several poverty alleviation strategies are put in place in countries of the world but the success of such efforts are determined by the nature of programme and extent to which such programmes are executed with required precision.

Insecurity, a state of living in worries has become serious the world over that individuals and communities live in fear of what may happen to them the next moment. This has affected the reasoning and overall performance of individuals and has prevented people from achieving their full potential. The cases of insurgency, banditry, kidnapping, armed robbery, domestic crime, extrajudicial killings, herder-farmer conflict and ritual murder from the misplaced youth who seek wealth at all cost have prevented people from going about their normal activities freely and these have compounded the security situation in the country and have subsequently predisposed people to poverty.

Concept of poverty

Poverty is a state or condition in which an individual or household lacks the financial resources and essentials to achieve a desirable standard of living. Poverty can have diverse social, economic, and political causes and effects. Poverty is about not having enough resources to meet basic needs including food, clothing and shelter. Poverty humiliates and dehumanizes its victim. Poverty is a condition where an individual or organization experiences a situation of lack, a situation with little or no resources to acquire the basic necessities of life. Poverty in Nigeria has gone beyond the levels of absolute poverty and relative poverty.

Causes of poverty

Poverty is usually recognized on the 2 basic concepts of whether it is absolute or relative. Absolute poverty refers to a condition under which there is a serious deficiency in or lack of access to the basic necessities of normal life such as food, clothing, housing, health and education services (African Medical and Research Foundation AMREF, 1998). Relative poverty relates to the condition of an individual, household, or group or community when considered

against some reference standards or parameters such as the average for the group or region, a target standard or objective or its ranking on given criteria. In the final analysis, all concepts of poverty are relative. Thus, when one speaks of absolute poverty, one refers to the existence below a reference standard of living.

According to World Bank Report (1999), poverty is hunger, lack of shelter, being sick and not being able to go to school, not knowing how to read, not being able to speak properly, not having a job, fear for the future, losing a child to illness brought about by unclean water, powerlessness, lack of representation and freedom.
An appraisal of past studies by the United Nations Development Programme UNDP advocates the use of the Human Development Index (HDI) and Capability Poverty Measure (CPM). According to the UNDP (1997 and 1998), HDI combines three components in the measurement of poverty. These are (i) life expectancy at birth (Longevity); (ii) educational attainment and (iii) improvement in standard of living determined by per-capital income.
The World Bank has called special attention to the causes of mass poverty in Sub-Saharan Africa, the most basic being lack of access to skill facilities and opportunities. In a situation of mass poverty such as we have in Nigeria, where poverty is the lot of the generality of the people rather than the misfortune of a few, the primary reason for poverty must be sought not just in the circumstances of individuals but in the state of the nation and its management. Ironically, according to Ukwu (2002), most developed countries of the world today include countries that are poor in natural resources while many poor countries of Africa are richly endowed with natural resources which are gift of nature. Such countries include Nigeria, Ghana, Cote 'dvoire, Sierra Leone etc.
Another fundamental issue in Africa today is the growth rate in population which has assumed the Malthusian geometrical progression. To reduce poverty, Africa economies must grow faster than the rate of growth in population. Income poverty is widespread in Africa. About 400 million people in Sub-Saharan Africa are reported to be poor. Non-income poverty is equally pervasive.

Impacts of COVID-19 on Poverty
Occurrences such as COVID-19 have made poverty rates rise higher among 75 million to 95 million individuals suffering from extreme poverty between pre-pandemic to 2022. This higher increase in poverty rates can be reflected by the rise in unemployment and work productivity caused by the pandemic. The International Labour Organization has estimated that global unemployment was increased to 33 million in the year 2020 which was four times higher than the global financial crisis that happened in 2009. According to the World Health Organization job losses for low-skilled workers were 11%, a much higher rate compared to medium and high-skilled workers, and in 71% of the lower-income household, at least one person in the household was unemployed or had to shut down their business due to the pandemic.

Poverty alleviation
Poverty alleviation is any process that reduces income fluctuation between poor and non-poor scenarios (Adongo and Deen-Swarray, 2006, Adongo and Deen-Swarray, 2006). This is different from poverty reduction, which aims to permanently move an individual or household from a poor to a non-poor scenario. Poverty alleviation, poverty relief, or poverty reduction are set of measures, both economic and humanitarian, that are intended to permanently lift people out of poverty. Poverty occurs in both developing and developed countries. While poverty is much more widespread in developing countries, both types of countries undertake poverty alleviation measures.

Concept of insecurity
Insecurity is the state of being open to danger or threat and lack of protection. Insecurity involves an overall sense of uncertainty or anxiety about an individual's worth, abilities,

skills, and value, conveying the message that the individual is at risk or in danger of something or someone. The negative impacts of insecurity could be physical, mental, or emotional. Without security, individuals can not accomplish their full trust or function to their fullest potential.

Dimensions of insecurity
Insecurity is of the following dimensions:

Basic need insecurity – Food, Housing, Health
Without enough food, housing, or health, it is challenging to succeed in life. When a person doesn't know where their next meal is coming from, where they will rest their head at night, and how much longer their physical and mental health will hold out, they can not devote enough energy towards other aspects of life. This high level of chronic stress results in physical hardships, as well as psychological hardships. This type is more related to poverty. It also relates to feeling of physical threats to their life and or property.

Physical insecurity
This refers to fear of not been safe physically, fear of being harmed by others and fear on not been able to go about their normal activities without harm being inflicted on them. Such harm may be as a result of insurgency, kidnapping and other acts that may lead to bodily harm or loss of life.

Social insecurity
Social insecurity typically involves a lack of confidence in one's own ability to do well and succeed in social settings. Like other forms, social insecurity is mostly a creation of the person's anxiety about what could happen in the future, rather than what has happened in the past. Often, social insecurity will overlap with the signs and symptoms of social anxiety. Someone with social insecurity might worry about: Appearing awkward; Saying something hurtful or inappropriate; Not being smart enough to contribute to conversations; Not understanding jokes

Body image insecurity
Those with body image insecurity will struggle to accurately perceive their physical appearance. Instead of having a balanced view of their characteristics, they may spend excessive time and energy worrying about how they look. Someone might feel insecure about is/her whole body, or focus on only one part like their nose, ears, knees, height, shape or teeth. Some people may feel insecure based on feeling judged by others, while others will judge themselves more harshly than anyone else ever could.

Job insecurity
Job insecurity centers around a person feeling inadequate in the workplace. They may have overwhelming doubt, confusion, hesitation, and anxiety about their job, constantly feeling like a fraud. Students in all levels of school may experience a similar type of insecurity that leads them to question their intelligence, ability to craft a well-written paper, and apply knowledge as needed. In either case, people with job and school insecurity face problems including failing grades, poor work performance, and leaving tasks unfinished.

State of insecurity in Nigeria
The issue of insecurity in Nigeria has become of grave concern to all well-meaning citizens, most of whom continue to wonder how the country arrived at such a dire situation where no one is safe. Unfortunately, rather than abate, the problem is escalating and now seem totally

out of control. Insecurity in Nigeria is a recurring phenomenon that threatens the well-being of its citizens. The nation is plagued by a surge in cybercrime, armed robbery, kidnapping, domestic crime, extrajudicial killings, herder-farmer conflicts, ritual killings, and banditry. The nation has become a haven for ritual killings, commercial crime, secessionist agitation, attacks by unknown gunmen, and banditry. The nation remains threatened by militancy, kidnapping, and environmental agitation. The problem is also of humanitarian crisis lasting over a decade and caused by Insurgents of different names and class. Meanwhile, the issues of illegal mining, ethno-religious killings and banditry are paramount. Therefore, insecurity in Nigeria has assumed a soft spot in political stance and it continue to claim thousands of lives as well as extensive damage and loss of property.

The impact of insecurity on the economy

According to Business Day, rising violence in the country cost Nigeria 11% of its GDP valued at N119 billion. Similarly, projects worth N12 trillion were abandoned across Nigeria due to insecurity and other challenges according to data from Town Talk solutions. In the same vein, the global peace index for 2021 compiled by the Institute for Economics and Peace ranked Nigeria 146th out of 163 countries with a score of 2.712, while among sub-Saharan African countries the country was ranked 39th out of 44 countries examined. According to experts, insecurity affects economic growth by drying out investments, increasing unemployment, and dwindling government revenue, among others.

The impact of insecurity is reflected in the performance of macroeconomic indicators, investment inflow as well as economic performance. As of 2020, over $40.6 billion worth of foreign investments were diverted from the Nigerian economy as a result of insecurity according to the global terrorism index. This had implications for job creation and economic prosperity as purchasing power declined. Nigeria was regarded as the world's poverty capital and has an estimated 91 million people living in extreme poverty which is projected to reach 106.6 million by 2030.

Human capital development also met with a hitch as schools in the north shut down to avoid recurring cases of kidnapping. The insecurity challenge also affected other sectors in terms of government revenue allocation as the security budget continues to increase year on year.

Poverty alleviation through agriculture

Agricultural productivity growth in Africa is negatively correlated with poverty. Factors responsible for low factor productivities in African agriculture are underinvestment in agricultural research, unfavorable geographic factors, conflicts, and inability to bear production and marketing risks. Transformation of the sector in the presence of conflicts or risky production environment will do little to reduce poverty. The good news, though, is that the fight against poverty and inequality is resuming with tools and programs that are more effective than ever before, that can be embraced by researchers, activists and government officials include the use of knowledge driven practices. The areas that are available for the push are as follows:

Agricultural enterprises such as:

Crop production- This involves production of crops not only for subsistence but as an agribusiness. It requires that markets are assessed and targeted for production to ensure all business acumen are deployed for efficient and effective production. This could be cultivation on soil, hydroponics or aeroponics.

Livestock production - This is the production of animals for commercial purpose. Common examples are sheep. goat, cattle and other large animals for commercialization.

Dairy Farming - The space and ability to care for cows or other dairy animals could be explored to ensure that milk is produced for the market. The financial outlay of this endeavor is high but can generate substantial revenue given an enabling environment for its practice. The dairy farm would be an avenue to produce milk, cheese and similar products.

Poultry Farming - This involves the raising of chickens and other poultry animals to supply individuals and food production companies. It is usually for meat and egg production

Fish Farming - Fish farming is a fast growing sector of the economy. The process involves raising fish in large tanks or enclosures. It can be in earthen ponds or other forms of tanks for commercial purpose.

Urban Agriculture - This involves exploiting unused spaces in urban centres for agricultural purposes. Crops are planted in small spaces or vertical containers to get the most out of available space.

Nursery Operation - This involves the production of seedlings that are offered for sale. It is involved in the raising of nursery where different types of plants are grown and sold to consumers or businesses.

Vegetable Farming - The cultivation of different types of vegetables while exploiting rainfed and irrigation facilities for maximum production. A variety of different vegetables can be planted and harvested for sale or to make into different products.

Livestock Feed Production - The production of different livestock feed can be exploited to alleviate poverty and cope with insecurity. This may not require large space to be accomplished. Individuals or groups can contribute to the industry by manufacturing feed for livestock.

Fruit Production - This is known as pomology. It requires the cultivation of various types of fruit for sale or to make into other fruit based products.

Rabbitry - Rabbits can also be raised for a variety of purposes within small pens or similar enclosures. They are good source of protein for human consumption. Rabbits have good food conversion ratio and provide meat for meeting the protein needs of man.

Snail Farming - Snail is a source of meat that can be raised for poverty alleviation as its capital outlay is low. It is a source of protein and snail slime can be used by companies for a variety of purposes.

Mushroom Farming - Mushroom farming is another source of earning for poverty alleviation. It could be used for growing various types of mushrooms. Mushrooms a re consumed to satisfied the nutrient needs of man.

Beekeeping - Beekeeping is an activity that can lead to a variety of different product-based business ventures.it generates different products that are of economic value. Honey is an important product from bee keeping and has been known for its utility and man's use to satisfy various needs such as for food and for medicinal purposes.

Fruit Canning - Most fruits are I excess supply during their season. Canning of such fruits will ensure that more value is obtained to reduce selling at cheap prices during the period of glut. Canning fruit is thus a good way of raising funds for improving the economy of households.

Organic Gardening - Organic products are of prime importance with its special market. Production of organic products is thus a specialized way of raising fund to alleviate poverty. The products are marketed to health and eco-conscious consumers.

Sustainable Farm Consulting - It is possible for graduates to offer their expertise to farmers and agriculture businesses that want to utilize sustainable methods as a consultant. This is a form of private extension through identifying areas of need and provide the needed inputs to fill such gaps. This ensures that services are rendered in a way that the recipients and the graduate benefits in a symbiotic relationship.

Mechanization of the Agricultural Sector - Mechanization and agriculture would be possible where there is sparse expanse of land. It is estimated that about 70% of Nigeria is essentially in rural settings and the people are involved in subsistent farming. The situation in the agricultural sector accounts significantly for the poverty of Nigeria. The agricultural resources should really serve the purpose of alleviating poverty in Nigeria because a successful agricultural sector would provide the food requirements, supply the industrial sector and provide adequate employment and income for rural dwellers (Aiyegbusi and Balogun, 2004). Effective mechanization of the agricultural sector through the use of appropriate technologies that are of low external input and sustainable will help alleviate poverty and insecurity.

Poverty Alleviation through Arts

Arts and culture are viable tools for poverty alleviation. There are viable art endeavors to improve income in efforts at alleviating poverty. Some of those endeavors are highlighted.

Beadmaking - The African culture is abundant in resources and the significant element of any vibrant society is embedded in its ability to reinvent different aspects of these cultural resources to conform to contemporary standards. By so doing, the history and heritage of such cultures are not just being conserved but also recreated as new forms of expressions. Basic equipment required include monofilaments, pliers, cutters, different shapes and sizes of beads, etc. that would be needed to start a professional business in bead making.

Training on Traditional Artistry - Bead making is a tool for economic self-reliance that involves the art of hair weaving, coral bead making, tie and dye and basketry. It also includes the rich and diverse traditional music, dance and drama.

Visual Arts, Painting, Sculpture and Pottery - The culture, religion and practice of a particular group are captured in the sculptures and artworks which meets with their cultural demands and dictates. For example, the Benin arts are easily recognisable anywhere in the world, whether there is a write up to explain where the artwork comes from or not and they are evidences of the ways and lifestyle of the Benin people.

Alleviating Poverty through the Use of Science and Technology

Science and technology have contributed tremendously towards seeking strategies to alleviate as well as reduce the incidence of poverty and insecurity. These have been in areas of making the world a global village through facilitating quick and easy dissemination of information to help to better the life of people. This has been through deployment of devices that aid in the discharge of duties and in the spread of information. Information that are erstwhile not available are now at the fingertips of several people. Exploitation of these opportunities have helped and continue to help to reduce the incidence of poverty and insecurity the world over.

Artificial Intelligence - Artificial intelligence, also known as machine learning is a software system based on neural networks which is a technique that leverages on computers and machines to mimic the problem solving and decision making capabilities of human mind. It has 3 types, Artificial Narrow Intelligence, Artificial General Intelligence and Artificial Super Intelligence. It involves the simulation of human intelligence processes by machines, especially computer systems. Specific applications of AI include expert systems, natural language processing, speech recognition and machine vision. It involves a foundation of specialized hardware and software for writing and training machine learning algorithms. It saves labour and increases productivity, thus knowledge would assist to alleviate poverty.

Science - Science seeks to provide solution to problems in human endeavor by generating targeted changes to elements crops and animals in areas that are vulnerable to climate

change.an example is change in a crop's DNA to accelerate development of more disease resistant, water efficient varieties that can improve food production and nutrition.

Technology - Technology involves the application of scientific knowledge for practical purposes, especially in industry. It is the branch of knowledge that deals with engineering and applied science. It embeds the use of Information Communication Technologies that facilitate the use of instruments for digital and analog communication. This is for the purpose of information sharing in manners that ensure good speed and volume. Technology provides satellites and drones that provide essential agronomic information for farmers to increase yield and boost income. It promotes inclusive development for traditionally excluded populations. It makes knowledge available remotely through e-learning, helps in storing sensitive information securely and process transactions and aids in interaction with the formal sector.

Requirement for Scientific and Technological Skill Base - For any nation to be able to cope with the demands of modern civilization, it must strive to acquire a strong scientific and technological skill base. Modern civilization is thus heavily dependent on advanced science and technology. Any nation that wishes to remain stable and self-reliant must strive to raise the standard of living of the people through the employment of certain scientific and technological advances that tend to maximize the exploitation of all available resources, especially to achieve alleviation of poverty and insecurity. Human development history has shown that sustainable development and self-sustaining progress of any country has generally followed the development and application of science and technology, controlled by response to the needs and endowment of a country.

Many developed countries of the world today, achieved their level of development through the deployment of technology and development of an efficient science and technology capacity. The importance of science and technology to poverty alleviation in Nigeria cannot be over-emphasized. In a developing economy like Nigeria, the problems competing for attention are many and diverse in nature. Apart from the fight against illiteracy and poor health care delivery system, there are problems of poverty and security as well as low level of productivity in commercial enterprises. All the problems can be alleviated through effective deployment of science and technology.

Methods of Alleviating Poverty and Insecurity

The possible and viable solution to alleviate poverty and insecurity is to solve the problem of unemployment. This is critical to ensuring a safe society with progressive and productive individuals working hard to make the country great. To be secured, the nation must revamp her leadership recruitment criteria and stick to them religiously and honestly. There is a need to interrogate the type of education being given to the younger generation. The decision has to be taken as to should it be one that guarantees our safety tomorrow or one that will pull us deeper into insecurity? These are issues that must be interrogated critically.

Building opportunities for self-sufficiency

It is important that employment opportunities are made available to help the citizenry increase income and secure access to basic needs. Economic models which lead to national growth will not necessarily lead to more opportunities for self-sufficiency. However, businesses designed with a social goal in mind, such as micro finance banks, may be able to make a difference. Self-sufficiency is potent in alleviate poverty.

Imparting Education and skill-building

Education should emphasise the role of preparing youth for basic academic skills. As an example, provision of modest amounts of cash and land with a modicum of agricultural skills can give way towards a modest societal wealth. Education for women will allow for good

home management as an important poverty reduction event in its own right. The portion of education pertaining to the variety of skills needed to build and maintain the infrastructure of a developing (moving out of poverty) society are clearly needed among a wide variety of individuals if the society is to move out of poverty or subsistence.

Provide Microloans

One of the most popular of the new technical tools for economic development and poverty reduction are microloans made famous in 1976 by the Grameen Bank in Bangladesh. The idea is to loan small amounts of money to farmers or villagers to obtain the things they need to increase their economic rewards. A small pump could make a very big difference in a village without the means of irrigation. Soft loans could help farmers buy equipment or seeds, help street vendors acquire goods to sell, or help others set up small shops. The formation of small credit groups (SCGs) could help increase access to microcredit for taking up small-scale farm activities.

Ensuring Women Empowerment

The empowerment of women, especially rural dwellers has become a significant area of intervention with respect to development and economics; however it is often regarded as a topic that only addresses and primarily deals with gender inequality. Because women and men experience poverty differently, they hold dissimilar poverty reduction priorities and are affected differently by development interventions and poverty reduction strategies. In response to the socialized phenomenon known as the feminization of poverty, policies aimed to reduce poverty have begun to address poor women separately from poor men. This is as poverty alleviation has different effects on men and women as far as the household economy is concerned. This is because women are more concerned with household welfare than men, especially in rural households.

Economic participation

Increasing female participation in the labor force ensures that women are able to contribute more effectively to economic growth and income distribution since having a source of income elevates their financial and social status. Protection of property rights is a key element in economically empowering women and fostering economic growth overall for both genders. With legitimate claims to land, women gain bargaining power, which can be applied to their lives outside of and within the household. The ability and opportunity for women to lawfully own land also decreases the asset gap that exists between women and men, which promotes gender equality.

Political participation

Political participation is one pillar of gender equality and women's empowerment. Sustainable economic growth requires the poor people to have influence on the decisions that affect their lives; specifically strengthening women's voices in the political process to build social independence and greater consideration of gender issues in policy. In order to promote women's political empowerment, there is the need to strengthen advocacy of women's organizations; ensure fair legal protection; and provide equivalent health and education for them. Fair political representation and participation enable women to lobby for more female-specific poverty reduction policies and programs.

Good institutions

Efficient institutions that are incorruptible and obey the rule of law make and enforce good laws that provide security to property and businesses. Efficient and fair governments would work to invest in the long-term interests of the nation rather than plunder resources through

corruption. Funds from aid and natural resources are often diverted into private hands and then sent to banks overseas as a result of graft. If Western banks rejected stolen money, ordinary people would benefit in a way that aid flows will achieve desired results. There is therefore the need for good institutions to enforce laws and order so that effort to divert aids and other funds will be near impossible.

Employment and Productivity

Economic growth has the indirect potential to alleviate poverty, as a result of simultaneous increase in employment opportunities and labour productivity. The International Labour Organization (ILO) estimates that as many as 40% of workers are poor, not earning enough to keep their families above the $2 a day poverty line. In most countries, most of the chronically poor are wage earners in informal employment owing to the fact that their jobs are insecure, low paid and offer no chance to accumulate wealth to avoid risks. Increase in employment without increase in productivity leads to a rise in the number of working poor, which is why some experts are now promoting the creation of quality and not quantity in labour market policies. This approach does highlight how higher productivity could help reduce poverty. Furthermore, productivity increase does not always lead to increased wage. Agriculture provides a safety net for jobs and economic buffer when other sectors are struggling.

Helping farmers

Raising farm income is described as the core of the antipoverty effort as three-quarters of the poor today are farmers. Estimates show that growth in the agricultural productivity of small farmers is twice as effective in benefiting the poorest half of a country's population compared to growth generated in non-agricultural sectors. Improving water management is an effective way to help reduce poverty among farmers. With better water management, they can improve productivity and potentially move beyond subsistence-level farming. Irrigation is a key factor in unlocking farmers' agricultural potential and reducing poverty. Access to irrigation provide farm families with opportunities to diversify their livelihood activities and potentially increase their income. For example, people with land could reliably grow rice or vegetables instead of working as labourers or relying on rain-fed agriculture. Those without land could benefit by working within new inland fisheries.

Conclusion

Poverty has pervaded the entire entity called Nigeria as a result of economic policies that do not have human face. This has led to frustration among the people and it has perpetrated the culture of lack of safety of life and property. These have given rise to the spate of insecurity that now permeates all spheres of the nation. Efforts to alleviate poverty to give meaning to the life of the citizenry has either not been well articulated or are not well executed. The need to engage the people economically through agriculture, arts, science and technology cannot be over-emphasised. There is the need for programmes and projects that will effectively engage the people in productive ventures that will give meaning to people's life through well-coordinated and regulated citizen's engagement through agriculture, arts, science and technology.

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ANIMAL AND FISHERIES PRODUCTION

EFFECT OF GROUND MAIZE COB AS A REPLACEMENT FOR WHEAT OFFAL ON GROWTH PERFORMANCE OF WEANER RABBITS

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Abstract
Forty two days feeding trial were conducted to determine the utilization of replacing wheat offal with different levels of ground maize cob (GMC) on growth performance of weaner rabbit, three experimental diets were formulated consisting diet 1 = 0%, diet 2 = 2% GMC and diet 3 = 4% GMC. A total of twenty four weaner rabbits with an initial average weight of 403.20g to 407.13g were randomly allocated to the three dietary treatments in a complete randomize design (CRD) with eight animals per treatment. Data were collected on growth performance. Increase (P>0.05) average weight was observed as the percentage inclusion of GMC increased, rabbit on diet 3 (4% GMC) recorded the highest (P>0.05) final body weight, similarly feed conversion ratio were recorded across the treatments, it was therefore concluded that the 4% GMC can be used in compounding weaner rabbits feed without deleterious effect on growth performance

Keywords: weaner rabbits, ground maize cob, growth performance

Introduction

The reduction on the reliance of importation of livestock feed in Nigeria has increased the demand and cost of conventional feedstuff (Togun *et al.*, 2006). The recommended policy is to identify and use locally available feed resources to formulate diets that are as balanced as possible (Guèye and Branckaert, 2002). This strategy could help reducing the cost of production, and ensuring cheaper meat production thereby making available the major crops for human consumption. The economization of feed cost using cheaper and unconventional feed resources is an important aspect of commercial rabbit production (Bhatt and Sharma, 2010). Rabbits are efficient converters of feed to meat and can utilize 30% fibre as against 10% by most poultry species (Egbo *et al.*, 2001). Nutritionally, Rabbit meat has high protein content, low in fat, cholesterol, and highly digestible (Yusuf *et al.*, 2011). Rabbits can utilize unconventional feeds like maize cob which are readily available (Olayeni *et al.*, 2006). In Nigeria the scarcity of conventional proteins and energy concentrates for the formulation of feeds have forced the animal scientists in Nigeria to search for attractive, cheaper and readily available fibre source. These efforts have produced accumulating evidence that alternatives such as palm kernel cake, rubber seed meal and maize cob meal, can be used for feeding livestock, especially poultry, pigs and rabbits with encouraging results. The proximate composition of ground maize cob reported (Adams *et al* 2019) were Crude protein 8.75%, Ash 5.20%, Ether extract 1.10%,Crude fibre 8.85%, Dry matter 93.74% Maize is a major energy feed ingredient, like other cereals, it is in short supply, leading to very high prices at certain periods of the year. To reduce the cost of feeding livestock, which competes directly with human beings for the same feedstuffs, attempts have been made to use alternative sources of protein and energy. These have mostly been of agro- industrial by-products which are not directly utilizable by man. A possible potential benefit is dietary inclusion of maize cobs a widely available crop residue that is abundant in the tropical areas of the world, when

treated and used in rabbits feeding, it could improve the quality of their carcasses. Maize cobs are highly fibrous product with many agricultural and industrial applications. In agriculture, they are used for fuel, litter for poultry and other animals, mulch and soil conditioner, and as fodder for ruminants. Their absorbency and abrasiveness makes them useful for several industrial applications Therefore the aim of the study was to investigate the effect of ground maize cob as a replacement for wheat offal on growth performance of weaner rabbits.

Materials and methods

The experiment was carried out at the rabbit unit, Teaching and Research Farm, Oyo State College of Agriculture and Technology, Igboora, Nigeria. A total of 24 weaner rabbits were obtained from reliable farm. The Hutch were washed and cleaned thoroughly with disinfectant prior to the arrival of the rabbits. The rabbits were weighed individually and allocated into 12 units. Each unit housed 2 rabbits and offered one of the 3 dietary treatments such that 4 replicates assigned to each dietary treatment. Each replicate contained two feeder plates and two drinkers. On the arrival of the rabbit, they were treated with neoceryl plus soluble powder against stress and bacteria. Three experimental diets were formulated for the grower phase. Experimental diets were fed for the duration of 6 weeks. Three substitution level of ground maize cob substituting wheat offal at 0%, 2% and 4% levels respectively. Gross composition of experimental diet is presented in table1

Measurement of growth parameters

At the beginning of the experiment, rabbits were weighed together. Feed intake was determined daily by the weigh back technique. Live weights were recorded weekly for each replicate. Feed conversion ratio were calculated from the data on live weights and feed intakes as quantity (g) of feed consumed per unit (g) weight gained over the same period.

Statistical analysis

Data collected was subjected to analysis of variance (ANOVA) in a completely randomized design (CRD). Significantly different means were separated using Duncan's New Multiple Range Test (DNMRT) according to Steel and Torrie (1980).

Table 1: Gross composition of experimental diet

Ingredients	T1 (0%GMC)	T2 (2%GMC)	T3 (4%GMC)
Maize	38.00	38.00	38.00
GNC	22.00	22.00	22.00
Wheat offal	36.00	34.00	32.00
GMC	0.00	2.00	4.00
Bone meal	3.00	3.00	3.00
Premix	0.25	0.25	0.25
Methionine	0.25	0.25	0.25
Lysine	0.25	0.25	0.25
Salt	0.25	0.25	0.25
Total	**100**	**100**	**100**
Cal value			
ME (Kcal/kg)	2346.62	2404.63	2346.02
CF (%)	15.45	14.89	14.33
CP(%)	15.48	15.54	15.59

A kg premix contains vitamin A; 110,000,000iμ Vitamin D; 2,500,00iμ, Vitamin E; 20,000mg Vitamin K_3; 3000mg, Vitamin B_3; 3.00mg Vitamin B_2; 7000mg, Vitamin B_6; 500mg Vitamin B_{12}; 25mg, Panthotenic acid; 10,000mg, folic acid; 800mg, Biotin; 50mg

Manganese; 80,000mg, Iron; 40,00mg, Zinc; 60,000mg, Copper; 800mg, Cobalt; 250mg, Iodine; 1,000mg, Selenium (1%); 150mg, Chlorine, 200,000mg and Antioxidant; 100,00mg.

Table 3: Growth performance of rabbits fed experimental diet

Parameters	T1 (0% GMC)	T2 (2%GMC)	T3(4%GMC)	SEM
Initial weight (g)	405.02	407.13	403.20	0.92
Final weight (g)	836.60^{c}	854.40^{b}	861.03^{a}	5.95
Total weight gain (g)	431.58	447.27	457.83	6.22
Average daily weight gain (g)	10.28	10.65	10.90	0.147
Total feed intake	2730.20	2722.01	2734.04	2.89
Average feed intake	65.00	64.81	65.10	0.069
Feed conversion ratio	6.32	6.09	5.97	0.084

^{abc}Means with different superscripts are significantly different ($p<0.05$)

Results and discussion

It was noticed that the final body weight were significantly different across the dietary treatments, rabbits fed with diet which contained the highest amount of ground maize cob (4%GMC) had the higher weight gain compared to those fed with the control (0% GMC) and 2% GMC . The higher growth rate in rabbits fed GMC might also be attributed to the higher fibre levels of these diets as lack of dietary fibre has been reported to reduce growth rate in rabbits (Bamgbose *et al.,* 2002) The average feed intake which ranges from 64.81 to 65.10 showed non-significant differences P>0.05. The dietary effect of the experimental diets on feed intake and the feed conversion ratio (FCR) of the experimental animals were similar (P>0.05). As the percentage inclusion of GMC was increased, there was a decrease in the feed conversion ratio. Moreover, The average daily weight gain reported in this study 10.28g/day to 10.90g/day are lower than the values 10.46g/day – 15.17g/day recorded by Enaku *et al. (*2017) for rabbit fed maize cob meal, this difference is attributed to high temperature in the tropics.The best feed conversion ratio (5.97 to 6.32) was obtained in treatment 3 with the value 5.97

Conclusion and recommendation

From the results obtained in the study, it could be concluded that 4% ground maize cob could be incorporated in rabbit diets to replace wheat offal so as to improve the growth performance of rabbits without any adverse effect. It could be recommended that the extension officer are therefore expected to encourage the farmers to adopt the use of ground maize cob as this will reduce the cost of production, serve as an alternative source of fibre and hence increase the profitability of the farmer as well as preventing the air pollution caused by maize cob when set on fire.

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COMMUNITY KNOWLEDGE ASSESSMENT AND DISTRIBUTION OF SOIL TRANSMITTED HELMINTHS FROM SOIL IN IBARAPA AREA OF OYO STATE, NIGERIA

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Abstract
Over a billion people are infected with Soil Transmitted Helminths (STHs), a prevalent Neglected Tropical Disease that affects the poor more. Soil contaminations with parasite eggs constitute a major risk factor for STH infections. This study was conducted to determine the prevalence of STHs in soil samples and associated determinants in Ibarapa area, Oyo State. A cross sectional study was conducted in Ibarapa area, Oyo State, Nigeria. Soil samples (432) were purposefully collected from cattle markets, cattle kraal, slaughter slabs, soil surrounding different stream water. Examination of STHs was carried out using centrifugal floatation. Semi-structured questionnaire were administered to 393 consenting participants to obtain information on the knowledge, attitudes and practices related to prevention of STH infections. Data were analyzed using descriptive statistics and multivariate logistic regression at 5% level of significance. An overall prevalence of 49 (11.3%) was recorded for STHs. Three STHs were identified; Strongyloides spp. 33 (7.6%), most frequently encountered, Ascaris lumbricoides 16 (3.7%) and Trichuris trichiura 10 (2.3%). Samples from the slaughter slab showed that 27 (6.3%) were the most contaminated. 71.5% of respondents did not know that transmission can occur via contact with contaminated soil. Also, more than half of the participants (53.4%) demonstrated bad practice to the prevention of STH. The prevalence of STHs in this study is a proof of its public health importance. Further, the poor disposition of respondents to preventive measures against STHs is disheartening. Hence, the need to embrace increased public health enlightenment campaigns on STH, in combination preventive chemotherapy in Ibarapa area.
Key words: Cattle, Ibarapa area, Prevalence, STH

Introduction

Approximately 1.5 billion people have been estimated to be infected with Soil Transmitted Helminthes (STHs) globally with a significant amount of morbidity and mortality (WHO, 2020). Soil Transmitted Helminthes infections are also known as intestinal parasitic infections belonging to the group of Neglected Tropical Diseases which are caused primarily by four major helminthe species of the class - Nematoda namely: *Ascaris lumbricoides*, *Trichuris trichiura*, *Ancylostoma duodenale* and *Necator americanus* (Karagiannis-Voules *et al*., 2015) and *Stongyloides stercolis*. The transmission is intimately associated with poverty, poor sanitation and lack of access to health care (WHO, 2020).

The parasitic contamination of the soil as a result of human and animal activities has not been comprehensively investigated in the study location, hence, the need to carry out the study in order to assess the distribution of parasites of public health importance of soil in Ibarapa area, Oyo State. Further, to investigate the level of knowledge and practices related to prevention of this intestinal parasitic infection among residents.

Materials and methods

Study area

The study was carried out in Ibarapa area in Oyo State, Nigeria, which falls within latitudes 70.15`N and 70.55`N and longitudes 30`E and 30.3`E.

Study design and sample size

A cross sectional study was conducted between the months of May and November, 2019. 432 soil samples (108 samples per sampling site) were examined and purposive sampling method was used. Sampling sites consists of cattle markets, cattle kraal, slaughter slabs, soil surrounding different stream water (used by both humans and animals). The parasite eggs were detected by modified centrifugal flotation method and eggs/oocysts were checked under the microscope at x10 and x40 magnification. Identification of specific STHs was carried out using bench aids.

Questionnaire Administration

The 393 questionnaire administered comprised of both close and open-ended questions, which was designed in order to collect data on socio-demographic characteristics, knowledge and practices related to prevention of intestinal parasitic infection.

Ethical Consideration

This research was approved by the Oyo State Ministry of Health (ref: AD13/479/304), Nigeria, before the commencement of the study.

Data Analysis

Data were analyzed using IBM SPSS software package version 23 and Epi-Info version 3.5.1. Descriptive statistics such as frequencies and percentages were determined. Association between variables was assessed by calculating the odds ratios. Multivariable logistic regression model (MVLM) was used to determine predictors of infection and Confidence Interval (CI) was set at 95% CI, level of significance 5%.

Results

Occurrence of STHs of Soil from Ibarapa Area

Of the total 432 soil samples that were collected across Ibarapa, 49 (11.3%) were positive for ova of STHs. *Strongyloides* spp. was the most frequently encountered STH, with an overall prevalence of 33 (7.6%) while *Trichuris trichiura* had the least prevalence of 10 (2.3%) as presented in Table 4.1. Also the study showed the true parasitic profile of contamination of soil in different sampling sites. The examined soil samples from each site showed that slaughter slab 27 (6.3%) was the most contaminated while the samples from both cattle market and the soil surrounding different stream water had the least, a prevalence of 3 (0.7%) each.

Knowledge and Practices Related to Prevention of Intestinal Parasitic Infection

All participants had heard of intestinal parasitic infection. However, only 28.5% knew transmission of intestinal parasites could occur via contact with contaminated soil. On intestinal parasitic infection prevention related questions, 86.2% of the respondents had good knowledge of prevention measures. 75.1%, 87.5% and 64.6% indicated contact with contaminated water, consumption of contaminated food and consumption of unwashed fruits and vegetables as modes of transmission, respectively. However, only 28.5% knew transmission of intestinal parasites could occur via contact with contaminated soil. Further, below half (46.6%) demonstrated good practice to the prevention of parasitic infection. 69.7% still walk barefooted, 67% of the respondents have access to water closet toilets, and only 42% of the respondents wash their fruits and vegetables before eating while about a third, 29.8% of the respondents deworm periodically.

Discussion

Soil samples collected in this study were found to be contaminated with helminth eggs, which is of great epidemiological significance and a serious public health concern in the study area. The presence of zoonotic nematodes, like *Trichuris* eggs, may likely be linked to sampled sites being exposed to scavenging stray and grazing animals that defecate about in cattle market, cattle kraal and slaughter slabs studied. The samples investigated displayed poor sanitation as soil samples from all the sites harbored one parasitic egg or the other. There is a risk of contracting infection from any of the sampled sites because both humans and animals frequent the sites sampled. Also, STH contaminated soil serves as a continuous source of infection (Ogbolu *et al*., 2011).

Lack of knowledge that transmission of parasites could occur via direct contact with contaminated soil was very high (72.5%). The high rate of lack of knowledge that transmission of parasites could occur via direct contact with contaminated soil is disturbing, considering the vulnerability and exposure risks associated with children (Welch *et al*., 2016). Further, less than half demonstrated good practices; observations showed that a little above half of them wash hands with soap after using the toilet, and less than half of them wash fruits and vegetables before eating in this study. This suggested the need for more enlightenment campaigns regarding prevention of intestinal parasitic infection among the members of the community.

Conclusion

The presence of parasitic contamination of soil observed in the present study coupled with lack of knowledge that transmission of parasites could occur via direct contact with contaminated soil pose a high risk of STH transmission in the study area, therefore there is a need for proper education on parasite transmission in the area.

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Conflict of Interest Statements

The authors declare no conflict of interest.

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Table 4.1 Prevalence of STHs in soil samples from various sites in Ibarapa areas

Sites	No. of sample	No. of positive Samples with STHs (%)	Frequency of STHs *Ascaris* spp (%)	*Trichuris trichuria* (%)	*Strongyloides* spp (%)
Cattle markets	108	3(6.1)	2(12.5)	1(10)	1(3.0)
Cattle kraals	108	16(32.7)	2(12.5)	4(40)	14(42.4)
Slaughter slabs	108	27(55.1)	10(62.5)	5(50)	17(51.5)
Soil around water sources	108	3(6.1)	2(12.5)	-	1(3.0)
Total	**432**	**49**	**16**	**10**	**33**

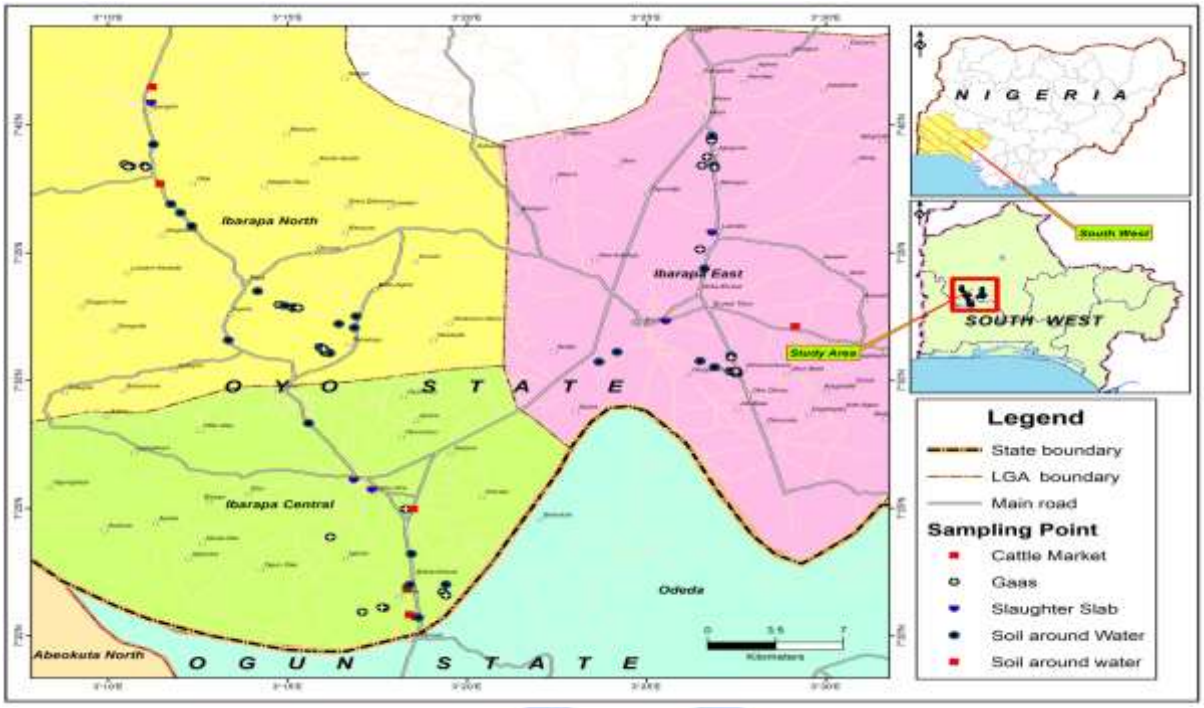

Figure 1: Map of the study area showing specific areas where soils were sample

. EFFECT OF REPLACING SOYBEAN MEAL WITH BUTTERFLY PEA (*Clitoria ternatea)* SEED MEAL ON GROWTH AND HAEMATOLOGICAL PARAMETERS OF AFRICAN CATFISH (*Clarias gariepinus)*

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Abstract
Clarias gariepinus juveniles of average initial weight of 22.48g were subjected to four (4) different dietary treatments of varying replacement levels of soybean meal with Butterfly pea (Clitoria ternatea) seed meal. The feeding trial was carried out for eight (8) weeks to assess the effect of the inclusion on the growth performance and hematological parameters of the experimental fish. The diet I-IV contained 0%, 25%,50% and 100% replacement level respectively. Feeding was done twice daily at 5% body weight and the fish were weighed every week. At the end of the feeding trial, the results showed that fish fed diet III (50% replacement) had the highest average weight gain (32.25g), specific growth rate (1.57) and protein efficiency ratio (0.80). The analysis of variance revealed that there was no significant difference (p>0.05) in the growth performance and feed utilization of fish fed diet III and diet I (control diet). It was also revealed that WBC increases as the level of replacement increases. The highest RBC was recorded in fish fed diet II (3.33 x 10^3/L), which was not significantly different (p>0.05) from diet III (2.83 x 10^3/L). The blood characteristics were mostly within the standard range for African Catfish, thereby indicating no serious adverse effect. The study concluded that soybean meal can be effectively replaced with Clitoria ternatea seed meal in the diet of Clarias gariepinus.
Keywords: African Catfish, Feed Utilization, Butterfly Pea, Diet

Introduction

African mud Catfish (*Clarias gariepinus)* is the most popular cultured species in Nigeria having the ability to feed on variety of food items ranging from zooplankton to fish (Sogbesan and Ugwumba, 2006). Like other animals, fish also need protein, carbohydrate, lipids, minerals and vitamins for growth and maintenance of physiological activities. A source of protein is not adequate but a combination of various sources such as animal and plant sources are the best. Many domestic and agricultural wastes such as corn bran, guinea corn bran, rice bran, wheat bran, brewery wastes, blood meal, palm kernel cake etc; are some main ingredients required for compounding artificial fish diet to reduce the cost of fish production (Tom, 1989). The need to source for cheaper (unconventional) feeds of high dietary values arose as a result of the expensive nature of commercial fish diet and conventional seed ingredients that are used in the formulation

Non-conventional feed resources (NCFRs) are feeds that are not usually common in the markets and are not the traditional ingredients used for commercial fish feed production (Madu and Ufodike, 2003). Depending on the locality, some feeds ingredients may be sourced cheaply as substitute to some expensive conventional feed item. Non-conventional feed items of plant source are abundant almost in every locality of Africa (Ugwumba and Ugwumba, 2003). Their potential and utilization in aquaculture have been reviewed with their level of inclusion in fish diet.

Clitoria ternatea commonly known as Butterfly pea belonging to the family *Fabaceae*, the plant is mainly used as a forage as it is highly palatable for livestock and it is well adapted to various climates (Gomez, 2003). *Clitoria ternatea* seed meal has the potential of being a good

feed in ingredient animal feed production because of its high crude protein content which ranges between 38% - 43% (Odeyinka *et al.,* 2004).
Levels of dietary protein and energy not only influence the growth and body composition but also digestive enzymes activities and plasma metabolites in various species (Yamamoto *et al.,* 2006). Moreover, dietary protein is considered as the main constituent in fish diets that is required to support growth but can proportionally increase the feed costs (Ahmad *et al.,* 2012). This has increased the search for alternative replacement of the conventional feed ingredient with unconventional feed ingredient to achieve a cost effective production. Therefore, this study investigates the effect of *Clitoria ternatea* seed meal on the growth response and hematological parameters of *Clarias gariepinus.*

Materials and Methods
The experiment was carried out in the Fish farm of Oyo State College of Agriculture and Technology, Igboora, Oyo State. Nigeria. A total of one hundred and forty-four (144) juveniles, average body weight 22.48g$^{\pm}$0.41g were purchased at Hephzibah Fish Farm, Idi iroko, Ogun State and acclimatized for two days prior the feeding trial. Four iso-nitrogenous and iso-caloric diets were formulated. Butterfly pea (*Clitoria ternatea)* seed freshly plucked from Oyo State College of Agriculture and Technology Igboora environment were included in the diets to replace soybean meal at 0%, 25%, 50% and 100% replacement level. The seed was extracted from the cob and oven dried at 70^0C using electric oven. Other ingredients (fishmeal, groundnut cake, soybean meal and maize) were grinded into powdery form using burr mill and mixed thoroughly with hand. Warm water was added to the premixed ingredients and homogenized to a dough-like paste. This was then pelletized using a 2mm pellet press. The pelletized feed was later sun-dried for 4 days, stored in airtight containers throughout the experiment period.
The experiment was laid out in a Simple Randomized Design (SRD); four treatments with three replicates. The experimental fish were randomly allotted to 12 plastic tanks at the rate of 12 juveniles per tank. The four diets (0% control diet, 25%, 50%, and 100% replacement with *Clitoria ternatea* seed meal) were administered to the fish at 5% of their body weight twice in a day (9am and 4pm) for period of 8 weeks. The water in the plastic was changed with pre-conditioned pipe-borne water every three days.

Table 1: Percentage composition of the experimental diets (%)

Ingredients	Diet I	Diet II	Diet III	Diet IV
Replacement level	0%	25%	50%	100%
Fishmeal	26.78	26.97	27.15	27.52
Maize	32.03	31.58	31.10	30.19
GNC	12.62	12.69	12.80	12.98
Soybean	26.78	20.23	13.58	0
Clitoria seed meal	0	6.74	13.58	27.52
Lysine	0.1	0.1	0.1	0.1
Methionine	0.1	0.1	0.1	0.1
Salt	0.1	0.1	0.1	0.1
Bone meal	1.0	1.0	1.0	1.0
Premix	0.5	0.5	0.5	0.5
Total	100	100	100	100

Table 2: Anti-nutritional factor present in seed of *Clitoria ternatea*

Anti-nutritional factor	Seeds (%)
Phytate	0.06
Oxalate	0.09
Tannin	0.05

Source: Alalade *et al. (*2019)

Growth performance parameters of the juveniles fed different diets

Fish growth and feed utilization efficiency in the experiment was measured weekly and at the end of the experiment. The following parameters were measured;

- Weight gained = final weight- initial weight
- Specific growth rate (SGR) = $\frac{\ln(\text{Final Weight}) - \ln(\text{Initial weight})}{\text{Duration of the Experiment (Days)}} \times 100$
- Feed conversion ratio (FCR) = $\frac{\text{Feed intake}}{\text{Body weight gain}}$
- Survival rate = $\frac{\text{Total number of dead fish}}{\text{Total number of stocked}} \times 100$
- Protein efficiency ratio = $\frac{\text{Mean weight gain}}{\text{Average crude protein feed}}$
- Net protein utilization = $\frac{\text{Net protein in carcass}}{\text{Protein feed}} \times 100$
- Percentage weight gain = $\frac{\text{Mean final weight gain} - \text{Mean initial weight}}{\text{Mean Initial weight}} \times 100$

Haematological Studies

Blood samples were collected at the expiration of feeding trials. The samples were collected from a total of 12 fish (3 fish/treatment) into EDTA bottles (Ethylediamine Tetraacetic Acid) for analysis. The blood samples in the bottles were transported to the laboratory for analysis, using the haematological procedure described by Blaxhall and Daisley, (1973) and Wedemeyer *et al.*,(1983). The parameters measured include; White blood cells (WBC), Red blood cells (RBC), Packed blood cell volume (PCV), Haemoglobin and Mean corpuscular volume (MCV).

Statistical analysis of data.

All the data obtained were statistically analysed. The analysis of variance (ANOVA) was used to determine the effect of the diets on the growth performance, and the means were separated by Duncan Multiple Range Test using the SPSS version 20.0

Results and Discussion

The proximate composition of Butterfly pea seed meal (*Clitoria ternatea*) was determined and revealed in table 3 below. The Crude protein, Lipid, Ash, Crude fibre and CHO content of *Clitoria ternatea* were 40.01, 13.32, 3.10, 9.70 and 23.96 respectively.

Table 3: Proximate Composition of Butterfly Pea Seed meal

Crude Protein (%)	**Lipid(%)**	**Ash(%)**	**Crude Fibre(%)**	**CHO(%)**	**Moisture(%)**
40.01	13.32	3.10	9.70	23.96	9.91

Protein requirement is given high priority in any nutritional study because it is the nutrient that is required in the largest quantity for growth and development. Since there was no significant differences in the protein content of the diet, differences in performance of experimental fish may be linked to superiority of protein quality of the feed ingredients. After 8 weeks of the feeding trial, fish fed diet III recorded the highest weight gain (32.25$\pm$0.32g)

but was not significantly different from the weight gained by fish fed control diet (31.71±1.05g). The weight gain reduced as the replacement level increased beyond 50%. This is similar to the findings of Tiamiyu *et al.,* 2014 who reported an increase in weight gain of African Catfish fed *Citrullus lanatus* at 50% replacement level. Many other authors have similarly reported replacement level of about 50% as tolerable level in most agricultural by-products (Babatunde *et al.,* 2007). Fakunle *et al. (*2013) had also stated that anti-nutritional factors in plant based protein rich ingredients may cause irritation of digestive tract which is capable of decreasing feed intake and growth. Hence, inclusion beyond the tolerable level of the fish can lead to adverse growth and consequences.

The improved specific growth rate (1.57±0.01) obtained in this study at 50% replacement level (diet III) is also in line with Tiamiyu *et al. (*2015) when he reported that the specific growth rate was highest in the 50% inclusion level of water melon seed. The specific growth rate at 100% inclusion level (diet IV) decreased. This is similar to the findings of Samuel *et al. (*2021). This is probably because the fish could no longer tolerate the anti-nutrient agents in the butterfly pea seed meal.

Feed conversion ratio (FCR) is the quantity of feed required to produce one unit weight of fish. The fish fed control diet had the lowest FCR (0.57±0.03). The analysis of variance revealed that the FCR of diet II and diet III were not significantly different ($p<0.05$) from the control diet. This is an indication of effective utilization of the feed; a lower FCR indicated a more efficient feed or feeding strategy (Sahzadi *et al.,* 2006).

The protein efficiency ratio is measured in growth using the dietary protein as an index (Solomon and Okomoda, 2012). The variation of Protein efficiency ratio of the various diets suggests the bulk of the protein consumed and converted to weight gain. However, the protein efficiency ratio of the control diet (0.78±0.03g) and diet III (0.80±0.02g) were not significantly different ($p<0.05$), but were significantly higher than diet II (0.72±0.01g) and diet IV (0.67±0.02g) respectively. This reveals that protein quality of *Clitoria ternatea* was effectively utilized by *Clarias gariepinus* juvenlines to about 50% inclusion level.

The analysis ofvariance revealed that the survival rates of the treatments were not significantly different ($p>0.05$). As shown in table 4, the control diet recorded the highest survival rate of 80.55±3.15

Table 4: Growth Performance of African Catfish (*Clarias gariepinus*) Juvenile Fed Varying Inclusion of *Clitoria ternatea* Seeds Meal.

PARAMETERS	DIET I	DIET II	DIET III	DIET IV
Average Initial weight (g)	22.90 ± 1.54^{a}	22.10 ± 2.08^{a}	22.57 ± 1.03^{a}	22.40 ± 0.89^{a}
Average Final Weight (g)	54.60 ± 2.67^{a}	51.41 ± 1.27^{b}	54.82 ± 2.10^{a}	48.33 ± 1.11^{c}
Average Weight Gain (g)	31.71 ± 1.05^{a}	29.30 ± 0.51^{b}	32.25 ± 0.32^{a}	25.93 ± 1.11^{c}
Percentage Weight Gain (%)	138.47 ± 2.11^{a}	132.58 ± 3.15^{b}	142.89 ± 2.74^{a}	115.75 ± 2.05^{c}
Av. Feed intake (g)	18.51 ± 1.04^{a}	17.10 ± 0.72^{b}	18.80 ± 1.11^{a}	17.51 ± 0.63^{b}
Specific Growth Rate	1.55 ± 0.05^{a}	1.51 ± 0.02^{b}	1.57 ± 0.01^{a}	1.38 ± 0.02^{c}
Feed Conversion Ratio	0.57 ± 0.03^{b}	0.58 ± 0.02^{b}	0.58 ± 0.03^{b}	0.68 ± 0.01^{a}
Protein Efficiency Ratio	0.78 ± 0.03^{a}	0.72 ± 0.01^{b}	0.80 ± 0.02^{a}	0.67 ± 0.02^{c}
Survival Rate (%)	80.55 ± 3.15^{a}	75.00 ± 1.40^{b}	75.00 ± 2.50^{a}	77.77 ± 2.33^{a}

Mean values along the row with different superscripts are significantly different ($p<0.05$)

Haematological parameters are routinely used for evaluation of physiological environment and husbandry stressors in fishes. The changes in the blood characteristics of *Clarias gariepinus* caused by stress due to exposure to environmental pollutant, diseases or pathogens have been studied by many researchers especially in capture fisheries (Ezeri, 2001). Haematological components of blood are also valuable in monitoring feed toxicity especially

with feed constituents that affect the formation of blood in culture fisheries (Oyawoye and Ogunkunle, 1998).

The PCV of 18.5% - 31.5% observed in this study is within the range of 20-37% reported by Adegbesan *et al. (*2018) from the study of haematological profile of African catfish fed varying levels of Aloe barbensis leaves. *Clarias gariepinus* juveniles fed 25% partial inclusion of *Clitoria ternatea* seed meal recorded the highest PCV (31.5%), which is significantly higher ($p<0.05$) than the control diet (18.5%) and other treatments observed. Hemoglobin was seen to be significantly higher in the test diets (II,III and IV) than the control diet as shown in Table 5. The higher values of hemoglobin in fish fed *Clitoria ternatea* shows an iron conjugated protein with effective and better oxygen carrying capacity. It also enhances metabolic reaction in the body of animals (Ugwuene, 2011; Omiyale *et al.*, 2012). The Red blood cells (RBC) reduces with increase in inclusion rate. The lowest RBC was recorded in diet IV (2.07 x 10^3/L) with 100% replacement of SBM. The reduced RBC of fish fed diet IV could be as a result of high concentration of anti-metabolised especially tannin. The range of RBC (2.07–3.33×10^3L) is comparable with (2.24–2.49×10^3L) reported by Sotolu and Faturoti (2009) in a study on growth performance and haemtological of *Clarias gariepinus* fed varying inclusion of *Leucaena laucocephala* leaf meal.

The increase in WBC as the level of inclusion surpasses 25% may be attributed to increased production of leucocytes in the hermatopoietic tissue of the liver. The WBC and lymphocytes are the defence cells of the body. Donglas and Jane (2010) reported that the amount of WBC and lymphocytes in the blood has an implication on immune responses and the ability of the animal to fight infection. However, Adegbesan *et al* (2018) stated that high WBC count can also be associated with microbial infection or circulating system. Analysis of variance showed that WBC (251.50 x10^3/L) and lymphocytes (92) value in fish fed diet IV differ significantly ($p<0.05$) from the values obtained in the fish fed the control diet. The MCV recorded for the treatments were within the standard for *Clarias gariepinus* as indicated by Peruzzi *et al. (*2005), and therefore not adjudged to indicate any negative physiological effect on the experimental fish. However, diet II (94.6) and diet IV (96.6) were significantly higher than the control diet (86.4).

Table 3: Haematological Parameters of African Catfish (*Clarias gariepinus*) Juvenile Fed Varying Inclusion of *Clitoria ternatea* Seeds Meal

TRT	PCV (%)	HB (g/dl)	RBC (x10^3/L)	WBC (x10^3/L)	PLATELET	LYM (%)	MCV
DIET 1	18.5^d	6.35^c	2.34^c	183.50^c	146000^b	61.5^b	86.4^b
DIET 2	31.5^a	10.1^b	3.33^a	167.50^d	143500^b	51.5^c	94.6^a
DIET 3	24.0^b	11.0^a	2.83^a	208.00^b	231000^a	57.5^b	84.8^b
DIET 4	20.0^c	9.65^b	2.07^c	251.50^a	156000^b	92.0^a	96.6^a

*Values across the same column with different superscripts are significantly different $p<0.05$

Conclusion and recommendation

Protein based ingredients are the most expensive ingredients in diet formulation (Solomon and Okomoda, 2012), particularly in the diet of fish due to their high protein requirement compared to other animals. Results from the experiment revealed that soya bean meal can be effectively replaced with *Clitoria ternatea* seed meal. The replacement is at best at up 50% inclusion level, as it compete closely with the control diet in terms of weight gain, specific growth rate, feed conversion ratio, protein efficiency ratio, feed intake and blood indices. Considering the high cost of conventional feed and the competitive use of soybean meal, it is recommended that *Clitoria ternatea* seed meal (a non-convention feed ingredient) be introduced to fish feed diet as a cheaper alternative to soybean meal.

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EFFECTS OF FEED RESTRICTION AND GENOTYPE ON CARCASS TRAITS OF BROILER AND NOILER CHICKENS

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Abstract
The experiment was conducted to evaluate the effect of feed restriction and genotype on carcass parameters of two chicken breeds. The experiment was carried out at Poultry Unit of Teaching and Research Farm, Oyo State College of Agriculture and Technology Igboora, Oyo State. A total of 100 chicks (50 per genotype) comprise Broilers and Noilers. They were housed separately in a deep litter pen at day old, all the birds were weighed at day old (initial weight). Twenty five of the broiler and Noiler chickens were fed ad libitum while the remaining 25 of the two breedswere fed 75% ad libitum. On the 6th week, data were collected on live body weight. The birds were starved over night to avoid contamination of carcass and to present wholesome meat. Broilers fed ad libitum (Bad) and Noiler fed ad libitum (Nad) had the highest live weight 2181.40 and 821.40g/bird, respectively, while broiler with restricted feeding (Br) and Noiler with restricted feeding (Nr) had the lowest lives weight 2034.00 and 622.00g/bird, respectively. There wa no significant difference (p>0.05) between all chicken breeds examined for percentage bled weight (BLW). There was significant (p>0.05) difference among Noiler fed ad libitum (Nad) and those with restricted feeding (Nr) (92.03% and 93.15%, respectively). The results of the present investigation have shown that birds not under too long and severe feed restriction could still perform well in terms of carcass characteristics. It was therefore recommended that restriction of feed in broilers and noiler could be used to increase profitability and production of lean chicken.
Keywords: Noiler, Broiler

Introduction

Early fast growth in broiler chickens is accompanied by excessive fatness and an increased incidence of skeletal and metabolic diseases. To minimize these negative effects of genetic selection associated with fast growing broilers that consume feed *ad libitum*, the concept of feed restriction was introduced in order to grow the industry and satisfy the animal protein requirements of the citizenry. Yu *et al. (*1990) observed that feed restriction has significant effect on body fat of broilers. Fast growth rate has been associated with greater susceptibility to metabolic disorders such as ascites and sudden death syndrome, and a high incidence of skeletal problems (Garner *et al.*, 2002; Scott, 2002; Yu and Robinson, 1992). Fat is an uneconomical and undesirable product that not only increases the occurrence of metabolic diseases and skeletal deformities, but also causes problems in feed efficiency, difficulties in meat processing, and rejection of meat by consumers for health reasons (Urdenta-Rincon and Leeson, 2002).

Feed restriction, whether qualitative or quantitative, is denying birds a full access to nutrients that are required for their normal growth and development (Sahraei *et al.*, 2007. Early feed restriction is practiced in broilers to induce compensatory growth, improve efficiency of feed utilization, and lower maintenance requirements in the grower and finisher phases (Teimouri *et al.*, 2005). This will ultimately lead to reduction in feed and production costs, thereby,

producing a lean quality meat at cheaper prices (Mahmud *et al.,* 2008; Navidshad *et al.,* 2006; Zubair and Leeson, 1996).
Periodic restriction of the daily feed offered to simulate compensatory growth is a mean to reduce the feed cost. Feed restriction during the growing period in broiler chicken lowers body weight and carcass fat, while improves feed efficiency with compensatory growth during re-feeding (Al-Taleb, 2007). In laying hen, feed restriction during rearing decreases adult body weight, delays age of sexual maturity, decreases mortality, and the number of heavy follicles at the onset of laying (Bruggeman *et al.,* 2005). The aim of this study is to determine the effect of feed restriction and genotype on carcass quality of commercial broiler and Noiler chicken.

Materials and methods

Experimental site

The experiment was carried out at the Poultry unit, Teaching and Research farms, Oyo State College of Agriculture and Technology, Igboora, Oyo State

Experimental animals and management

A total of 100 chicks were used, 50 chicks per genotype (Noiler and commercial Broiler chicken). The chickens were divided into two and housed separately, constituting the replicates with 25 birds in a deep litter pen at day old. The experiment was carried out for 6 weeks

Diet and Feeding plans

Commercial starter containing 20% CP and 2996Kcal/kg ME was given from 0-4 week feed and finisher diet with 16.80% CP and 28232996Kcal/kg ME was given from 4-6weeks, clean and cool water were provided *ad libitum.*The first groups were fed *ad libitum* while the second groups were fed 75% *ad libitum*. Necessary vaccinations against Newcastle and Gumboro diseases as well as prophylactic antibiotics and anti-coccidial drugs were given to the birds

Data collection

All the birds were weighed at day old (initial weight. At 6th week after an overnight fasting, five birds per replicate were randomly picked, weighed, slaughtered, scald in hot water and defeathered by hand picking. Eviscerations was accomplished by posterior ventral cuts, thus a complete removal and weighing of visceral organs, each carcass was dissected into different cuts and were measured using electronic digital weighing.
The following carcass parameters were evaluated:

- **Live weight**: weight of the bird before slaughter
- **Plucked weight**: i.e. weight of the carcass after feather plucking (Salami *et al.,* 2004)
- **Eviscerated weight:** i.e. weight after removal of the head and the intestine (Aduku and Olukosi,2000)
- **Carcass yield:** as % by weight of the carcass to living bird before slaughter (Hahn and Spindler, 2002)
- **Weight of cut part:** weight of the individual part of the carcass in percentage of the live bird (Breast yield, Thigh yield, Drumstick yield, chest yield Wing yield)

Data analysis

Data on body weight, carcass traits and internal organs were arranged in a General Linear Model (GLM) procedure and analysed using one-way analysis of variance of SAS version 9.4 (2019). Differences among genotype means were compared by Duncan's Multiple Range test (Duncan, 1955).

Results

The results of effect of feed restriction and genotype on carcass traits and internal organs of two chicken breed was presented in table 1. The results revealed that there were significant

differences between the broilers and Noilers for almost all the parameters. The values of live weight recorded across the genotypes were significantly different ($p<0.05$). Broiler fed *ad libitum* (B*ad*) and Noiler fed *ad libitum* (N*ad*) has the highest weight 2181.40g and 821.40g respectively, while broilers placed onrestricted feeding (B*r*) and Noiler with restricted feeding (N*r*) had the lowest live weights (2034.00g and 622.00g, respectively). There was no significant difference ($p < 0.05$) between all chicken breed examined for bled weight (BLW).The values of plucked weight (PW) were significant difference between the PW of N*ad* and N*r*,(92.03% and 93.15%, respectively), while B*ad* and B*r* recorded similar values. There were no significant difference ($p<0.05$) between breast muscle, leg, wings and thigh of both B*ad*, N*ad*and B*r*. B*r* has the highest percentage of drum stick (11.5%) while B*ad* has the lowest compared with Noiler fed *ad libitum* that has the highest percentage of drumstick value of 10.48%.

There were no significant differences ($p<0.05$) between chest, back, fat and tail values of all the birds examined. The chest value range from 5.87% to 4.67%. The highest value was obtained for back in N*ad* with 7.70% and the lowest of 7.17% from N*r*. There were no significant differences ($p<0.05$) between the internal organs of broilers fed *ad libitum* and those with restricted feeding. But there were significant ($p>0.05$) differences between gizzard, lungs and heart of both Noiler fed *ad libitum* and those with restricted feeding. Gizzard recorded highest percentage in B*ad* (50.40g) and lowest percentage was obtained from N*r* (27.20g). For lungs, its ranged from 2.80g to 11.40g , also for the heart, the highest value was obtained from B*ad* with 9.40g and lowest from N*r* with 2.60g. No significant ($p<0.05$) differences was observed between the values of proventiculus of all the groups of chicken examined; B*ad* (9.40g), Br (8.40g), Nad (7.00g) and Nr (4.20g).

Table 1: Effect of feed restriction and genotype on carcass traits and internal organs of two chicken breeds

Parameters	B*ad*	B*r*	N*ad*	N*r*	SEM
Live Weight (g)	2181.40^{a}	2034.00^{b}	821.40^{c}	622.00^{d}	161.65
PercentageBLW(%)	98.36	99.38	98.13	98.87	0.22
Percentage PW(%)	95.13^{a}	94.55^{a}	92.03^{c}	93.15^{b}	0.34
Percentage BRW (%)	26.43^{a}	25.30^{a}	14.76^{b}	14.52^{b}	1.13
Leg(%)	4.24^{b}	4.23^{b}	5.50^{a}	5.55^{a}	0.18
Wing(%)	7.93^{b}	8.26^{b}	9.55^{a}	9.35^{a}	0.19
Thigh(%)	7.93^{b}	8.26^{b}	9.55^{a}	9.35^{a}	0.19
Drum stick(%)	10.93^{ab}	11.65^{a}	10.48^{bc}	9.61^{c}	0.24
Neck(%)	10.47^{b}	9.92^{ab}	9.77^{ab}	9.09^{b}	0.19
Head(%)	4.32^{bc}	3.57^{bc}	6.52^{a}	5.06^{b}	0.31
Chest(%)	5.71	5.87	4.67	5.13	0.30
Back(%)	7.66	7.21	7.70	7.17	0.19
Fat(%)	1.16	1.48	1.75	1.19	0.09
Tail(%)	0.73	0.58	0.86	0.64	0.49
Crop(%)	1.08^{b}	1.67^{ab}	2.14^{a}	1.40^{b}	0.13
Intestine(g)	107.8^{a}	94.4^{a}	54.2^{b}	43.2^{b}	6.64
Liver(g)	44.2^{a}	38.6^{a}	23.8^{b}	20.6^{b}	2.49
Gizzard(g)	50.40^{a}	47.40^{ab}	37.80^{b}	27.20^{c}	2.61
Lungs(g)	11.20^{a}	11.40^{a}	5.40^{b}	2.80^{c}	0.93
Heart(g)	9.40^{a}	8.40^{a}	4.60^{b}	2.60^{c}	0.40
Proventiculus(g)	9.40^{a}	8.40^{a}	7.00^{b}	4.20^{b}	0.59

^{abcd}Mean on the same role with different superscripts are significantly different ($P<0.05$) . B*ad* = Broiler fed *ad libitum*; B*r* = Broiler with restricted feeding;N*ad* =Noiler fed *ad*

*libitum;*N*r* =Noiler with restricted feeding;, BLW = Bled live weight;PW = Plucked weight; BRW = Breast weight

Discussion

Dressing percentage is a better index of total edible meat after the visceral organs, blood and feathers have been removed (Ugwu and Onyimonyi, 2008). Based on the present study, Broiler with restricted feeding has highest percentage of carcass and internal organs traits.

Amao *et al. (*2011) obtained final body weight of Ross, Anak and Marshall broiler chickens as 2.445.32±60.02, 2.340.75±39.04, and 2.100.21±61.23g respectively. This is partially in agreement with what was obtained in this present study of feed restriction. Broiler fed *ad libitum* (2181.40) and those with restricted feeding (2034.00g).

The weight of primal cuts of the chicken such as breast, thighs, drumstick, wings and back are very important as whole carcass are no longer popular but preference given to cuts, This study confirmed the work of Sahraei *et al. (*2007) who stated that there was no significant different in the yield of carcass after slaughter.

Early fast growth in modern broilers is associated with increased stress and development of fats and can result in metabolic diseases and skeletal disorders that lead to economic losses due to reduced animal performance, high mortality rates and carcass condemnation at slaughter houses (Sahraei *et al.,* 2007).

The benefits of early feed restriction are the monetary savings obtained by improved feed conversion, reduced sudden death syndrome (Bhat and Banday, 2000), reduced death losses, ascites (Arce*et al.,* 1992) and reduced skeletal disease (Robinson *et al.,* 1992). The use of total feed restriction at an early age to elicit compensatory growth, improved feed efficiency and reduced abdominal fat pad which has received considerable attention. Leeson 2002 suggested that physical feed restriction at early age of birds for a short period stimulated compensatory growth so that at the market age, feed restricted birds performed similarly to those of the full fed group. Birds subjected to feed restriction have been shown to have lesser carcass fat content at market age (Sahraei *et al.,* 2007). This is in agreement with what was recorded in this present study with no mortality for the period of the experiment.

Feed restriction had no effect on the total carcass fat content of broiler chickens (Lippens *et al.,* 2000, Benyi *et al.,* 2009).

This present study is in agreement with the findings of Urdaneta-Rincon and Leeson (2002) that the breast meat yield of broiler chickens was not significantly affected by feed restriction, 26.43% and 25.30% breast meat for B*ad* and B*r* respectively. According to Sahraei *et al. (*2007), breast, leg and wing yields expressed as a percentage of the carcass were not significantly affected by feed restriction this is also in agreement with what was obtained in this present study.

Conclusion and recommendation

Conclusion

The results of the present investigation have shown that birds not under too long and severe feed restriction could still perform well in terms of carcass characteristics. It was therefore recommended that

- Restriction of feed in broilers and noiler could be used to increase profitability and production of lean chicken.
- 75% of *ad libitum* feed can be adopted by poultry farmers especially for broiler production.

More research should be carried out for further study on feed restriction in chicken.

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EFFECT OF FEEDING GRADED LEVELS OF HYACINTH BEAN (LABLAB PURPUREUS) SOAKED IN PAP WATER FILTRATE ON GROWTH PERFORMANCE OF BROILER AT FINISHER PHASE.

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Abstract
A total of 90 day old broilers were used for the study to determine the growth performance of broiler finisher fed graded levels of lablab purpureus seed soaked in pap water filtrate. The experiment was carried out at the Teaching and Research Farm of Oyo State College of Agriculture and Technology, Igboora. The seeds used were purchased from Bodija Market in Ibadan. The raw seeds were first soaked at the rate of 1kg/3L of water for 12 hours, after which the soaked seed were soaked at the rate of 1kg/3L of pap water filtrate for 24 hours, initial and final pH were taken, samples were sundried for 3days, milled and then included in the diet accordingly. Birds were randomly assigned into 3 dietary treatments of 30 birds consisting of 3 replicates of (10) birds per replicates in a completely randomized design experiment. Birds on T1 received the control diet (0% lablab), T2 received 5% level of lablab, while T3 received 10% level of lablab. The experiment lasted for eight (8) weeks. Results showed that there were significant (P<0.05) differences in all the growth performance parameters measured. Birds on T3 had the highest value of final live weight (2128.50g), weight gain (1816.56g) feed intake (5780g) and a better feed conversion ratio of (3.18). However, birds on TI had the lowest value of final live weight (19800.50g), weight gain (1634.09g) and feed intake (5680g). It can be concluded that feeding of acid soaked lablab seed improved performance of the experimental broiler finishers
Keywords: Broiler, *Lablab purpureus*, treatment, replicate, performance

Introduction

The use of legumes as source of protein and energy in animal production has greatly contributed to the survival of livestock industry in developing countries. However with the increasing importance of conventional grain legumes such as soya bean and groundnut in human diets, their use has almost disappeared as source of supplementary protein in cereal based diet for livestock animals (Oluyemi and Robert, 2000). Improved nutrition in animals is subject to either the possibility of increasing the local production of soya bean and groundnut, or encouraging the use of other lesser- known grain legumes. An example of the lesser known grain legumes in the tropics is pigeon pea (*lablab purpureus*). *Lablab purpureus* is a tropical leguminous plant with high seeds and foliage yield. The legume is potentially suitable for feeding livestock with a protein content ranging between 25% was reported for lablab by (Eneche, 2003). Lablab is cultivated for its edible part (bean) which is contained in hard and tough, 20-30 long pods. It is mainly used as food but can be used to feed animal. However, the nutritive value of lablab is masked by the occurrence of anti-nutritional factors such as tannins trypsin inhibitors hydrogen cyanide, saponins and phytic acid (Akinmutimi *et al.*, 2006). Processing method such as heating, soaking or fermentation can be used to reduce the anti-nutritional factor and improve the nutritional value of the seed and its by-products (Onyeike *et al.*, 1995). Boiling, toasting and soaking are some of the

processing method which had been used (Ahameufule, 2000) to inactive these anti-nutritional factors in legumes

Materials and methods

Experimental site

The experiment was carried out at the Teaching and Research Farm, Oyo State College of Agriculture Igboora, Nigeria.

Procurement of Lablab seeds: Lablab seed was purchased from Bodija market, Ibadan.

Pre-treatment of lablab seeds: the lablab seeds were soaked at the rate of1kg/3L of water for 12 hours after which the water was decanted

Treatment of sample: The soaked seeds were soaked at the rate of 1kg/3Lof raw pap water filtrate for 24hours. Initial and final pH was taken. The seeds were sundried for 3days, milled and then included in the diet accordingly

Experimental diet

A total number of 90 birds were used for the study, they were randomly assigned into 3 dietary treatments of 30 birds consisting of 3 replicates often (10) birds per replicates in a completely randomized design experiment. Birds on T1 received the control diets (0% lablab), T2 received 5% level of lablab, while T3 received 10% level of lablab. The experiment lasted for eight weeks

Table 1: Gross composition of experimental diets (5-8weeks)

Ingredient	T1 (0%)	T2 (5%)	T3 (10%)
Maize	58.00	56.24	54.50
SBM	27.00	25.64	24.29
Lablab	0.00	3.12	6.21
Wheat offal	10.00	10.00	10.00
Limestone	2.00	2.00	2.00
Bonemeal	2.00	2.00	2.00
Lysine	0.25	0.25	0.25
Methionine	0.25	0.25	0.25
Salt	0.25	0.25	0.25
Broiler Premix	0.25	0.25	0.25
TOTAL	100.00	100.00	100.00
Calculated Analysis			
Crude protein (%)	19.65	19.47	19.29
ME (kcal/kg)	2908.22	2904.50	2901.99

ME: Metabolizable Energy, SBM: Soyabean meal

Data collection: Data were collected on initial weight, final weight, Feed intake, Weight gain, Feed conversion ratio and mortality

Statistical analysis: Following the experimental design, all data collected were subjected to statistical analysis of variance (ANOVA) using SPSS 2003 version and means separated by Duncan Multiple Range Test.

Results and Discussion

Results

There were significant ($P<0.05$) difference in all the growth performance parameters measured for birds fed acid soaked lablab purpureus across the treatments. Birds on T2 had the highest significant ($P<0.05$) values of final live weight (2128.50g), weight gain (1816.56g) feed intake (5780g) and a better feed conversion ratio of (3.18g). However, birds

on TI had the lowest value of final live weight (19800.50g), weight gain (1634.09g) and feed intake (5680g)

Table 2: Effect of feeding varying inclusion levels of Acid soaked *Lablab purpureus* seed on growth performance of broiler finishers.

Parameters	T1(0%)	T2(5%)	T3(10%)	SEM+/-
Final Live Weight (g)	1980.50^{c}	2070.50^{b}	2128.50^{a}	35.15
Initial Weight(g)	346.41^{a}	346.35^{ab}	311.94^{c}	9.37
Weight Gain(g)	1634.09^{c}	1724.15^{b}	1816.56^{a}	43.01
Feed intake (g)	5680^{c}	5740^{b}	5780^{a}	23.73
Feed conversion ratio (g)	3.48^{c}	3.33^{b}	3.18^{a}	0.18
Mortality	0.00	0.00	0.00	0.00

abc-means on the same rows having different superscripts are significantly different (P<0.05)
SEM +/-: Standard Error of Mean

Discussion

The effect of the processed *Lablab pupurus* on the growth performance of broiler finisher significantly (P<0.05) influence the final weight, initial weight, weight gain, feed intake and feed conversion ratio. Feeding of *Lablab purpurus* at 5% and 10% level of inclusion showed better utilization of the seed by birds, Birds were able to utilize the nutrients in the feed and convert into flesh at both 5% and 10% inclusion levels. The result of this research also suggested that the higher the inclusion values the higher the availability of nutrients which could be seen from the result obtained from the study. Also the processing methods employed were effective in reducing the ANFs which resulted in better amino acid profile of the diets and better palatability of diets 2 and 3

Conclusion

It can be concluded that feeding of *Lablab purpureus* soaked in pap water filtrate can be fed to broiler birds at 10% level of inclusion without having any negative effect on the growth performance of the birds.

Recommendation

Feeding of processed lablab seed to birds shows good results at both 5% and 10% level of inclusion of acid soaked lablab. However further research needs to be and the level of inclusion level increased.

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COMPARATIVE SEMEN CHARACTERISTICS OF NIGERIA INDIGENOUS, IMPROVED AND EXOTIC STRAINS OF COCKS

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Abstract
An experiment was conducted to examine three different cock strains semen quality. The experiment was carried out in the Poultry unit, Teaching and Research farms, Oyo state College of Agriculture and Technology, Igboora. Six (6) Noiler, Nigeria Indigenous normal feather and Isa brown cocks each were used for the experiment. The experiment consists of three experimental group of (6) birds per treatment. Each strain of cock was fed finished feed and their semen were collected and examined twice in a week for three weeks. Macroscopic and microscopic semen analysis were carried-out on the ejaculated semen from the three strains. No significant (p>0.05) different was observed in microscopic semen analysis of the three strains of cock. However, Noiler cocks has highest sperm motility of 88.33% compared to the two other strains. Also Isa brown has highest sperm viability of 94.00 and highest sperm membrane integrity of 86.25 % compare to the other two strains. Although Isa brown has the highest semen volume, but no significant (p>0.05) different was observed in the semen volume. Records on Colour, Consistency and Viscosity revealed that Noiler cocks resulted into low characteristics among the three strains. This also generally reflected in the grade, having the lowest grade of D. It is therefore concluded that semen quality of Nigeria improved strain, (Noiler) and Nigeria indigenous strain (normal feather) do not differ from the exotic strains (Isa Brown) in microscopic characteristics but may differ in macroscopic characteristics.
Keywords: Exotic, Cock, Strain, Semen

Introduction

Semen collection and evaluation is paramount for Artificial insemination practice in poultry breeding. The successful collection may result in high quality of semen obtained, with the maximum number of sperms harvested per ejaculate (Tijani, *et al.,* 2014). Moreover, according to Peters *et al.,* (2004), Semen characteristics of poultry birds is considered as an excellent indicator of their reproductive potential and also serves as major determinant of fertility and subsequent hatchability of eggs in poultry breeding

Semen evaluation in poultry breeding is essential for selecting breeding males and for routinely monitoring their reproductive performance (Cheng *et al.,,* 2002), to enhance and ascertained their fertility potentials. To a great extent, the fertilizing capacity of semen can be evaluated through its motility, live or dead sperm and morphological evaluation (Alkan *et al.,,* 2002).

Recently in Nigeria, due to inability to afford exotic poultry species by most Nigerians especially low income earners, the indigenous breeds have been deemed as better alternative to fall back to as they are accessible, better adapted and cheaper to raise (Fisinin and Zlochevskaya, 1989). These birds are considered as natural foragers and scavengers and always range farther. Singh and Sharma (2012), reported that they thrive best on freely movement, feeding on seeds, fresh grass, locusts, crickets, grasshoppers, worms, slugs, snails and can be raised with little or no medication. It is therefore, necessary that more research be

conducted on them, especially comparing their reproductive performance with the common exotic breeds and improved Nigeria breed, through the evaluation of their semen attributes.

Materials and methods

The experiment was carried out at the Poultry unit, Teaching and Research farms, Oyo state College of Agriculture and Technology, Igboora. The area is situated in the savannah forest vegetation zone of Ibarapa Central Nigeria on Latitude 7^0 43N, Longitude 3^0 28E and elevation of 140m above sea level. The average minimum temperature is above 21.5^0C and maximum average temperature is about 32.5^0 C (World Atlas, 2020). Six each of matured Nigeria indigenous normal feather domestic fowl, Noiler and Isa brown cocks at their reproductive were used for the experiment. Feed and water were supplied base on breeders requirements. The cocks were trained for semen collection for period of two weeks by using Balogun *et al.* (2015), modified procedure of poultry semen collection. Semen was usually collected twice in a week for adequate sperm reserve duration

Experimental Design: Completely Randomized Design (CRD)

The experiment consist of three experimental group of (6) birds per treatment. Each strain of cock was fed finished feed and their semen were collected and examined twice in a week for three weeks. The experiment comprises of three treatment groups

Treatment 1: Noiler improved Nigeria cock
Treatment 2: Nigeria indigenous normal feather cock
Treatment 3: Isa brown cock

Semen Analysis

Macroscopic semen analysis

Macroscopic semen analysis such as semen volume, colour, consistency and viscosity were carried-out on the ejaculated semen from the three strains fed with conventional diet.

Microscopic semen analysis

Microscopic semen analyses such as Mass activities, progressive motility, sperm viability, plasma membrane integrity were assayed according to Jeyendran *et al.*,, (1984), Sperm concentration according to Mahmoud *et al.*,, (1997).

Statistical Analysis

All data obtained were subjected to analysis of variance (ANOVA) in R software. Significant means was separated using turkey HSD (Highest Significant Difference) of the same Analytical software (XL Stat, 2014).

Results and discussion

Comparative microscopic semen characteristics of the three different strains of commercial cocks in Nigeria are presented in table 1. No significant ($p>0.05$) different was observed in microscopic semen analysis of the three strains of cock. However, Noiler cocks had the highest sperm motility of 88.33% compared to the two other strains. Also, Isa brown had highest sperm viability of 94.00 and highest sperm membrane integrity of 86.25% compared to the other two strains. The highest sperm concentration of 9.33 $x10^7$ was recorded for Nigeria indigenous normal feather cocks compared to others

Table 1: Comparative microscopic semen characteristics of three different strains of commercial cocks in Nigeria

Strains	Isa Brown Cock	Noiler Cock	Normal Feather	SEM	P-Value
Mass activities (%)	++++	++++	++++		
Progressive Motility (%)	82.50	88.33	85.00	2.02	0.57
Viability (%)	94.00	90.33	81.25	2.48	0.06
Membrane Integrity (%)	86.25	84.33	83.50	0.28	0.56
Sperm Concentration sperm/ml	5.25×10^7	4.80×10^7	9.33×10^7	1.12	0.18

Comparative macroscopic semen characteristics of three different strains of commercial cocks in Nigeria are presented in table 2. Although Isa brown had the highest semen volume, but no significant ($p>0.05$) different was observed in the semen volume. Records on Colour, Consistency and Viscosity revealed that Noiler cocks hads varying records compared to Isa brown and Normal feather. This has generally reflected in the grade, having the lowest grade of D

Table 2: Comparative macroscopic semen characteristics of three different strains of commercial cocks in Nigeria

Strains	Isa Brown Cock	Noiler Cock	Normal Feather	SEM	P.Value
Volume	0.49	0.38	0.36	0.04	0.48
Colour	Milk	White	Milk		
Consistency	Thin cream	Slightly watery	Thin Creaming		
Viscosity	Slow running	Completely running	Slow running		
Grading	DD	D	DD		

Discussion

It was observed that there was no significant difference among the strains in results from both microscopic semen analysis and volume. However, the higher amount of semen volume recorded for both Isa brown and Noiler, compared to normal feather, may be attributed to the genetic improvement they might have experience over the years in different generation through several selection experiments on them. Peters *et al.*, (2008) found that there were differences in strain with respect to semen volume, where the exotic strain of White Leghorn and Giriraja had the highest semen volume probably because they had been selected for high reproductive efficiency. Our observation from this study revealed no significant differences

between the two strains (Nigeria improved and indigenous cock). However, the Nigeria improved cock (Noiler) still exhibited a better semen quality which is evidenced in both microscopic and macroscopic semen characteristics such as volume, progressive motility, membrane integrity and viability, except for sperm concentration where the Nigeria indigenous cock semen surpassed Noiler cocks. These differences observed may be attributed to genetic effects. Due to series of selection and breeding pattern that the Noiler cocks may have undergo over years of genetic improvement programme on its strain.

The results of Peters *et al.,* (2008) and Tuncer *et al.*, (2006) were in agreement with our present findings, that there were differences in strain with respect to concentration. Donoghue and Wishart (2000) and Etches (1996) observed the sperms concentration decrease for heavy breeds as well as to the fact that the strains are from different genetic back grounds and that the indigenous chickens are fully adapted to this environment (Peters *et al.*,, 2008). Also, the result was in agreement with the previous study that revealed the average mass motility was recorded on white leghorn cocks (Hafiz and Hafiz, 2000). The values obtained for individual sperm progressive motility were also within the acceptable range for AI (Hafiz and Hafiz, 2000; Ezekwe and Machebe, 2004). However, high value obtained on noiler cock semen might be as a result of hybrid vigor an additional advantage of cross bred over their parent. As it has been reported that local cocks could provide in high motility percentage compared to exotic breed (Tijjani *et al.*,, 2014b).

The proportion of live spermatozoa in the present study was also in contrast to the previous finding on white leghorn as reported by Lukaszewicz *et al.*, (2008) However, this may not be true, as semen volume does not necessarily determine sperm concentration. Further-more, Peters, *et al.*, (2008), stated that the coefficients between semen quality and quantity traits were generally very low to medium with positive values ranging from 0.01-0.35, and sire strain variation was found to be significant on semen volume, sperm concentration, sperm motility and percentage of active and sluggish sperms and this effects were certainly a reflection of other macroscopic sperm parameters observed in this study.

Conclusion and recommendation

It is therefore concluded that semen quality of Nigeria improved strain, (Noiler) and Nigeria indigenous strain (normal feather) do not differ from the exotic strains (Isa Brown) in microscopic characteristics but may differ in macroscopic characteristics, and therefore recommended that the Nigeria indigenous normal feather and improved strain cock can be used for artificial insemination program in poultry breeding.

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NUTRITIONAL COMPOSITION OF THREE COMMONLY PATRONISED FISH IN OGUN-OSHUN RIVER BASIN OYAN DAM, OGUN STATE, NIGERIA

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Abstract
This study analyzed the nutritional composition of three most patronized fish (Oreochromis niloticus, Chrysichthys nigrodigitatus and Aletes nurse) landed at Oyan dam. A total of 9 fish samples (3 for each fish species) with average total length of 25.5cm and average weight of 2.75kg were purchased and processed at OYSCATECH, Fisheries Technology laboratory. Fish was killed by severing the spinal cord with a sterile scalpel and eviscerated, washed and rinsed in distilled water. The fish samples were soaked in 10% brine for 5minutes prior to smoking in a local smoking kiln for a period of 6 hours at 70^{o}C samples was subjected to laboratory analysis; data were analyzed using one-way ANOVA. All the fish species evaluated belonged to a high protein fish profile, highest protein content was observed in Chrysichthys nigrodigitatus (CN) (42.45%) which varied significantly (P<0.05) from Alestes nurse (AN) (21.87%) and Oreochromis niloticus (ON) (21.68%). All the species are rich in the mineral and vitamins examined, fat and Carbohydrate content of the three samples varied significantly (P<0.05), high Fat and Carbohydrate value was observed in Sample AN and CN respectively. No significant difference (P<0.05) existed in Ash, Crude fibre and moisture content of the three samples observed, CN had the highest Ash (4.17%) and crude fibre content (4.66%) while AN had least value (3.77%), (4.16%) for both parameters respectively. ON had the highest values for iron, magnesium, calcium, sodium, Vit.B1 and B2
Keywords: Nutritional composition, *Oreochromis niloticus, Chrysichthys nigrodigitatus, Aletes nurse*

Introduction

The freshwater habitat forms one of the cornerstones of human life. It comprises a little fragment of the World's water (0.01%) and approximately 0.8% of the Earth's surface, yet this tiny portion of global water provides supports to about 100,000 species out of approximately 1.8 million species thus, Inland waters and freshwater biodiversity constitute a valuable natural resource, in economic, cultural, aesthetic, scientific and educational terms (Dudgeon *et al.*, 2006). The Oyan River is situated in Abeokuta North local government area of Ogun State in the West of Nigeria, about 20 km northwest of Abeokuta the state capital. The dam crosses the Oyan River, a tributary of the Ogun River is used primarily to supply raw water to Lagos and Abeokuta and has abundant fisheries and other wildlife resources (Ikenweirwe, *et al.*, 2007). Freshwater fishes are an important component of global biodiversity and have become a relished delicacy with increasing demand for its products. Thus there is a need to investigate the nutritional benefits the consumer can get and how this varies from species to species. Thus this study is designed to survey fish species landed in Oyan dam, identify three dominant species from the fish landed for nutrients profile evaluation

Materials and method

The Study Area

Oyan Dam is situated along Abeokuta-Igboora high way with close proximity to Abeokuta. It has a surface area of 4000 ha. It is located 7°15' North latitude and 3°16'East longitude at an elevation of 43.3m above sea level on the confluence of Oyan and Ofiki rivers, both tributaries of Ogun River (O-ORBDA 1998).

Table 1 Fish landed and Patronage frequency

Family/species	Common name	Frequency of patronage
ALESTIDAE		
Alestes nurse		High
Hydrocynus vittatus	Tiger fish	Low
CLAROTEIIDAE		
Chrysichthys nigrodigitatus	silver catfish	High
LATIDAE		
Lates niloticus	Nile perch	Average
CICHLIDAE		
Oreochromis niloticus	Nile tilapia	High
Tilapia zillii	Red belly tilapia	Average
MORMYRIDAE		
Mormyrus rume	Trunkfish	Low
OSTEOGLOSSIDAE		
Heterotis niloticus	Nile arowana	Average
CLARIDAE		
Heterobranchus		Average
Clarias gariepinus	African catfish	Average

Nile Tilapia (*Oreochromis niloticus*), *Chrysichthys nigrodigitatus* and *Aletes nurse* were found to be the most patronised of all the species landed on the lake at the time of our visit in August

Sample Preparation

The 3 *Oreochromis niloticus*, *Chrysichthys nigrodigitatus* and *Alestes nurse* most patronised fish samples was chosen for nutritional composition studies.

A total of 9 fish samples (3 for each fish species) with average total length of 25.5cm and average weight of 2.75kg were purchased from Ibaro village along Oyan Lake, Ogun-Osun River Basin, Ogun state, Nigeria. Fish was killed by severing the spinal cord with a sterile scalpel and eviscerated, washed and rinsed in distilled water.

Brining

Brine solutions of 10 percent saturation were used. Saturated brine was made by dissolving 10g sodium chloride in 100ml water; fish samples were then soaked in brine for 10minutes.

Smoking

The brined fish was smoked using a local smoking kiln for a period of 6 hours at 70^{o}C. After smoking, the fish was allowed to cool down at room temperature.

Laboratory Analysis

Samples was homogenized and taken to Fisheries laboratory Federal University of Agriculture, Abeokuta (FUNAAB) for proximate composition, which was determined using the standard methods of AOAC (1995) and mineral analysis mineral content were also determined using Atomic Absorption Spectrophotometer (AAS Buch Scientific Accusys 211).

Statistical Analysis

Data collected were analyzed using Analysis of variance (ANOVA). Duncan Multiple Range Test was used to compare differences among means. Significant level was chosen at $p<0.05$.

Results and discussion

Table 2 Proximate Analysis of the Selected Fish

Parameters	*Alestes nurse (AN)*	*C. nigrodigitatus* (*CN*)	*O. niloticus* (*ON*)
Crude Protein	21.87±0.38[b]	42.45±0.95[a]	21.68±0.17[b]
Fat	31.00±0.58[a]	26.00±0.00[b]	22.00±1.15[c]
Ash	3.77±0.23	4.17±0.17	4.00±0.00
Crude Fibre	4.18±0.26	4.66±0.22	4.44±0.00
Moisture	5.77±0.67	4.87±0.29	5.43±0.26
Carbohydrate	17.82±0.88[c]	44.11±2.07[a]	31.71±3.87[b]

**Different letters in the same row show significant differences among samples (P<0.05)*

Discussion

As shown in Table 2, the crude protein content of the samples ranges from 21.68- 42.45% indicating high protein values considering Ndome *et al. (*2010) rating 15-20% for crude protein in fish belonging to high protein category. The highest crude protein value was recorded in sample *CN* (42.45%) which varied significantly (P<0.05) from crude protein content of sample *AN* (21.87) and *ON* (21.68). The crude protein content of *Alestes* nurse (21.87%) from his study is higher than values recorded by Kasozi *et al. (*2014) who worked on *Alestes baremoze*. Also the protein content for *O. niloticus* is higher than what was observed by Olopade *et al. (*2016) who recorded 13.66% for *O. niloticus.* The high protein levels recorded is proving that these fish could be used to enrich basic food rations and prevent its deficiency-related diseases. A direct relationship exists between moisture content and protein content; the higher the moisture content the lower the crude protein content. To be healthy; FAO (Food and Agricultural Organization) and WHO (World Health Organization) (2007) recommend a protein intake of 0.66 g/kg of weight body/day. Fat content and Carbohydrate of the three samples varied significantly (P<0.05), highest Fat and Carbohydrate value was observed in samples AN and CN respectively. Fish fat is one of the very few natural sources of vitamin D and contains significant amounts of vitamins A and E. The least fat content was recorded for O. *niloticus* (22.00±1.15). There is no significant difference (P<0.05) in the Ash, Crude fibre and moisture content of the three samples observed. Ash is an indication that the fish is rich in minerals elements.

Table 3 Mineral Analysis of the Selected Fish

Parameters	*Aletes nurse*(AN)	C. *nigrodigitatus*. (CN)	*O. niloticus(*ON)
Iron	17.62 ±0.48[b]	17.14±0.01[b]	20.00±0.01[a]
Zinc	3.04±0.01[b]	3.10±0.01[a]	2.95±0.01[c]
Magnesium	47.26±0.24[b]	52.61±0.31[a]	53.24±0.71[a]
Phosphorus	390.93±0.67[a]	315.33±0.27[b]	310.67±0.35[c]
Potassium	85.19±0.30[a]	49.55±0.13[c]	83.78±0.26[b]
Calcium	20.00 ±0.01[b]	20.36±0.36[b]	22.89±0.36[a]
Sodium	25.33±0.01[b]	24.89±0.22[b]	26.22±0.22[a]
Vit B1	13.06±0.07	13.11±0.04	13.18±0.03
Vit B2	0.53±0.23	0.56±0.25	0.73±0.829
Vit B3	2.59±0.06[a]	2.05±0.18[b]	1.81±0.06[b]

**Different letters in the same row show significant differences among samples (P<0.05)*

The mineral compositions of the samples are shown in table 3. The three fish observed contained good proportion of mineral and vitamins they were examined for. ON had highest Iron content (20.00±0.01),AN and CN recorded close values of 17.62 and 17.14 respectively.

ON was significantly different (P<0.05) from other samples. Iron is one of the vital parts in cells of living organisms needed in several biochemical reactions and a cofactor for number of enzymes (Mohammed, 2010). *Oreochromis niloticus* was also observed to have the highest composition of Magnesium (53.24±0.71), Calcium (22.89±22.89) and Sodium (26.22±0.22) as well as in VitB1 and B2(Riboflavin). Riboflavin is important for body growth and the production of red blood cells; niacin helps maintain healthy skin and nerves and ensures that the digestive and nervous systems function properly; thiamine helps the body cells change carbohydrates into energy (Aremu *et al.*, 2013). The value of Calcium and Sodium in sample **ON** are significantly different (P<0.05) from other fish samples.

Close values of Vit B1 and Vit B2 were observed across the three samples, highest found in sample **ON** although, there is no significant difference. Vitamin B3 (Niacin) composition varies across the three samples, and sample AN recorded the highest (2.59±0.06)). Vitamin B3 composition of AN differs significantly from CN (2.05±0.18)) and sample **ON** (1.81±0.06). Vitamin B-12 is responsible for manufacturing genetic material, normal red blood cell formation and neurological health (Mohammed, 2010).

Differences observed in the nutritional and mineral composition of the fish samples could be explained by some variation of the extrinsic factors (quality of water, quality and availability of food, migration and intrinsic factors (species, breeding period, age, sex and size at capture) Djopnang *et al. (*2018).

Conclusion

Based on the present findings, all the fish species examined belonged to a high-protein (15-20%) category. They are, therefore, highly recommended as a good protein source more preferable to red meat. However, because of their high fat (oil) content (>5%) which means a high calorie content per unit of protein; they may not necessarily be an ideal source of animal protein for people controlling diets. However, the observed range of ash content indicated that the studied species are a good also a good source of minerals such as calcium, potassium, zinc, iron and magnesium. Therefore consuming the fish samples singly and most importantly as a mixed diet is recommended for optimal health.

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LINEAR BODY MEASUREMENTS OF GROWING PIGS REARED ON CONCRETE, WOOD SHAVING AND CLAY FLOORS

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Abstract
This research aimed to investigate the effect of three floors (concrete, wood shaving and clay) on the linear body measurement of crossbred growing pigs. Eighteen (18) crossbred growing pig were obtained from the piggery unit of the Teaching and Research Farm of the Oyo State College of Agriculture and Technology, Igboora, Nigeria and used for the study. The concrete floor were constructed using cement, gravel, sand and water while the wood shaving floor were obtained from the sawmills and metals, broken bottles and dirts were removed and later spread on the cemented floor to make wood shaving floor. The clay were obtained from the clay soil with the help of soil scientist in the Department of Soil Science, Oyo State College of Agriculture and Technology, Igboora and sundried before being spread on the floor to make clay floor. The growing pigs were allotted into three treatments of six animals per treatment and two animals per replicate. The experiment lasted eight {8} weeks. Data obtained were arranged in a completely randomized design (CRD) and analyzed by Analysis of Variance. Results obtained showed significant (P<0.05) difference in the body length of growing pigs. Pigs reared on concrete floor recorded the higher value (56.53cm)while pigs maintained on clay floor had the least mean value {51.47cm}There were no significant (P>0.05) difference in in the mean value of tail length and ear length of growing pigs reared on concrete and wood shaving and clay floors. However, significant (P<0.05) difference exist in the mean value of pigs kept on concrete, wood shaving and clay floors for hind limbs and forelimb. Pigs reared on concrete floor recorded the highest (25.07cm and 27.07cm) respectively for hind limb and fore limb. Based on the result, rearing pigs on concrete floor increased the linear body measurement of pigs which might lead to higher market price and farmer will maximize their profit.
Keywords: Growing pig, concrete, clay, linear, wood shaving,

Introduction

In pig production it is always important to know the weight of pigs at a given time as such knowledge is vital for the determination of feed requirement (Gunawan and Jakaria, 2011), animal health status, determination of time when animals are sent to market, space allowances and determination of drug dossages (Brandl and Jorgensen, 1996). Accuracy of predicting pig weight leads to profitability in commercial farms due to the reduction in feed cost which account for 70% production as feed requirements are accurately calculated (Zaragoza, 2009). Costs are also reduced in the treatment of diseases as there is no overestimation of weights. Linear body measurement such s chest girth, heart at withers and body length are used to relate body dimensions to an animals overall body size or weight. These measurements are frequently used in studies of an animal growth. Oluwole *et al. (*2012) reported that there is appositive correlation between linear measurements and body weight in pigs. Sowande *et al* (2010) advocated that that changes in linear measurements are an indication of tissue growth evidenced in the muscle and fat tissues. Those parameters tend to increase as the animal grows over time. The present work was designed to investigate the linear body measurements of growing pigs reared on concrete, wood shaving and clay floors.

Materials and Methods

The experiment was carried out at the piggery unit of the Teaching and Research Farm of the Oyo State College of Agriculture and Technology, Igboora, Nigeria. Eighteen (18) crossbred (Large white X Landrace**)** growing pigs with an average weight of 12.00kg were used for the study and obtained from the piggery unit of the Teaching and Research Farm of the Oyo State College of Agriculture and Technology, Igboora. The pigs were dewormed and fed 4% of their body weight as feed per day at the beginning of the experiment and increased as the animals increased in age while water was supplied *ad libitum.* The animals were kept and monitored for one week of acclimatization before the commencement of the experiment. The experiment lasted 56 days (eight weeks). The diet was formulated to meet the nutritional requirement of the animals. Three different types of floors were used. The floors were concrete, wood shaving and clay. The concrete floor were constructed using cement, gravel, sand and water. Wood shaving were collected from saw mills within Igboora metropolis and broken bottles, dirts, iron metals and pebbles were removed before it was spread on the cemented floor to make wood shaving floor. Clay were gotten from clay soil within the College campus with the assistance of soil scientist in the College and spread on the cemented floor to make clay floor. The concrete floor were cleared daily by washing down the floor with broom, water and manure were collected in the gutter and flushed into a pit. The wet floor area and manure in wood shaving and clay floors were packed daily and clean and dry wood shaving and clay were spread on the floor. The pigs were housed in the pens equipped with individual drinking and feeding facilities. All data obtained were subjected to analysis of variance using SAS (2018) Software. Means were separated using Duncan Multiple Range Test of the same statistical software at 5% level of probability.

Results and Discussion

The results of linear body measurements of crossbreed pigs reared on concrete, wood shaving and clay floors are presented in Table 2. Body length ranged from (56.53cm to 51.47cm) with the highest value (56.53cm) recorded in pigs reared on concrete floor. Pigs maintained on concrete floor had the highest value (17.93cm) of tail length while the least value (16.40cm) was obtained in pigs reared on clay floor. Pigs reared on clay floor had the highest value (14.63cm and 59.53cm) for ear length and flank respectively. Pigs kept on concrete floor recorded the highest (27.07cm and 26.07cm) for hind limb and fore limb respectively.

Table 2: Linear body measurements of growing pigs reared on concrete, wood shaving and clay floors

Parameters(cm)	Concrete	Wood shaving	Clay	P value
Body length	56.53^{a}	53.60^{b}	51.47^{c}	0.02
Tail length	17.93	17.00	16.40	0.13
Ear length	13.43	12.70	14.03	0.17
Hind limb	27.07^{a}	23.00^{b}	23.33^{c}	0.01
Fore limb	26.07^{a}	25.40^{b}	24.13^{c}	0.01

There were significant ($P<0.05$) difference in the mean value of the body length of pigs reared on concrete and bedded floors. Linear body measurements are useful predictors of body weight. Pigs on concrete floor had higher body length than those on bedded floors

might be as a result of the barren environment which makes the pigs to fully utilize the feed compared to bedded floor which are enriched with wood shaving and clay floors. The animals on bedded floor exhibit their natural behavior by chewing and rooting within the floor. The other possible reason for the variation in body length may be due to breed or genotype differences and other environmental factors like climate, temperature, and feeds (Beretti *et al.,* 2009) There were no significant (P>0.05) difference in the mean value obtained for tail length and ear length of pigs across the treatment. Since tail length and ear length measure skeletal tissues, it is possible that these tissues could be growing at a similar rate in young animals compared to older ones hence the non-significant of the tail length and ear length. Liu *et al. (*1999) reported that hind limb bones tended to have higher growth coefficient than forelimb bones suggesting an anterior-posterior gradient of long limb bone growth. Greater diameter growth compared with length growth of the long limb bones indicated that the differentiation in growth for diameter and length of the long limb bones was an effective response to the functional requirements of standing, walking and running.

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SEMEN QUALITY AND REPRODUCTIVE HORMONES OF COCKS FED WITH VARYING INCLUSION LEVEL OF MONOSODIUM GLUTAMATE

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Abstract
In poultry industry, nutrition in term of palatability and quantity of feed is key to proper feed intake and body weight needed for optimal reproductive performance. Monosodium glutamate (MSG) is a widely used food additive that promotes feed palatability and acceptability. However, its safety and systemic side effect have not been ascertained. Therefore, this study was conducted to evaluate sperm characteristics and reproductive hormone level in cocks fed with diet containing varying inclusion level of MSG. A total of thirty two (32) 28-weeks old cocks were randomly allotted into four groups, each containing 10 cocks: control (group A) and MSG-diet groups- B, C and D. The control group was given basal diet while groups B, C and D were placed on feed containing 0.5 % MSG, 1 % MSG, 1.5 % MSG (Ajinomoto®) respectively for eight weeks. On day 57, semen and blood samples were collected from the cocks for laboratory analysis of semen volume, sperm count, viability, motility, and serum level of testosterone, FSH, LH and estrogen. Mean±SD values were calculated for each group and compared for significant difference with ANOVA at $p < 0.05$. Serum concentration of testosterone, estrogen, follicle stimulating hormone and luteinizing hormone in both control and MSG-diet groups were not significantly different. Similarly, semen volume, sperm count, viability and motility of both control and MSG-diet groups were not statistically significant. Findings of this study showed that MSG at studied inclusion level has no negative effect on reproductive hormones and sperm characteristics of cocks.
Keywords: Monosodium Glutamate, Reproductive Hormones, Semen Quality, Cocks

Introduction

Poultry is a major component of livestock farming contributing immensely to economic development of most countries. Reproductive efficiency is critical for profitability and improved production needed to meet increased demand for poultry products (Scanes *et al.*, 2020). Fertility of male poultry birds is dependent on reproductive status, which is influenced by level of reproductive hormone, and semen quality (including volume, sperm count, viability and motility) (Peter *et al.*, 2004). Analysis of semen quality is generally carried out to evaluate and predict male fertility in poultry (Chen *et al.*, 2016; Sun *et al.*, 2019). In poultry industry, nutrition in term of quality and quantity of feed is key to proper feed intake and body weight needed for optimal reproductive performance. Palatability of feed is an indirect measure of feed quality. It influences feed intake and optimum utilization of feed (Olarotimi *et al.*, 2020). Several reasons are responsible for non-palatability of feed. For example, long storage of feed resulting in deterioration of maize component (Olarotimi *et al.*, 2020), putrefaction of proteins and rancidity of feed ingredient generates non-acceptable flavours and odors that affect feed palatability. To address this challenge, there are growing

interests in the usage of flavor additives to improve feed palatability and acceptance. Most investigated flavor enhancing agents include garlic, ginger (Utsav *et al.*, 2018) and, monosodium glutamate (MSG) (Saad *et al.*, 2009).

Monosodium glutamate is a food additive commonly added to human diet to improve palatability and intake. The growing use of MSG in poultry feed to improve feed palatability and acceptability is also well documented. Till now, there are still controversies concerning the safety of MSG intake particularly at high quantity. Food and Drug Administration of the United States and European Food Safety Association reports show that MSG is safe and classified it under ''Generally Recognized as Safe'' (GRAS)-list of foods. Conversely, both minimal and high MSG intake has been reported to cause deleterious effect on various organs of human and experimental animals. Accumulating evidence show that excess intake of MSG impaired sperm parameters (Oyeniran *et al.*, 2022) and caused damage to nerve cells of hypothalamus (Igwebuike *et al.*, 2011). Considerable number of rodent studies have highlighted negative effect of high MSG intake on secretion of reproductive hormones like LH, FSH and testosterone (Koohpeyma *et al.*, 2022). Also, oral administration of MSG to rodents caused substantial reduction in serum concentrations of testosterone (Franca *et al.*, 2006; Ochiogu *et al.*, 2015). Presently, there is insufficient data on inclusion level of MSG that is less deleterious to poultry performance especially reproductive capacity of birds. Knowledge of the inclusion level of MSG that poses minimal threat to birds' health and reproductive performance will be useful to poultry farmers in achieving optimal production. Therefore, the goal of this study was to examine the effect of graded inclusion level of MSG in feed on reproductive indices of cocks via evaluation of sperm characteristics and reproductive hormones.

Methodology

Study Location

The experiment was conducted at experimental unit of Oyo State College of Agriculture and Technology, Igboora.

Source of Animals and MSG

A total of thirty-two (32) 28-weeks old cockerels used in this study were purchased from a commercial poultry farm in Abeokuta whereas monosodium glutamate (Ajinomoto® sachet) was bought at a local market in Igboora.

Animal Management

The birds were housed in a well-ventilated pen and placed on beddings containing wood shavings. Two weeks acclimatization was observed before the commencement of feeding trial. Water and feed were provided to the birds *ad libitum* throughout the duration of the experiment.

Dietary Treatment and Experimental design

The birds were randomly allocated to four dietary treatment groups (8 birds/group) - control, and MSG diet groups-B, C, D. The groups were placed on different dietary treatments for duration of eight weeks as follows:

Control- Standard basal feed
Group B-fed with basal feed containing 5 g of MSG /1 kg of feed (0.5 % MSG)
Group C- fed with basal feed containing 10 g of MSG /1 kg of feed (1.0 % MSG)
Group D- fed with basal feed containing 15 g of MSG /1 kg of feed (1.5 % MSG)

Sample collection

On day 56, semen was collected manually by massaging the cloaca of the birds to achieve phallic tumescence and cloacal stroke (Shinde *et al.*, 2012). After this, the birds were bled via the wing vein with 5 ml syringes and the blood samples were collected into covered plain bottles and centrifuged for 20 minutes at 3000 x g for 20 min to obtain sera for analysis of

estrogen, FSH, LH and testosterone. The blood samples were kept inside cooler containing ice-block and taken to the laboratory for analysis.

Semen Analysis

Semen collected was put unto slides and sperm count was determined using the improved Neuber counting chamber in the haemocytometer. To assess sperm motility, a 10 L diluted sample (1:20 in 2.9% sodium citrate) was placed on warm slide (37^0 C) and then covered with a cover slid. In five microscopic fields, the percentage of sperm motility was determined using light microscope. The viability was assessed by staining of sperm smear with eosin-nigrosin staining technique. The resulting stain was then studied under the microscope using x 40 objective lens magnification of light microscope. The motile (live) sperm cells were unstained while the non-motile sperm (dead) sperm cells were stained. The stained and unstained sperm were counted and average was taken for the percentage.

Statistical analysis

The data were analyzed with Statistical Package for the Social Sciences (SPSS) version 23.0 for windows. One-way ANOVA was used to test for significant difference among the groups. The means were compared for significant differences at $P<0.05$ using post-hoc test (Duncan's Multiple Range Test).

Results

Sperm motility and viability of control and MSG-diet groups were not significantly different when compared. Similar trend was observed when sperm concentration and semen volume in control and MSG-diet groups were compared. Also, there was no significant difference between values of sperm parameters recorded for MSG-diet groups when compared. FSH, LH, testosterone and estrogen levels in the serum of the control and MSG-diet groups were not significantly different when compared. Similarly, there was no significant difference in serum levels of these hormones when MSG-diet groups were compared.

Table 1. Semen Quality and Reproductive Hormones of Control and MSG-Diet Groups

Groups	Control	0.5% MSG	1 % MSG	1.5% MSG
Sperm Motility (%)	65.65 ± 12.05	68.40 ± 7.64	70.66 ± 11.64	65.60 ± 16.43
Sperm Viability (%)	88.80 ± 9.63	93.80 ± 5.63	84.20 ± 10.91	84.40 ± 5.03
Sperm Count (x 10^6)	64.72 ± 5.70	64.48 ± 8.19	65.96 ± 6.11	66.00 ± 16.52
LH (ng/ml)	4.40 ± 0.14	4.68 ± 0.20	4.66 ± 0.17	4.71 ± 0.20
FSH (ng/ml)	3.48 ± 0.27	3.47 ± 0.25	3.50 ± 0.27	3.49 ± 0.28
Estrogen (pg/ml)	113.40 ± 7.70	115.22 ± 8.20	117.30 ± 7.90	116.12 ± 7.82
Testosterone (ng/ml)	4.36 ± 0.33	4.48 ± 0.33	4.52 ± 0.36	4.64 ± 0.42

Discussion

In the present study, serum level of FSH, LH, testosterone and estrogen in cocks fed with diet containing 0.5 %, 1 % and 1.5 % MSG were not significantly altered. Absence of negative effect of MSG on these reproductive hormones could be related to poor bioavailability of glutamate content of MSG in circulation when consumed orally. Glutamate is the major content of MSG (Chakraborty, 2019) and accounts for most of the reported deleterious effect of MSG. However, large number of reports have demonstrated that normal and high intake of MSG has no considerable effect on plasma glutamate level due to complete metabolism of the amino acids by the enterocytes (Tsai *et al.*, 1999). Our findings confirms the report of past studies which indicated that LH, FSH, estradiol and testosterone level were not significantly altered in MSG diet-fed rats (Fernstrom *et al.,* 1996).

In this study, the cocks fed with diet containing MSG had no significant alteration in their sperm characteristics-(sperm concentration, motility and viability), and semen volume. The

production of reproductive hormones was not remarkably affected in the birds and this may account for non-significant alteration in their sperm characteristics and semen volume. Evidence from past studies showed that FSH, LH and testosterone levels are associated with spermatogenesis (Khaki *et al.*, 2009) and changes in testosterone level affected semen volume, sperm motility, viability and total sperm count (Qi *et al.*, 2019). Contrary to our findings, administration of MSG to rats through oral gavage was found to increase sperm abnormality and as well caused a decrease in sperm concentration, motility, and viability (Abd-Elaziz *et al.*, 2007; Ivakhul *et al.*, 2019). The disparity between our finding and previous studies could be due to difference in methodology. Previous studies indicated that the potential of MSG to cause toxicity is influenced by the type of animal species, mode of administration (gavage versus feed added) and dose of MSG used (Walker and Lupien, 2000).

Conclusion

Findings of this study showed that monosodium glutamate at studied inclusion level in feed had no deleterious effect on reproductive capacity of cocks. Therefore, inclusion of MSG in feed to improve palatability and acceptability, and ultimately poultry birds' performance is recommended.

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EVALUTION OF HAEMATOLOGICAL AND GROWTH PERFORMANCE OF WISTER RATS TO CORN MEAL COMBINED WITH ANTIBIOTICS

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Abstract
This study aimed to determine the effects of dietary supplementation of corn meal on haematological and growth performance of Wister rats. Thirty (30) Male Wistar strain of albino rats, divided into five groups (A-E) of six (6) each arranged in a Complete Randomised Design. Rats were managed on a deep litter system for 6 weeks. Data on body weight, feed intake, feed conversion ratio and blood parameters were collected. On weight gained, there was no significant difference (P = 0.05) in sample A, B and E compared to sample C and D rats. For food intake, sample A, D and E were similar no significant different compared to B and C. In protein intake, sample A, C and E sample were similar with no significant different compared to B and D that were significantly different. In NPR, sample A, C and D were similar in which there were no significant different in them compared to sample B and E. In PER, sample A, B, C and D were similar in which there were no significant different in them compared while sample E was significant different only. In FER, sample B, C, D and E were similar in which there were no significant different in them compared to sample A only. In SGR, sample B, D and E were similar in which there were no significant different in them compared to sample A and C. In PR, sample A, B, D and E were similar in which there was no significant different in them compared to sample C only. The PCV of the rats were similar in which sample A, C and D were no significant different in them compared to sample B and E that were significantly different. The PCV values fell within the normal range of 25% – 45%. In hemoglobin, sample A, B and D were similar in which there was no significant different in them compared to sample C and E that were significantly different. However, the total RBC count of the rats was similar in which there was no significant different in sample A, D and E compared to sample B and C that were significantly different. the total WBC count of the rats were similar in which there was no significant different in sample B, C, D and E compared to sample A that was significantly different (P = 0.05). The platelet count of the rats were similar in which there was no significant different in all the samples. It can be concluded that supplementation of corn powder with different antibiotics improved growth performance and haematological characters in wister rats.
Key words: corn meal, weight gained, blood parameter, blood serum, biochemical indices

Introduction

Nutrition has been recognized as a major constraint to livestock production in Nigeria and elsewhere (Okai and Boateng, 2007 and Yusuf *et al.,* 2008). Research has shown that feed cost accounts for 70-80% of total production (Sola-Ojo *et al.,* 2011) and protein is likely to be the first limiting factor in poultry diets at the level of small scale farmers. The feed cost in Nigeria, just as any other developing countries of the world, is quite expensive, and often beyond the reach of ordinary farmer. There is the need for research to determine the suitability of utilizing locally available feed resources, particularly leaves from multi-purpose trees to replace these expensive feed ingredients while increasing the protein content of the diet. It is a common practice by small holder farmers in the sme area in Nigeria to offer small amounts of green feed to their animals to reduce cost while protecting them against possible vitamin and protein deficiencies. The end of the 20th century was marked by drastic increase

in the incidence of protein energy malnutrition, chemical hazards and other safety issues (Moterjemi and Lelieveld, 2013).

Over the years, there have been demands to increase the quality of animals for research, which show that laboratory, or model animals are widely used with most of them being mice, rats and/or other rodents. These animal models are used for developing new methods and approaches to the cure and improvement of human and animal diseases, disability, and other biological processes (Ihedioha and Okafor, 2004).

The use of laboratory rats (*Rattus norvegicus*) in research has increased steadily as they are preferred because of their short life cycles, inexpensive cost to purchase, easy maintenance in limited space (Neg, 2008) and availablity of a large database of their characteristics that are useful in interpreting relevant animal data for humans. The rats particularly the inbred strains are now more widely used as laboratory model in the understanding and studying of diseases (Ihedioha and Okafor, 2004; and Smith *et al.,* 2004). In this research, abnormal treatment-related values could represent changes pertaining to the effects of the treatments such as the toxicity's effects, which could be detected by alterations in a series of in vivo analysed parameters (Ihedioha and Okafor, 2004). Among these parameters are haematology data and are of great importance in determining such effects. This is because blood plays a major role in the body's transport system and excretion of substances of almost all the body's metabolic processes, and any deviations from normal are detectable in the blood profile (Ihedioha and Okafor, 2004) One way of evaluating the haematologic profile is by Full Blood Count (FBC) otherwise called Complete Blood Count (CBC). It yields information about production of all blood cells, the oxygen-carrying capacity through RBC indices, haemoglobin and haematocrit.

It also provides information about the immune system through the evaluation of the WBC counts especially along with differential counts (George-Gay and Parker, 2003). Thus, CBC is one of the most frequently requested tests in clinical medicine with multiple indications such as anaemia, cancer, infection as well as monitoring for side effects of drugs causing blood dyscrasias (George-Gay and Parker, 2003; Graham, 2003) of all the rat models, Sprague Dawley (SD) rats are the most widely used research models in all aspects of biomedical (Ihedioha and Okafor, 2004). The docile nature of the rats provides a variety of health profiles that enable for the needs of specific research. Laboratory or model animals are used in research for cure and improvement of human and animal diseases. Rats particularly the inbred strains are now more widely used laboratory model especially in toxicology and for understanding the pathophysiology of diseases. In evaluating the biological effect of some food on rat organs (small intestine, pancreas, liver and heart), Smith *et al.*, 2004 observed no significant difference in the organ weight of the rats fed the test diets as compared with cerelac- a commercial weaning diet.

Rats fed on extruded weaning foods based on peanut, maize and soybean were observed by Smith *et al.,* 2004 to have between 60-100-fold increases in mean weight gain over the control. It was also reported that haemotological data of test animals showed normal values for white blood cell count, red blood cell count, haemoglobin level and packed cell volume for all the weaning food studied except the control.

Materials and methods

Description of Study Area

The study was carried out in Ibarapa central local government area, which has its head quarters in the town of Igboora, covers about 440km^2 of savannah zone to the west of Ibadan, the Ogun and Oyan rivers from eastern and western boundaries respectively. It is between latitude 7'53^0 and longitude 3'08^0 with the population of 102,979 according to 2006 census (Sanusi, 2011).

Experimental animals

Thirty (30) Male Wistar strain of albino rats, divided into five groups (A-E) of six (6) rats each per group were used for the studies. The average weights of the rats were between 150 to 200g. The rats were housed individually in stainless-steel metabolic cages. The rats were allowed to acclimatize with the environment and feeding were done for four weeks with each group receiving graded levels of corn meal and bone meal mixed with antibiotics.
The antibiotics used include, Penicillins, Cephalosporins, Cloraphenicol and Gentamycine.

Experimental diets and Treatment
Rats were divided into five (5) groups and labeled as follows, A with Penicillins, B with Cephalosporins, C with Cloraphenicol, D with Gentamycine and Control = E with no antibiotics. The rats were fed for 30 days

Growth performance
At the onset of the experiment, initial body weights of the rats were recorded. Feed intake (FI) and body weight (BW) were measured weekly. Mortality was recorded as it occurred. Weight gain, average daily weight gain, and feed conversion ratio were calculated. The weight gain was calculated as the difference between the final weights and the initial weights. FI was determined as the difference between the amount of feed offered and refusals. Feed conversion ratio (kg feed/kg gain) was calculated by dividing FI by BW gain.
The growth performance was evaluated in terms of feed intake (FI), weight gain (%), specific growth rate (SGR) and feed efficiency ratio (FER).
Weight gain (%) = (final weight - initial weight) /initial weight ×100
SGR = 100 (loge average final weight x loge average initial weight) /number of days z
FER = weight gain (g)/feed intake (g)

Haematological parameters
Blood collection was carried out at the end of the experiment (6th week). Five (5) rats were selected at random from each of the treatments and bled via the vein using sterile needles and syringes. Two (2.0) ml of blood was collected into each sterilised bottles containing EDTA as anticoagulant for haematological analysis. The packed cell volume (PCV), red blood cell (RBC), white blood cell (WBC), Platelet and haemoglobin (Hb) concentrations were measured using Mindray BC 2800, an automated system for the determination of haematological parameters.
Statistical analysis
The data were analyzed using one way ANOVA and expressed as mean ± SEM. The significant differences between means were determined using Duncan's multiple range comparison tests. The level of significance was set at 5%. All analyses were performed using statistical software package SPSS version 16.

Results and discussion
Weight gained, food intake, protein intake and feed conversion ratio
The results of corn meal on growth performance of Wister rats were presented in Table 1. In weight gained, there was no significant difference (P = 0.05) in sample A, B and E compared to sample C and D. In food intake, sample A, D and E were similar with no significant different compared to samples B and C. In protein intake, sample A, C and E were not significant compared to sample B and D that were significantly different. In NPR, sample A, C and D were not significant compared to sample B and E. In PER, sample A, B, C and D were not significant while sample E was significant. In FER, sample B, C, D and E were not significant compared to sample A. In SGR, sample B, D and E were not significant compared to sample A and C. In PR, sample A, B, D and E were not significant compared to sample C.

The results obtained were similar to the work of Tokofai *et al. (*2020) in which there was variation in weight gained, food intake, protein intake and feed conversion ratio.

Table 1. Effect of corn meal on the performance of the wister rats

Parameters	**Sample**				
	A	**B**	**C**	**D**	**E**
Weight Gained (g)	51.73 ± 2.15^{a}	55.21 ± 1.26^{a}	49.97 ± 2.33^{b}	49.65 ± 1.95^{b}	53.07 ± 2.03^{a}
Food Intake (g)	709.00^{c}	854.00^{b}	897.00^{b}	843.00^{c}	899.00^{c}
Protein Intake (g)	18.34^{b}	19.17^{a}	19.57^{b}	18.77^{c}	19.96^{b}
NPR	1.22^{b}	1.80^{a}	1.23^{b}	1.13^{b}	1.14^{c}
PER	2.22^{b}	2.23^{b}	1.99^{b}	2.20^{b}	1.54^{a}
FER	0.07^{b}	0.06^{a}	0.06^{a}	0.06^{a}	0.06^{a}
SGR	1.35^{c}	1.98^{b}	1.47^{a}	1.33^{b}	1.69^{b}
PR	45.24^{b}	43.14^{b}	41.22^{a}	43.57^{b}	49.63^{b}

^{abc} Means with different superscripts on the same row differ significantly ($P < 0.05$) while a, b and c with the same superscripts on the same row are not differ significantly ($P < 0.05$).
NPR = Net protein utilization, PER = Protein efficiency ratio, FER = Feed efficacy ratio, SGR = Specific growth rate, PR = Protein ratio, Weight gained % = final weight - Initial weight/ initial weight X 100, Specific growth rate (SGR) = 100(Log_eaverage final weight X Log_eaverage initial weight) /number of days, FER = Weight gained (g) / feed intake (g)
A = bone meal combined with Penicillins., B = bone meal combined with Cephalosporins.
C = bone meal combined with Cloraphenicol., D = bone meal combined with Gentamycine.
E = control group animals and given normal rat cerelac only.

Table 2 shows the haematological characters of the various treatments. The PCV of the rats were similar and samples A, C and D were not significant compared to sample B and E that were significantly different. The PCV values fell within the normal range of 25% – 45%. In hemoglobin, samples A, B and D were not significant compared to samples C and E that were significantly different. However, the total RBC count of the rats was similar and was not significant samples A, D and E compared to samples B and C that were significantly different. The total WBC count of the rats were not significant in samples B, C, D and E compared to sample A that was significantly different ($P = 0.05$). The platelet count of the rats was not significant different in all the samples.

Table 2. Haematology repormance of corn meal on blood characters of wister rat

Parameters	Samples				
	A	B	C	D	E
PCV (%)	34.9^{a}	33.5^{b}	32.4^{a}	35.7^{a}	35.3^{b}
Hemoglobin (g/dl)	11.0^{a}	10.7^{a}	10.5^{b}	11.0^{a}	11.9^{c}
RBC ($x10^{6uL}$)	5.38^{a}	5.26^{b}	5.20^{b}	5.42^{a}	5.49^{a}
WBC ($x10^{3u}L$)	3050^{b}	4250^{a}	4150^{a}	4650^{a}	3940^{a}
Platelet	166000^{b}	159000^{b}	1730600^{b}	165000^{b}	164000^{b}

^{abc}Means with different superscripts on the same row differ significantly ($P < 0.05$). PCV = Packed cell volume, RBC = Red blood cell, WBC = White blood cell

Discussion

Body weight, feed intake and feed conversion ratio

From this study, it could be clearly shown that incorporation of corn meal with different antibiotics in the wister rat diet had affected the growth performance and haematological and characteristics of the blood. The performance of the rats in the present study shows that the final weight gain and feed conversion ratio of the rats were significantly different. The rats fed with corn meal had better weight gain and feed conversion ratio. The result is in line with

the findings of (Yusuf *et al.*, 2008) who reported improved growth performance of rats fed with bitter leaf. The improvement in weight gain observed in the treated group resulted in a lower FCR. (Olobatoke and Oloniruha, 2009) reported that inclusion of corn meal powder in rat diets significantly improved FCR. This indicate an optimal level of VALM inclusion for better performance and could be recommended to farmers.

Haematological variable

In the study, there was no influence of the dietary treatment on haematological indices among the treatments, except for PCV and WBC. On the other side, there was a marginal increase in RBC levels of rats fed corn meal and this shows that corn meal powder may have a possible potential to stimulate erythropoietin release from the kidneys, which is the humoral regulator of RBC production. According to Maxwell *et al. (*1990), blood parameters are important in assessing the quality and suitability of feed ingredients for farm animals. It's also reported that blood parameters are the major indices of the physiological, pathological, and, when compared to normal values, nutritional status of an organism. Changes in the constituent compounds of blood could be used to interpret the metabolic stage of an animal as well as the quality of the feed (Attia *et al.*, 2017; Attia *et al.*, 2018; Attia *et al.*, 2019). The higher PCV and WBCs in rats offered corn meal are in agreement with earlier findings of Owen and Amakiri (2011) who showed that, with the exception of WBC, all other haematological indices measured were influenced by increasing levels of corn powder. The numerical differences observed in the PCV, Hb, RBC, and WBC of rats fed suggest that the feed were better utilised and assimilated into the blood stream of the rats (Onu, 2010).

Conclusion

Considering the effects of different levels of corn meal on weight gain, food intake and feed gain ratio of the rats, it appears that the corn meal showed optimum effect on the improvement of growth performance and physiological responses in rats. It can therefore be recommended for wister rat as meal for growth performance, although further experiments are recommended for further findings.

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ECONOMY OF PRODUCTION OF GROWING NOILER (7 TO 9 WEEKS) FED MIXED SAWDUST AS A SUBSTITUTE FOR WHEAT OFFAL

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Abstract
Economy of production of Noiler fed mixed sawdust as a substitute for wheat offal was conducted using 90 Noiler. They were allotted to two dietary treatments and each treatment consists of three replicates with 15 Noiler per replicate. Two dietary treatments were formulated with mixed sawdust substituting wheat offal at 0%, and 100% respectively. The experiment lasted for three weeks and arranged in a Completely Randomized Design (CRD). Significant (p<0.05) differences were observed in all parameters determined across the dietary treatments. The lower values (₦297.65/kg) for the cost of feed was obtained in Noiler fed diet 2 while the higher value (₦304.15/kg) was obtained in Noiler fed diet 1.The highest cost (₦96.44/kg) of weight gain was obtained in Noiler fed diet 2, while the lowest cost (₦88.81/kg) was noticed in Noiler fed diets 1.The values recorded for the cost of feed in ₦/kg reduced as the substitution level of mixed saw dust for wheat offal increased. It could be concluded that feeding of mixed sawdust in the diet of Noiler resulted in a decreased cost of raising Noiler thereby increased the profitability of farmers.
Keywords: Economy of production, Noiler, mixed sawdust, wheat offal

Introduction
Feed ingredients are of high economic importance in the rearing of commercial poultry not only because it is primarily responsible for growth response of birds, but mainly because it represents the largest cost in the production cycle (Avila *et al* 1992). Types and sources of feed ingredients for poultry includes energy (maize, sorghum, millet), proteins (soya bean meal, groundnut cake, full fat soya, fish meal, blood meal, cotton seed cake etc), fillers/industrial by-products (wheat bran/offal, palm kernel cake, rice husk etc) and micro-ingredients which includes amino acids (lysine, methionine), macro-minerals (bone meal, oyster shell, limestone, di-calcium phosphate etc), additives (toxin binders, etc), vitamins and micro minerals (NIAS, 2017). Consumers have reported Noiler meat to be firmer in consistency, tastier and less fatty than that of cockerel. It is also relatively cheaper to raise Noiler to 2kg body weight than cockerel because of lower cost of feed and medication and the hardiness of the birds. Harnessing these inherent potentials in Noiler production will therefore go a long way in ameliorating the shortage of proteins, particularly those of animal origin that is prevalent in most African countries reputed with low consumption of animal protein (FAO, 1986).Saw dust serves as a source of cellulose, fibre starch that is indigestible to human and a filler in some low calorie food as well as other plant sources (Nyiszli 2011) Thus, this study was designed to examine the cost effectiveness of production of growing Noiler fed mixed sawdust as a substitute for wheat offal.

Materials and methods
Experimental site and animals
The experiment was conducted at the Poultry Unit, Teaching and Research Farm, Oyo State College of Agriculture and Technology, Igboora. A total of 90 growing Noiler at six weeks of age were obtained from Marveprerola Nigeria Enterprise. The birds were weighed individually and allocated into 6 units. Each unit housed 15 birds and were offered one of the

two dietary treatments such that there were 3 replicates assigned to each dietary treatment. Each replicate contained two feeder plate and two drinkers. The birds were vaccinated against Newcastle disease using ND Lasota vaccine by dissolving 100 doses of each vaccine in 2litres of chlorine free water.

Experimental diets

Two experimental diets were formulated for the growing Noilers. Experimental diets were introduced from 7-10weeks and fed for three weeks of the experiment. Two replacement level of mixed saw dust for wheat offal at 0% and 100%

Table 1: Proximate analysis of mixed saw dust

Component	Percentage
Dry matter	86.60
Crude protein	10.50
Crude fibre	18.99
Ether extracts	18.90
Ash	3.00
Moisture content	13.40
NFE	35.21
ME (kcal/kg)	3184.48

Nitrogen Free Extracts (NFE), Metabolizable Energy (ME).

Table 2: Gross composition of experimental diet of growing Noiler

Percentage	**0%**	**100%**
Ingredients	T_1	T_2
Maize	58.00	58.00
Soya bean meal	32.00	32.00
Wheat Offal	5.00	0.00
Saw Dust	00.00	5.00
Limestone	2.00	2.00
Bone Meal	2.00	2.00
Broiler Premix	0.25	0.25
Salt	0.25	0.25
Methionine	0.25	0.25
L- Lysine	0.25	0.25
TOTAL	100.00	100.00
ME kcal/kg	2934.79	3000.26
Crude Protein (%)	21.75	21.43

A kg premix contains vitamin A; 110,000,000 Vitamin D; 2,500,00iμ, Vitamin E; 20,000mg Vitamin K_3; 3000mg, Vitamin B_3; 3.00mg Vitamin B_2; 7000mg, Vitamin B_6; 500mg Vitamin B_{12}; 25mg, Panthotenic acid; 10,000mg, folic acid; 800mg, Biotin; 50mg Manganese; 80,000mg, Iron; 40,00mg, Zinc; 60,000mg, Copper; 800mg, Cobalt; 250mg, Iodine; 1,000mg, Selenium (1%); 150mg, Chlorine, 200,000mg and Antioxidant; 100,00mg.

Table 3: Economy of production of Noiler fed mixed saw dust as a substitute for wheat offal

Parameter	**T_1 (0% Sawdust)**	**T_1 (100% Sawdust)**	**SEM**
Initial weight (g)	847.00^b	880.00^a	11.67
Final live weight (g)	1139.00	1204.00^a	22.90
Weight gain (g)	292.00^b	324.00^a	11.31

Feed intake (g)	1369.44[a]	1220.96[b]	52.50
Cost of feed (₦ /kg)	304.15[a]	297.65[b]	2.30
Cost of weight gain (₦ /kg)	88.81[b]	96.44[a]	2.70
Cost of feed/bird (₦ / kg)	416.38[a]	363.13[b]	18.83

[a,b,]Means on the same rows with different superscript differ significantly ($p<0.05$)

Data Collection and Analysis

At the end of the experiment, data were collected on initial weight, final weight, weight gain, feed intake and cost of feed in kg. Data collected were subjected to statistical analysis of variance using SPSS 2003version and means separated by Duncan Multiple Range Test (Duncan 1955).

Results and discussion

The values recorded for the cost of feed in ₦/kg reduced as the substitution level of mixed saw dust for wheat offal increased. The result confirmed the finding of (6) who reported a reduction in the cost of feed in ₦/kg as the substitution level of mixed saw dust for wheat offal increased. The higher (304.15) cost of feed in (₦/kg) was recorded for Noiler fed diet 1 (0% substitution level of mixed saw dust for wheat offal) while the lower (₦297.65 feed/kg) was recorded in Noiler fed diet 2 (100% substitution level of mixed saw dust for wheat offal). This result was in agreement with the finding of (Ogungbenro *et al* 2019) who reported the higher (130.97) cost of feed in (₦/kg) in cockerel fed diet 1 (0% substitution level of mixed saw dust for wheat offal) while the lower (124.57) of feed in ₦/kg) was noticed in cockerel fed diet 3 (40% substitution level of mixed saw dust for wheat offal).The result of this confirmed the finding of (Ogungbenro *et al* 2016) who reported the lower cost/kg feed (77.36) for Noiler fed diet 3 (100% substitution level of cashew nut meal for soya bean meal).This result was in agreement with the finding of (Ojewola *et al.,* 2005) who reported lower cost/kg diet in diet 4, containing cashew nut meal as a plant protein source. The result of this study was also in agreement with the finding of (Ojewola *et al.,* 2004) who reported the lower cost/kg feed (49.66) for Noiler fed diet 5 (100% cashew nut meal and 0% soya bean meal) based diet. The higher cost (96.44) of weight gain in (₦/kg) was obtained in Noiler fed diet 2 (100% substitution level of mixed saw dust for wheat offal). While the lower cost (88.81) of weight gain in (₦/kg) was obtained in Noiler fed diet 1 (0% substitution level of mixed saw dust for wheat offal). This result negates the finding of (Ogungbenro *et al* 2019) who reported the higher cost (94.98) of weight gain in (₦/kg) in cockerel fed diet 1 (0% substitution level of mixed saw dust for wheat offal). The higher final live weight and weight gain (1204.00 and 324.00) was obtained in diet 2 (100% substitution level of mixed saw dust for what offal) while the lower final live weight and weight gain (1139.00 and 292.00) was obtained in diet 1(0% substitution level of mixed saw dust for what offal). This result negates the finding of (Ogungbenro *et al.* 2019) who reported the higher live weight and weight gain (1321.50 and 725.20) in cockerel fed diet 1 (0% substitution level of mixed saw dust for wheat offal).While the lower live weight and weight gain (1132.00 and 668.20) was noticed in cockerel fed diet 3(40% substitution level of mixed saw dust for wheat offal). The result of this study confirmed the finding of (Kumuyi 2016) who reported that dietary fiber aids a healthier digestive process and supports the muscles and nerves. The numerical higher feed intake (1369.44) observed for Noiler fed diet 1 could be due to an improved palatability while high energy density of diet 2 could have slightly depressed appetite. It could be concluded that the use of mixed saw dust as a substitute for wheat offal resulted in a decreased in the cost of production of Noiler and this resulted in an increase in the profitability of Noiler production.

Conclusion

It could be concluded that the use of mixed sawdust is a good non-conventional feedstuff that could be substituted for wheat offal. This resulted in reduction in cost of production of Noiler which eventually increase the profitability of poultry farmers and better their standard of living.

Recommendation

Based on the result of this research, it could be recommended that trained extension officer should be encouraged to have on farm demonstration of the use of mixed saw dust as a substitute for wheat offal in Noiler production. This will ease the adoption of this alternative feed resource by farmers as its use will lead to increased profitability of Noiler production.

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OXIDATIVE PARAMETERS OF WEST AFRICAN DWARF RAMS TREATED WITH AQUEOUS EXTRACTS OF NEEM PLANT PARTS

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Abstract
Most antibiotic growth promoters have been linked with residues in meet and development of resistance by human consumers to antibiotics drugs. The use of plant materials as immune booster serves as an alternative to synthetic antioxidant agents. The experiment was carried out to investigate the effects of aqueous extracts of neem leaf and neem bark on serum metabolites of West African dwarf rams at the Teaching and Research Farm of Oyo State College of Agriculture and Technology Igbo-ora, Nigeria. Twelve (12) apparently healthy WAD rams of age6-12 months with body weight of 10.00 - 20.00kg were randomly selected and allocated to three treatments with four rams each and 2 rams per replicate. The compared treatment for administered were: T_1 (2ml dextrose saline) represent the control, T_2 (5ml/kg body weight of the aqueous neem leaves) and T_3 (5ml/kg body weight of the aqueous neem bark) drenched for each individual ram at day0, day 3, and day 7,while blood samples were collected at day 12into different labeled plain bottles to coagulate and the samples were taking to the laboratory for oxidative enzymes examination. Data obtained were subjected to general linear model using SPSS. The results revealed no significant (P >.0.05) difference in MDA, Arginase and catalase except SOD that showed significant($P<0.05$)differences.Ram drenched with T_2 (ANL) had the highest SOD (8.73unit/mg Protein) while the lowest value (3.15unit/mg Protein) for SOD was recorded on ram drenched with T_3 (ANB).Results obtained indicates that aqueous Neem bark (ANB) could reduce serum SOD and increase serum MDA with non-significant impact on serum catalase and arginase. This shows that aqueous neem leaf has the potential to decrease antioxidant, hence reduce oxidative stress in ram compared with aqueous neem bark. However, ram treated with aqueous neem bark are more susceptible to oxidative stress compared to the ram treated with aqueous leaves extract of neem

Keywords: **WAD rams, Neem (Azadirachtaindica), Oxidative enzymes.**

Introduction
*Azadirachta indica (*Neem*)* is well known in India and her neighboring countries for more than two centuries as one of the versatile medicinal plants having a wide spectrum of biological activities (Kausik *et al.*, 2002). It is also widely grown in Africa (David *et al.*, 2010). It has been known, as a result of its phytochemical constituents, to possess anti-inflammatory, antipyretic, antimicrobial, antidiabetic, and diverse pharmacological properties (El-Hawary *et al.*, 2013; Prashanth and Krishnaiah, 2014). There are few reports of the implication of oxidative stress in ruminants. There is need for more information on the levels of oxidative stress biomarkers in small ruminant animals, especially in tropical rearing systems and climatic conditions (Yusuf *et al.*, 2017). In the last decade, the evaluation of oxidative stress (the imbalance between the production of free radicals and the efficiency of antioxidant defense systems in the body) has become increasingly important in ruminant health and animal production as complementary tools in evaluation of the nutritional and metabolic status of the animals (Mohebbi *et al.*, 2012). A stressful condition leads to the excessive production of free radicals, which results in oxidative stress, an imbalance in the oxidant/antioxidant system. Generation of free radicals is an integral feature of normal cellular functions. In contrast, excessive generation and/or inadequate removal of free

radicals results in destructive and irreversible damage to the cell (Lopaczyski and Zeisel, 2001). Oxidative stress results from increased production of free radicals and reactive oxygen species (ROS), and a decrease in antioxidant defense (Trevisan *et al.,* 2001).The present study was designed to investigate the effects of aqueous extract of neem plant parts on oxidative parameters of West African dwarf rams.

Materials and methods

Experimental Animals and their Management

The experiment was conducted at the Sheep and Goat Unit, Teaching and Research Farm, Oyo State College of Agriculture and Technology, Igboora. Twelve (12) apparently healthy rams of between 10.00 -20.00 kg and 6 – 12months of age were randomly selected at the sheep unit. The rams were managed under semi-intensive system, were allowed to graze freely on their own for a period of 6 hours per day and later served concentrate after returning from grazing.. Routing management of the experimental pen was carried out on daily bases.

Preparation of aqueous extracts of neem leaves and neem bark

Fresh neem leaves and neem bark were collected within the college premises and sun-dry for 6hours per day for 10 days, the neem bark was chopped into pieces. The dried neem leaves and neem bark were ground separately using mortar and pestle to a powdered form. 200g of ground leaves and back were later soaked in 800ml of distil water in separate conical flask for 72 hours. The conical flasks were sealed up and incubated at temperature of 40^{o}C. The mixtures were filtrated to obtained aqueous extract solution of leaf and bark separately while the residues were dried and weighed; these gave approximate concentration of 10mg/ml of neem leaves and neem bark respectively.

Experimental layout, design and aqueous extract administering procedure

Rams in treatment 1 (T_1) which is the control was drenched with 2ml of normal saline while treatment (T_2) and treatment (T_3) were drenched with 0.5ml /kg live weight aqueous extract of neem leaves and neem back respectively at day 0, day 3 and day 7. Blood sample was collected at day 12 post experiment. All animals in treated groups were closely observed for sign(s) of toxicity and other physical reactions.

Collection of blood samples and statistical analysis

Blood samples were collected at 12th day of the experiment by raising the head of the ram and straight the neck to the desired side then the neck region was sterilized with swamp. The jugular vein was punctured to withdrawn blood from the vein. The collected blood was transferred into different labeled plain bottles. Samples collected were transported to the laboratory for oxidative parameters analysis. The obtained data on oxidative parameters were subject to one-way analysis of variance (SPSS Statistic version 23), while differences among the means were separate using Duncan's multiple range test (Duncan, 1955).

Laboratory analysis

The concentrations of superoxide dismutase (SODs) activity and malondialdehyde (MDA) levels in plasma were analyzed using the commercial assay kits from Nanjing Jiancheng Biochemistry Reagent Co(NJBC, Nanjing, Jiangsu, China; Bai *et al.,* 2017) Catalase was estimated by the method described by Beers and Sizer (1952) while Arginase activity was measured using methods as previously described by Loeb and Stuhlman (1969).

Results and discussion

The results of oxidative parameters of rams treated with aqueous extract of neem leaves and neem bark shown in Table 1. The results revealed no significant ($P > .0.05$) difference in MDA, Arginase and catalase except SOD that showed significant ($P<0.05$) differences. Rams drenched with aqueous extract of neem leaves (ANL) recorded the highest value of SODs (8.73unit/mg protein), while the lowest value (3.95unit/mg protein) for SODs was recorded on ram drenched with aqueous extract of neem bark (ANB). The oxidative status is a variable and can be changed by the influence of different factors even during exercise, oxidative stress

is triggered and anti-oxidant capacity tends to decrease (Marshall *et al.*, 2002). Jack *et al.* (2016) reported that significantly higher serum catalase activity in WAD rams led to apparently higher total antioxidant activity. According to Puppel *et al. (*2013), free radicals have a crucial role in the development of over 100 diseases affecting all major organs. Maintaining physiological equilibrium between intracellular antioxidants levels and production of reactive oxygen species (ROS) is crucial for the survival of the organisms (Garrel *et al.*, 2010; Hayajneh *et al.*, 2016).The results from this work indicate no harmful effect was recorded from the treated groups. Although, oxidative stress has been implicated in numerous disease (Celi 2008), it can be particularly dangerous because it usually leaves no clinical signs and the condition is diagnosed by means of dedicated analytical methods to evaluate the integrity of the defense mechanisms and the end products of oxidative stress (Celi *et al.*, 2010).Tightly controlled ROS generation appears to be one of the central elements in the mechanisms involved in cell function, growth, differentiation and death (Valko *et al.*, 2007).There is a positive correlation between oxidative stress and cells life cycle (Hajimohammad *et al.*, 2015). The decrease antioxidant enzymes SOD activities with elevated MDA in ram drenched with T_3 (ANB) could be associated with stress or decreased antioxidant potential. Decreased in SOD in ram treated with ANB (T_3) may also be associated with superoxide production resulting to the mopping up on available SOD. However, higher MDA and lower SOD recorded in T_3 with regards to potent of ANL and ANB could be suggestive that ANL could control oxidative stress more effectively compared to ANB. This finding is consistent with the report of Yampalle war *et al.*, 2003 which reported that increase in MDA implies increased in lipid peroxidation as a result of oxidative stress. The value obtained in MDA concentrations suggest the safety of the *Azardirachta indica* as there was no record of lipid peroxidation across the treatments, this disagreed with finding of ThankGod *et al. (*2021) who observed reduction in lipid peroxidation of broiler chicken infected with Eimeria species and treated with aqueous *A. indica* leave at 200mg, 400mg and 800mg/kg. The author attributed this to secondary metabolites in plant extracts such as saponin and alkaloids which bind to critical macromolecules on the parasites. Increased in SOD in group of rams received extract of ANL indicates that extract of *A. indica* influence the activity of antioxidants enzymes suggestive of the antioxidant inducing properties of the extract in the ram, the innate immune system of these animals, protects the rams by producing reactive oxygen species in a process termed 'oxidative burst'. Reduction in the values of the SOD in the group of rams drenched bark of A. indica suggest that bark of the neem can dispose the ram to oxidative stress, this could be due to high concentration of tannins and saponin in the bark which could be as a results of toxicant that bind to critical macromolecules, thereby predispose the ram to oxidative stress.

Table1: Oxidative parameters of WAD rams treated with dextrose saline and aqueous extract of neem plant parts

Parameters	**T_1 DES**	**T_2 ANL**	**T_3 ANB**	**SEM (±)**	**P-value**
MDA(µmol/mg)	5.71	4.50	7.41	0.89	0.47
SODs(unit/mgprotein)	6.57^a	8.73^a	3.95^b	0.76	0.01
Catalase(mg/g.protein)	15.01	13.18	13.71	0.43	0.29
Arginase(ng/ml)	6.12	5.36	4 26	0.37	0.10

$^{a\,b\,c}$ Means on the same row with different superscript are significantly different ($P< 0.05$).DES= dextrose saline,ANL= Aqueous extract of Neem leaves, ANB= Aqueous extract of Neem bark

Conclusion

Based on the results of this finding, it could be deduced that aqueous leaf extract of neem could enhance enzymatic antioxidants better than aqueous neem extract of bark as indicated

in the serum SOD values recorded. It is also suggestive that aqueous neem leaf and bark extract at 0.5ml/kg body weight did not show a significant effect on enzymatic anti-oxidant examined except the SOD. This implies that aqueous neem leaf has the potential to decrease antioxidant, hence reduce oxidative stress in ram compared with aqueous neem bark..

Recommendations

More research work is required on the volume of the extract that could be tolerated by ram without posing stress on the oxidative enzymes examined. Toxicity of the extract should be monitored as the dosage increase to evaluate it effect on liver hepatotoxicity and histopathological lesions.

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ANTIBIOTIC SENSITIVITY PATTERN OF PATHOGENIC BACTERIA OF FISH ISOLATED FROM COMMERCIAL AQUATIC FARMS IN IBARAPA CENTRAL LOCAL GOVERNMENT, OYO STATE.

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Abstract
One of the greatest discovery in the history of microbial control is antimicrobial agents, however, effective use of these agents have been defiled by the occurrence antibacterial resistance. This study was carried out to isolate, identify and conduct antimicrobial sensitivity test on the identified bacteria in 50 adult Clarias gariepinus harvested from three different farms and 10 ponds in Ibrarapa Central Local Government, Oyo State. Five fish were randomly selected from each pond. Organs (i.e. liver, kidney, gut and skin) of adult Clarias gariepinus reared in earthen ponds were assessed bacteriologically. The following bacteria were isolated i.e. Citrobacter freundii, Vibrio vulnificus, Edwardsiella tarda, Aeromonas hydrophila, Aeromonas schubertii and Pseudomonas aeruginosa. Antibiotic susceptibility was determined using Kirby-Bauer disc diffusion method. The tested antibiotics were enrofloxacin, gentamicin, oxytetracycline, Neoceryl® which is a combination of 5 antibiotics: neomycin, streptomycin, erythromycin, colistin and oxytetracycline, and Anidoxytyl® which is a combination of 2 antibiotics: tylosin tartrate and doxycycline hydrochloride (the last two drugs are Animal Care products). Enrofloxacin had the highest susceptibility frequency (100%) while oxytetracycline had the lowest susceptibility frequency (30.77%). The highest resistance frequency was seen in three bacteria i.e. E. tarda, A. schubertii and P. aeruginosa which had 100% resistance frequency to oxytetracycline while the lowest resistance pattern was found in Citrobacter freundii. Multiple Antibiotic Resistance Index (MARI) for all isolates was between 0 and 0.2. Twelve isolates had 0.2 MARI, seven of these isolates were from farm 2 i.e. having the highest 0.2 MARI, four from farm 3 and one from farm 1 i.e. having the lowest 0.2 MARI. Although, the MARI from this experiment is not beyond 0.2 i.e. it is still within the safety margin for resistance pattern but it may be alarming indicator to avert future resistance hazard in aquaculture. Aquatic farmers should avoid overuse, under use and misuse of antibiotics especially oxytetracycline were resistance ranges from 23 to 100%.
Key words: Antibiotics**,** Pathogens**,** Susceptibility

Introduction

The discovery and development of antimicrobial agents to treat bacterial infections is one of the most fascinating stories in the history of microbiology (Rodgers and Furones, 2009), however, the phenomenon of bacterial resistance has tainted the effective use of antibiotics which can no longer be taken for granted. This study was designed to evaluate antimicrobial susceptibility pattern of pathogenic bacteria of fish isolated from commercial aquatic farms in Ibarapa Central Local Government, Oyo State.

Materials and methods

50 apparently healthy adult *Clarias gariepinus* were obtained from three different farms ten ponds (five fish from each pond) in Ibarapa Central Local Government, Igboora, Oyo State Nigeria. Samples were taken from liver, kidney, gut and skin and bacteriological analysis was conducted using nutrient broth, nutrient agar and tryptone soy agar and identified based on colony, Gram reactions and were biochemically characterized, according to Bergy's Manual of Systematic Bacteriology (Brenner *et al.*, 2005). Antibiotic susceptibility test was performed according to Kirby-Bauer disk diffusion method (Bauer *et al.*, 1966) on pathogenic bacteria of fish which were isolated from organs of (i.e. liver, kidney, gut and skin).

Results

Table 1: Cumulative and differential frequency of sensitivity test of isolates

Antimicrobial agents	**E**		**G**		**OX**		**X**		**Y**	
Differential Frequency (%)	**S**	**R**	**S**	**R**	**S**	**R**	**S**	**R**	**S**	**R**
Organisms										
Citrobacter freundii	100	0	100	0	33.4	49.9	100	0	100	0
Vibrio vulnificus	100	0	100	0	0	66.6	100	0	100	0
Edwardsiella tarda	100	0	100	0	0	100	100	0	100	0
Aeromonas hydrophila	100	0	92.3	0	46.15	23.08	92.3	0	100	0
Aeromonas schubertii	100	0	100	0	0	100	100	0	100	0
Pseudomonas aeruginosa	100	0	100	0	0	100	50	0	50	0
Cumulative Frequency (%)	100	0	96.15	0	30.77	46.15	92.30	0	96.15	0

Keys: E= Enrofloxacin-10µg, G= Gentamicin-10µg, OX= Oxytetracycline-30µg, 'X' is a combination of 5 antibiotics: Neomycin-10µg, streptomycin-5µg, erythromycin-5µg, colistin-5µg and oxytetracycline-15µg as seen in Neoceryl®, 'Y' is a combination of 2 antibiotics: Tylosin tartrate-15µg and Doxycycline hydrochloride-15µg as Seen in Anidoxytyl or Anitylodox,

Table 2: Multiple Antibiotic Resistance Index (MARI) of organisms in relation to farm location

	$NMARI_A$			**$NMARI_B$**			**TN**
Farm Nomenclature	**F1**	**F2**	**F3**	**F1**	**F2**	**F3**	
Organisms							
Citrobacter freundii		1	2	2		1	6
Vibrio vulnificus		1	1			1	3
Edwardsiella tarda		1					1
Aeromonas hydrophila	1	2		5	1	4	13
Aeromonas schubertii		1					1
Pseudomonas aeruginosa		1	1				2
NF	1	7	4	7	1	6	26
TN		12			14		26
	$FMARI_A$			**$FMARI_B$**			
DFMARI (%)	3.85	26.92	15.38	26.92	3.85	23.08	100
CFMARI (%)		46.15			53.85		

Keys: $NMARI_A$ = Number of isolates with 0.2 MARI, $NMARI_B$ = Number of isolates without 0.2 MARI, TN = Total Number of isolates, NF = Number of isolates from each farm, $FMARI_A$ (%) = Frequency of isolates with 0.2 MARI (%), $FMARI_B$ (%) = Frequency of

isolates <0.2 MARI (%), F1 = Farm 1, F2 = Farm 2, F3 = Farm 3 DFMARI (%) = Differential frequency of MARI status (%), CFMARI (%) = Cumulative frequency of MARI status (%)

Discussion

In this study, the pathogenic organisms (*Citrobacter freundii, Vibrio vulnificus, Edwardsiella tarda, Aeromonas hydrophila, Aeromonas schubertii* and *Pseudomonas aeruginosa*) subjected to antibiotic sensitivity test only showed resistance to oxytetracycline. 100% resistance was recorded in *E. tarda, A. schubertii* and *P. aeruginosa.* Efuntoye *et al. (*2012), Wamala *et al. (*2018) and Adah *et al. (*2022) reported varying frequency of resistance to tetracycline's in African catfish and *Orechromis niloticus* of which *Pseudomonas* and *Aeromonas* species were included, Efuntoye *et al. (*2012) claimed that this it may be due to incorporation of these drugs into feeds used in aquaculture.

Resistance to enrofloxacin, gentamicin, Neoceryl® (containing neomycin, streptomycin, erythromycin, colistin and oxytetracycline) and Anidoxytyl® (containing tylosin tartrate and doxycycline hydrochloride) did not occur in this study but Efuntoye *et al. (*2012) and Adah *et al.,* 2022 reported resistance to erythromycin and streptomycin in their studies.

Multiple antibacterial resistance index (MARI) which has been defined as resistance to three or more classes of antibacterial agents by an isolate (Tenover, 2006) and it is used to identify antibiotics that are misused in a location. Multiple Antibiotic Resistance Index (MARI) for all isolates is ≤ 0.2. The frequency of farms with MARI less than 0.2 is 53.85%. Claudious *et al.,* 2019 and Adah *et al.,* 2022 reports were contrary to this result, Adah *et al.,* 2022 reported MARI ranging from 0.3 to 0.8 with frequency of 97.3%.

Conclusion

Isolates from this study are not multi drug resistance, the organisms were sensitive to enrofloxacin, gentamicin, Neoceryl® (containing neomycin, streptomycin, erythromycin, colistin and oxytetracycline) and Anidoxytyl® (containing tylosin tartrate and doxycycline hydrochloride). it is an indicator that these antibiotics were not misused in this areas. Farmers should use of oxytetracycline responsibly, because it is showing some warning signs.

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GROWTH QUALITIES OF BROILER STARTER AND FINISHER FED FORMULATED AND FOUR DIFFERENT COMMERCIAL FEEDS

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Abstract

One hundred (100) day old broiler chicks were obtained to conduct an experiment on growth qualities of broiler chickens (starting and finishing phases) by feeding formulated and four different commercial feeds. Broilers chicks were randomly allotted into five (5) treatments that contained two replicates with 10 broilers each. The replicates were distributed using Completely Randomize Design (CRD). Experiment lasted for eight (8) weeks. Final live weight shows significant ($p<0.05$) different across the dietary treatments, highest (1290.00g) was recorded from T4 while the lowest (845.00g) was noticed from T1. Weight gain had lowest (793.00g) from T1 while the highest (1248.00g) was obtained from T4. Significant ($p<0.05$) highest (2205.45g) feed intake was recorded on T3 while the lowest (1960.00g) was obtained on T1, T4 and T5. Highest (2.51) significant ($p<0.05$) feed conversion ratio (FCR) was recorded from T1 while the lowest (1.59) was obtained from T4. Significant ($p<0.05$) highest mortality (20%) was recorded from T3 while birds on T1, T2, T4 and T5 had no (0.00%) mortality. At finishing phase, highest (1290.00g) initial weight was observed from T4 but was statistically ($p.>0.05$) similar with T5 while least (885.00g) was noticed from T2 but were not significantly ($p>0.05$) with birds on T1, and T3. Highest (3700.00g) final live weights were obtained from T4 and statistical ($p>0.05$) similarity were observed with T3, and T5 while least (2650.00g) significant ($p<0.05$) different was noticed from T2. Weight gain revealed significantly ($p<0.05$) higher different of 2410.00(g) from T4 while least (1765.00g) was observed from T2. Statistically ($p>0.05$) similarity were obtained on T1, T3, T4 and T5. FCR showed highest values of 1.76 from birds placed on T2 while least (1.16) was showed on T4. From outcome of this finding, it could be concluded that formulated and four different commercial feeds procured in Igboora town performed better at broiler starting and finishing phases. Based on FCR from this finding, both T4 and T5 are recommended to feed broilers at both phases in order to get more profit.

Keywords: Broiler, performance, protein, self-formulated and commercial feeds.

Introduction

Poultry farming is one of the most profitable businesses, its represents major sources of animal protein. It can be reared on a commercial and backyard scales, which make it accessible and affordable by low income earners, to meet the protein requirement of the human population in the world which is equally lucrative and legitimate (Yalcin *et al.*, 2001). Broiler chicken exploit its maximum genetic potential for meat production, its feed must be nutritionally balanced. A deficiency in a particular nutrient would not be conducive for economic production (Ononiwu *et al*, 2017). Based on contemporary research, the nutritional

needs of broiler chickens have been established to guide the feed manufacturing industries. However, broiler chicken producers have experienced reduced performance production when fed on different commercial feeds. Probably some of these commercial feeds fail to meet standard requirements for high production due to sub-standard feed production. Therefore, aim and objectives of this article is to evaluate formulated and four different commercial feeds on growth qualities of broiler starter and finisher obtained in Igboora.

Materials and methods

Experimental site

The experiment was carried out at the Teaching and Research Farm, Oyo State College of Agriculture and Technology Igboora, Nigeria. The experimental area lies in savannah forest zone on latitude 7.4148°N and longitude 3.3015°E, with an elevation 140m above sea level. The average minimum temperature is about 21.50°C and maximum 32.50°C. The average humidity is 58.0% The double maximum rainfall is about 214.3mm in June and 165.2mm in September.

Experimental diets

One experimental diet was formulated and four different commercial feeds were obtained from a reputable feed retailer in Ibarapa axis and were designed as treatment one (T_1) served as control, while T_2, T_3, T_4 and T_5 were commercial feeds. Experimental diets are shown in the Table 1 below.

Table 1: The composition of the experimental diets

Calculated values	T1	T2	T3	T4	T5
At starting phase (0-4 weeks)					
Crude Protein (%)	21.75	22.00	22.00	22.00	21.00
Crude Fat (%)	3.61	5.00	5.00	4.50	4.30
Crude Fibre (%)	2.60	4.30	5.00	5.00	3.90
Energy(kcal/kg)	2934.54	3000.00	3000.00	2950.00	2600.00
At finishing phase (5-8 weeks)					
Crude Protein (%)	18.67	19.50	18.00	18.00	17.00
Crude Fat (%)	4.95	5.50	6.00	5.00	4.00
Crude Fibre (%)	3.45	3.00	5.00	5.00	5.00
Energy (Kcal/kg)	3.00	3100.00	3000.00	3150.00	3000.00

SEM = Standard Error of Mean. FCR = Feed conversion ratio T_1 = Formulated Feed

T_2 = Commercial Feed T_3 = Commercial Feed T_4 = Commercial Feed
T_5 = Commercial Feed

Experimental birds, design and management

One hundred day-old broiler chicks were procured from Fidan Farm Limited, Ibadan. They were moved to the Poultry Unit of the Teaching and Research Farm of Oyo State College of Agriculture and Technology, Igboora where the experiment was conducted. The broiler chicks were randomly selected and divided into Five (5) treatments and replicated twice with 10 broilers per replicate. The replicates were distributed using Complete Randomize Design (CRD). The brooding pen was washed, cleaned thoroughly with disinfectant; thereafter, it was fumigated with potassium permanganate and formalin for seven days prior to the arrival

of the birds. Proper vaccination and medications were observed as at when due. Birds were managed under a deep liter system of management with wood shaving as bedding materials throughout 8 weeks of the experiment.

Data Collection

Initial body weights of the birds were taken at the arrival of the birds while body weight and feed intake were measured weekly. Average weight gain (AWG) was obtained by subtracting initial body weight from final body weight gain. Feed conversion ratio (FCR) was computed by dividing feed intake by weight gain. Mortality was recorded, as it occurred to compute percent mortality rate.

Statistical analysis

Data obtained were subjected to one-way analysis of variance using SPSS (2020), version 27. Mean value of variance showing significant ($P<0.05$) differences were separated using Duncan's Multiple Range test of some package.

Results and discussion

Growth qualities of the experimental broiler chickens are presented on Table 2. The values obtained were significantly ($p>0.005$) different across dietary treatments except initial weight at starting and feed intake at finishing phases. The highest final live weight (1290.00g) was recorded from T4 while the lowest (845.00g) was noticed on T1. Weight gain had lowest (793.00g) from T1 while the highest (1248.00g) was obtained from T4. Feed intake was significantly ($p<0.05$) similar on T1, T2, T4 and T5. The highest (2205.45g) significant ($p<0.05$) was recorded on T3 while the lowest (1960.00g) was obtained on T1, T4 and T5. Highest (2.51) significant ($p<0.05$) feed conversion ratio was recorded from T1 while the lowest (1.59) was obtained from T4. Mortalities were significantly ($p<0.05$) similar on T1, T2, T4 and T5 respectively. The highest mortality (20%) was recorded from T3 while those birds on T1, T2, T4 and T5 had no (0.00%) mortality. While at finishing phase, highest (1290.00g) initial weight was observed from broiler fed on T4 but was statistically ($p.>0.05$) similar with those birds fed T5 while least (885.00g) was noticed from birds fed on T2 but were not significantly ($p>0.05$) with birds on T1, and T3. Highest (3700.00g) final live weights were obtained from birds fed on T4 and statistical ($p>0.05$) similarity were observed with birds fed on T3, and T5 while least (2650.00g) significant ($p<0.05$) different was noticed from birds placed on T2. Weight gain revealed significantly ($p<0.05$) higher different of 2410.00(g) from T4 while least (1765.00g) was observed from T2. Statistically ($p>0.05$) similarity were obtained on T1, T3, T4 and T5. Feed conversion ratio showed highest values of 1.76 from birds placed on T2, T2 and T3 were not significantly ($p>0.05$) different while least (1.16) was observed on T4 but T1 and T5 were statistically ($p>0.05$) similar with T4. Mortalities were not significantly ($p>0.05$) different across dietary treatment groups at finishing phase.

Significant ($P<0.05$) differences of final live weight, and weight gain of the broiler starter across dietary treatment groups examined in this finding were influenced by formulated and four different commercial feeds examined but those birds fed on T4 and T5 performed better than other groups. Better performance on T4 and T5 in this finding could be attributed to the nutritional composition of the feed, most especially right proportion of the essential nutrients required by the animals for optimum performance. This research was in agreement with Ekeocha *et al. (*2021) who opined significant ($p<0.05$) different when compared three commercials feeds on layers performance and egg qualities parameters. Feed intake observed from this research is in line with the findings of Tejbeer, *et al. (*2019) who reported significant difference in feed intake on birds fed different commercial feeds. In term of feed conversion ratio (FCR), both birds placed on T4 and T5 had least (best) but those on T4

showed superlative FCR than T5. This performance could be attributed to the nutritional composition of the feed, most especially adequate essential nutrients required by the broiler chickens for quality. Rama *et al. (*2011) reported that the genetic potential of birds can only be realized in case of adequate nutrient intakes under variable environmental condition, which might require updates of the nutrient recommendations for poultry while at finishing phase finishing broiler chickens showed that initial weight, final weight, weight gain and feed conversion ratio (FCR) were significantly ($p<0.05$) influenced by the treatment groups. These values were comparable to the report of Sanusi *et al. (*2015). Finisher birds fed on T4 and T5 had lowest (2800.00g) feed intake but had highest statistically ($p>0.05$) similarity than T1, T2 and T3. This shows that nutritive nutrients in the T4 and T5 diets were not negatively challenged before and during the experimental period of this study. Though, FCR were statistically ($p>0.05$) similar on T1, T4 and T5 but T4 had least (best) FCR from this finding.

Table 2: Growth qualities of the experimental broiler chickens

Parameters	T1	T2	T3	T4	T5	SEM
At starting phase (0-4 weeks)						
Initial weight (g)	52.00	52.00	52.00	52.00	52.00	0.00
Final live weight (g)	845.00^{b}	885.00^{b}	975.00^{b}	1290.00^{a}	1195.00^{a}	61.04
Weight gain (g)	793.00^{b}	833.00^{b}	923.00^{b}	1248.00^{a}	1143.00^{a}	62.13
Feed intake (g)	1960.00^{b}	2052.07^{b}	2205.45^{a}	1960.00^{b}	1960.00^{b}	34.84
Feed conversion ratio	2.51^{a}	2.47^{a}	2.40^{a}	1.59^{b}	1.76^{b}	0.14
Mortality (%)	0.00^{b}	5.00^{b}	20.00^{a}	0.00^{b}	0.00^{b}	2.69
At finishing phase (5-8 weeks)						
Initial weight (%)	845.00^{b}	885.00^{b}	975.00^{b}	1290.00^{a}	1195.00^{a}	61.04
Final live weight (g)	2750.00^{bc}	2650.00^{c}	3250.00^{ab}	3700.00^{a}	3600.00^{a}	150.15
Weight gain (g)	1905.00^{ab}	1765.00^{b}	2275.00^{ab}	2410.00^{a}	2405.00^{a}	102.13
Feed intake (g)	2838.90	3033.26	3249.93	2800.00	2800.00	117.32
Feed conversion `ratio	1.50^{b}	1.76^{a}	1.55^{a}	1.16^{b}	1.18^{b}	0.08
Mortality (g)	0.00	0.00	0.00	0.00	0.00	0.00

^{a,b,c} Means in a row with different superscripts are significantly different ($P<0.05$).

Conclusion

From outcome of this finding, it could be concluded that formulated and four different commercial feeds procured in Igboora town performed better at both phases of the studies

Recommendation

Based on FCR from this finding, both T4 and T5 are recommended to feed broilers at starting and finishing phases in order to produce more acceptable broiler chickens.

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GROWTH CHARACTERISTICS OF BROILERS FED DIETS CONTAINING VARYING LEVEL OF SAND PAPER LEAF MEAL DURING DRY SEASON

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Abstract
There is an increase in the use of phytogenic in recent times as feed supplements in poultry production. This has attracted much attention due to the anti-oxidant properties of the plants. Hence, this study evaluated the performance characteristics of broilers fed diets containing sand paper leaf meal (SPLM) during dry season. One hundred and twenty, four weeks old broiler were randomly allotted into four dietary treatments in a Complete Randomized Design. The birds received 0, 5, 10, and 15 g sand paper leaf meal/kg of concentrate. Parameter recorded were the initial weight, final weight, weight gain, average feed intake, feed conversion ratio, and mortality. Results revealed that there were no significant ($p<0.05$) differences in all the parameters. The ranges of values for initial weight, final weight, weight gain, average feed intake, feed conversion ratio, and mortality were 1.22 – 1.23kg/bird; 2.00 - 2.25kg/bird; 0.78 – 1.02g/bird/day; 2.40 – 2.2.62g/bird/day; 2.57 – 3.37. The study concluded that the dietary inclusion of SPLM had no adverse effects on growth performance of the experimental birds.
Keyword: Broiler finishers, Sandpaper leaf meal, FCR and Weight gain.

Introduction

Poultry sector despite its potential is faced with the problem of feeding and drugs in Nigeria. To confront these threats, alternatives to antibiotics collectively called phytogenic should be explored which include medicinal plants and their products, plant extracts and essential oil of plants or parts of plants and plant extracts (Alloui *et al.*, 2014). These phytogenic are capable of positively influencing performance and immune status of birds without adverse effect on animal and final consumers (Karangiya *et al.*, 2016). There is an increase in the use of phytogenic in recent times as feed supplements in poultry production and this has attracted much attention due to the anti-oxidant properties of phytogenic (Basit *et al.*, 2020). One of the phytogenic is sand paper leaf meal (*Fiscus exasperata*).
Fiscus exasperata leaves contain about 18.39% proteins (Obour *et al.*, 2017) and are rich in minerals such as calcium, iron, titanium (Hernandez *et al.*, 2004). Phytochemical analysis of the leaf extract of *Fiscus exasperata* has revealed the presence of flavonoids, tannins, saponins and alkaloids (Ijeh and Agbor, 2006).

Previous research revealed that *Fiscus exasperata* has been used for treating several health challenges like difficult child birth, bleeding and diarrhea (Ijeh and Agbor, 2006). Taiwo *et al. (*2010) reported the hypoglycaemic potential of the leaf of *Ficus exasperata*. In Nigeria, it has been reported that leaf extract of sand paper leaves is taken to lower blood pressure and for the treatment of heart diseases (Ijeh and Ukweni, 2007). Thus, this study assessed the growth performance of broilers fed diets containing varying level of sandpaper leaf meal in dry season.

Materials and methods

The experiment was carried out at the poultry unit of the Teaching and Research farm of the Oyo State College of Agriculture and Technology, Igboora, Oyo State, Nigeria. The area is situated in the derive savannah zone in Ibarapa Central Local Government, Oyo State, Nigeria. This site is situated at 80 kilometres (50mi) north of Lagos (Latitude 7^0 26' 1.79" N and Longitude 3^0 17' 16.37" E). The town's average annual rainfall is 139.39 mm, 76% humidity and 22^0C – 29^0C temperature (www.worldweatheronline.com).

Experimental birds and materials

One hundred and twenty, four weeks old broilers were purchased from a reliable farm. The birds were grouped into 4 dietary treatments with three replicates of ten birds each in a completely randomized design. Sand paper leaves were plucked, shade dried under room temperature and ground into fine particles with the use of kitchen blender. The study was carried out between February and March, 2023. Nutrients composition of the preparatory feed used is presented in table 1.

Table 1: Nutrients composition of the preparatory feed fed to the birds

Nutrients	%
Crude protein (Min)	22
Crude fat (Min)	5
Crude fiber(Max)	3
Calcium (Min)	1.2
Phosphorus (Min)	0.4
Lysine (Min)	0.7
Methionine (Min)	0.4
Metabolizable energy (Kcal/kg)	3000

Experimental treatments

Treatment 1: - 0 g/ kg of concentrate
Treatment 2: - 5 g/kg of concentrate
Treatment 3: - 10 g/kg of concentrate
Treatment 4: - 15 g/kg of concentrate

Parameters considered were initial weight, final weight, weight gain, average feed intake, feed conversion ratio, and mortality. All data obtained were subjected to analysis of variance (ANOVA) using SPSS 2020 version and the significant treatment means were separated by Duncan Multiple Range Test.

Results and discussion

Results of growth performance (i.e., initial weight, final weight, weight gain, feed conversion ratio, average feed intake and mortality) of broiler finishers fed diets containing varying level of sand paper leaf were showed in the Table 2. Results revealed that there were no significant ($p<0.05$) differences in all the parameters. Though the values increased with increasing supplementation of sand paper leaf. The ranges were 1.22 – 1.23kg/bird; 2.00 - 2.25kg/bird; 0.78 – 1.02g/bird/day; 2.40 – 2.2.62g/bird/day; 2.57 – 3.37, respectively. The results showed that growth parameters measured increased with increasing sand paper levels in the diets

Table 1: Growth performance of broiler fed diets containing varying levels of sand paper leaf meal

Parameters	T_1 0g/kg of concentrate	T_2 0g/kg of concentrate	T_3 0g/kg of concentrate	T_4 0g/kg of concentrate	SEM	P-Value
Initial weight (kg)	1.22	1.22	1.23	1.23	0.01	0.97
Final Weight (kg)	2.00	2.01	2.10	2.25	0.05	0.26
Weight gain (kg)	0.78	0.80	0.87	1.02	0.05	0.33
Average feed intake (kg)	2.59	2.40	2.59	2.62	0.13	0.85
Feed conversion ratio	3.32	3.00	2.98	2.57	0.12	0.30
Mortality (%)	0.00	0.00	0.00	0.00	00	00

Discussion

Growth performance reflects adequacy and efficiency of feed given to an animal in an environment (Oloko *et al.*, 2022). This study showed no significant increase in weight gain across the treatments suggested that sandpaper meal did not adversely affect the growth of broiler up to 20g/kg supplementation of feed. The result agreed with finding of Osei *et al. (*2013) who reported that *Ficus exasperata* did not affect broiler when fed diets containing *Ficus exasperate* at 2.5% and 5% finisher stages. Observation of no mortality across the treatment suggests leaf meal as a safe feed for broilers. *Ficus exasperate* leaves are known to contain anti-nutritional factors including genogenic, glycosides, tannins and alkocoids (Ijeh and Ukwemi, 2007). Smulikowska *et al. (*2001) reported that tannins may responsible for decrease in growth, feed efficiency, net metabolisable energy and protein digestibility. However, non-detrimental effects of inclusion of sand paper meal could imply that the concentrations of anti-nutritional factors were not enough to exert known adverse effects. Feed conversion ratio values were 3.32g and 2.57 which decreased as sand paper meal increased in the diets and also indicated that *Ficus exasperate* leaf can improve feed conversion ratio at higher level of inclusion.

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EFFECT OF VARYING LEVELS OF WILD COLOCYNTH (*Lagenaria breviflora*) FRUIT EXTRACT ON CARCASS AND FOOTPAD DERMATITIS OF BROILER CHICKEN

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Abstract
This study was carried at the Poultry Unit of the Teaching and Research Farms, Oyo State College of Agriculture and Technology, Igboora with a total number of 96 unsexed day-old broiler chicks which were randomly allotted into 4 groups of 24 birds each in a completely randomized design (CRD). Each group was subdivided into 3 replicates of 8 birds each, having an inclusion level of 0ml, 30mls, 60mls and 90mls of wild colocynth fruit extract (WCFE) in their drinking water for a period of 7 weeks. Parameters collected on carcass (live weight (LW), dressed weight (DW), percentage dressed weight, back, breast, legs, wings) and footpad dermatitis were subjected to ANOVA using SAS 2012 software, significant means were separated using Duncan's Multiple Range Test. The result obtained showed that WCFE inclusion in drinking water of the birds significantly ($p<0.05$) affected Live weight (g), dressed weight (g), breast (%) back (%) heart (%), abdominal fat (%) as well as pododermatitis measured however, dressed weight (%), wings (%), thigh (%), gizzard (%), kidney (%), liver (%) and spleen (%) were similar ($p>0.05$) across the treatment groups. It can be concluded from the study that WCFE inclusion in drinking water of broiler chicken had great deal of influence on the performance of broiler with no detrimental effects on carcass and the welfare in terms of walking ability of broiler birds and can be included up to 90mls/litre for proper performance in broiler production.
Keywords: Wild colocynth fruit extract, Broiler, wings, breast, footpad

Introduction

The continuous population growth, with accompanying accelerated rural-urban migration and the rise in living standards have caused enormous increase in the demand for livestock products especially poultry. Nevertheless, development of resistance to antibiotics and other drugs by pathogens in livestock and consumers of the animal products besides other complications have been noticed over the years which stimulated the interest of many researchers to investigate and explore the use of herbs, spices, plant extracts and their products as botanicals or organic supplements in animal rations (Hernadez *et al.,* 2004 and Afolabi *et al.,* 2016). Spices and herbs of various plants extracts have appetizing, digestion stimulating property and antimicrobial effects (Alcicek *et al.,* 2003). Odoemelam *et al. (*2013) reported that up to one third of all commercial swine and chicken rations in Europe now use mixtures of herbs and spices to accelerate growth and maintain good health. *Lagenaria breviflora* (wild colocynth) is one of those plants with characteristics antibacterial and antiviral herbal remedies in local communities such as Nigeria (El mahmood *et al.*, 2008) and the medicinal values of these plant lie in their component photochemical mostly alkaloids, tannins, flavonoids, and phenolic compound. Various livestock farmers used it for the treatment of Newcastle disease and coccidiosis in various animal species, especially poultry (Sonaiya, 1999). With no residual effect when consumed as they are of natural source, and there is no social, cultural, or religious taboo or discrimination against it use. Hence, the impetus for its phytogenic potentials in broiler chicken productivity and welfare

Materials and methods

Location of the study

The experiment was carried at the Poultry Unit of the Teaching and Research Farm, Oyo State College of Agriculture and Technology, Igboora

Collection and Preparation of Wild colocynth (*Lagenaria breviflora)* fruit extract (WCFE)

Fresh wild colocynth fruits were harvested from Igbo-ora community and environs. The fruits were washed, peeled, cut into pieces, and weighed. 1kg of the fruit is added to 2Litres of water in a breathable mesh container, covered tightly and allowed to stay for a period of 7 days. It is then filtered, and the filtrate (extract) is kept at room temperature prior to use.

Experimental animal managements

A total number of ninety (96) unsexed day-old broiler chicks (Marshal ®) were purchased from a reputable hatchery. On arrival, chicks were carefully removed from their box and randomly allotted into groups. Water and feed were supplied ad libtum. No vaccination nor other synthetic drugs were administered during the period of study. The wild colocynth fruit extract (WCFE) served as sources of antibiotic, antiviral as well as multivitamin for the treatment groups except the control. The feeding program consisted of the starter diet that was used until 21 days of age and a finisher diet until 49 days of age.

Experimental design

The chicks were randomly allotted into 4 treatment groups of 24 birds each in a completely randomized design (CRD). Each group was subdivided into 3 replicates of 8 birds each placed on a deep litter. The study lasted for a period of 42 days

Treatment was as follows:

T1 = control
T2 = (30mls of WCFE + 1 litre of water)
T3 = (60mls of WCFE + 1 litre of water)
T4 = (90msl of WCFE + 1 litre of water)

Data collection

Carcass evaluation

At the end of the 7 weeks experimental period, 3 birds per treatment were randomly selected having an appropriate body weight equal to the mean weight of the birds in the treatment used, starved overnight to allow for the emptying of the gastro-intestinal track (GIT) and weighed. The birds were slaughtered by severing the jugular vein, scalded in warm water for a minute and de-feathered by manual plucking for carcass and internal organ analysis. The kidneys, liver, gizzard, heart, spleen, bile breast, wings back and legs were removed and weighed using a sensitive scale.

Footpad dermatitis

At the end of the 3rd and 7th week, 3 birds per treatment were randomly selected. Scoring scale for pododermatitis (i.e., footpad disease) in broiler chickens was used for the evaluation. The feet of each bird were washed with clean water, inspected, and given a score based on the photograph they most closely resemble. The scores show an increase in the severity of pododermatitis and ranges from 0 (representing no evidence of pododermatitis) to 4 (representing severe pododermatitis) based on the Welfare Quality Project (Welfare Quality, 2009).

Statistical analysis

All data collected during the study were subjected to analysis of variance (ANOVA) using the Statistical Analysis System (SAS 2012) software. Significantly different means were separated using Duncan's Multiple Range Test (DMRT) of the same software.

Table 1: Ingredients and nutrients composition of starter and finisher diet (%)

Ingredient	**Starter (1-21 days)**	**Finisher (22-49 days)**
Maize	58.00	63.80
Soybean meal	34.50	28.40
Soya oil	3.30	3.70
Di-calcium phosphate	1.70	1.70
Limestone	1.80	1.70
Salt {NaCl)	0.25	0.25
Methionine	0.15	0.15
Premix*	0.30	0.30
Total	**100**	**100**
Calculated composition (%)		
Crude protein	22.10	19.18
Energy (MEKcal/kg)	3030	3100
Ether extract	5.79	6.34
Crude fibre	2.62	2.51
Calcium	1.04	1.00
Phosphorous	0.46	0.45
Methionine	0.53	0.45

*premix supplied per kg diet: vitamin A 15,000 I.U, vitamin D3 13000 iu, thiamin 2mg, Riboflavin 6mg, pyridoxine 4mg, Niancin 40mg, cobalamine 0.05g, Biotin 0.08mg, choline chloride 0.05g, Manganese 0.096g, Zinc 0.06g, Iron 0.024g, Copper 0.006g, Iodine 0.014g, Selenium 0.24mg, Cobalt 0.024mg and Antioxidant 0.125g. NFE = Nitrogen free extract

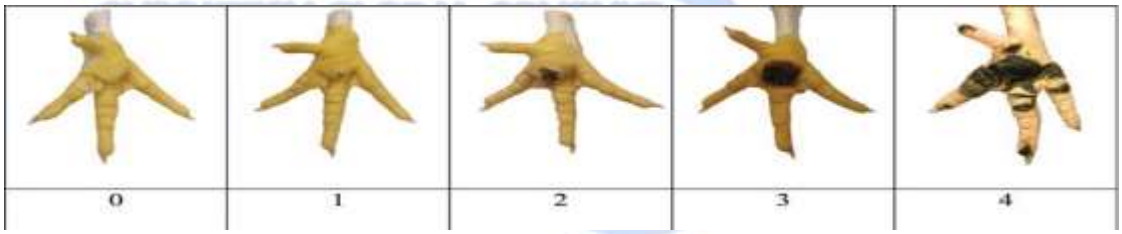

Figure 1: Photograph from A. Butterworth (University of Bristol, North Somerset, UK).

Results

Table 2 revealed wild colocynth (*Lagenaria breviflora)* fruit extract (WCFE) inclusion in drinking water of the birds significantly ($p<0.05$) affected Live weight (g), dressed weight (g), breast (%) back (%) heart (%) abdominal fat (%) however, dressed weight (%), wings (%), gizzard (%), kidney (%), spleen (%) and bile (%) were similar ($p>0.05$) across the treatment groups. Live weight was observed to be highest at 90mls WCFE (T4), while T2 (30mls WCFE), T3 (60mls WCFE) had comparable means ($P<0.05$) which is not different from the mean obtained in T1 (control). Similarly, dressed weight was observed to be highest at 90mls (T4) with a mean value of 2638 while T2 (30mls), T3 (60mls) had comparable means ($P<0.05$) which is not different from the mean obtained in T1 (0mls) as well. Likewise, back % was highest at T4 (90mls WCFE) with a mean value of 15.49% while the means of T3 (60mls WCFE) and T2 (30mls WCFE) (14.72 and 15.32) had comparable values with T1 (control). Heart also showed an increasing trend with increase in WCFE inclusion

levels although, heart of T4 had the highest significant mean of 0.60 while T1, T2 and T3 had a comparable means of 0.48, 0.51 and 0.54 respectively. All other parameters measured had comparable means across the treatment.

Table 3 results showed significant (P<0.05) difference was obtained only at the 3rd week using A. Butterworth (University of Bristol, North Somerset, UK) grading system. At the 3rd week, T2 (30mls) had the highest mean value of 2.33, followed by T4(90mls/1L) (2.00) while T3 (60mls/1L) (1.67) had means which were not different from the means obtained in T1 (0.00mls) (0.67). however, the7th week showed a range of mean values across the treatment.

Table 2. Effect of wild colocynth fruit extract (WCFE) on carcass characteristics of broiler birds (7weeks)

Parameters	T1(Control)	T2(30mls) WCFE	T3(60mls) WCFE	T4(90mls) WCFE	SEM	P-value
Live wt (g)	2317.00^{b}	2524.70^{ab}	2516.70^{ab}	2638.00^{a}	78.3	0.042
Dressed wt (g)	1637.30^{b}	1757.70^{ab}	1727.70^{ab}	1779.00^{a}	39.18	0.061
Dressed wt%	72.19	71.52	70.26	70.61	1.30	0.266
Prime cuts expressed as percentage of dressed weights (%)						
Brest%	24.16^{c}	22.51^{c}	24.03^{b}	24.40^{a}	11.62	0.001
Back%	15.06^{b}	15.32^{ab}	14.72^{ab}	15.49^{a}	17.64	0.052
Wings%	7.97	8.01	8.09	8.80	16.44	0.080
Thigh%	21.72	22.03	22.24	22.23	31.72	0.111
Organs expressed as percentage of live weight (%)						
Kidney	0.84	0.75	0.85	0.72	0.05	0.438
Gizzard	4.23	4.20	4.33	3.50	0.36	0.461
Heart	0.48^{ab}	0.51^{ab}	0.54^{ab}	0.60^{a}	0.03	0.200
Liver	3.01	2.53	2.61	2.59	0.18	0.426
Spleen	0.15	0.13	0.08	0.19	0.04	0.456
Abdominal fat	0.88^{ab}	0.84^{ab}	0.55^{b}	1.28^{a}	0.20	0.157

Note:-^{ab}= means with different superscripts on the same row differ significantly (p<0.05), wt = weight, WCFE = wide colocynth fruit extract, SEM = Standard error of means

Table 4: Effects of wild colocynth (*Lagenaria breviflora)* fruit extract (WCFE) on the footpad dermatitis of broiler chicken at 3rd and 7th weeks

Parameters	T1(Control)	T2(30mls) WCFE	T3(60mls) WCFE	T4(90mls) WCFE	SEM	P-value
Footpad (3weeks)	0.67^{c}	2.33^{a}	1.67^{ab}	2.00^{b}	0.449	0.096
Footpad (7weeks)	0.3	1.33	1.31	1.03	0.309	0.074

^{ab} = Means in the same row with different superscripts are significantly (p <0.05) different

Discussion

The inclusion of wild colocynth fruit extract (WCFE) at varying levels in water for the birds had its main effect on the birds' live weight which naturally translated into higher weight for the different body parts from the result showed that this may probably imply that feed palatability, digestion and utilization of birds administer drinking water with highest wild colocynth fruit extract (WCFE) inclusion was significantly influenced as compared with the control treatment. This observation agrees with the report of Kaefer and Milner 2011, that

herbs enhance and complement flavour in foods with no detrimental effect on the organoleptic quality of the feed. Although present study administered the herbs in water, but its effects on the gut microflorals responsible for digestibility and utilization of feeds may have translated to the effective usage of the diets by the birds. Moreso, significant effects of WCFE compared to the control in live weight and dressed weight are in line with the opinion of Gauthier, (2001) who stated that growth enhancement with phytogenics is probably the result of the synergistic effects among complex active molecules existing in phytobitics. The increase in the heart weight of the birds with increase in the level of inclusion of wide colocynth fruit extract could probably be due to higher physiological activities triggered by the presence of the anti-nutritional factors in the wide colocynth fruit extract and their associate effects which was also reported by Uchegbu *et al. (*2004). Feeding of neem products to poultry and other livestock had been reported to have significant increase in the organ weight of the heart, liver (Esonu *et al.,* 2006; Uko and Kamlu, 2008). The results on footpad dermatitis at the 3rd week strongly show a significant level of footpad dermatitis across the treatment groups though at a minimal level at the 7th week which might have been due to any of the following assertions: litter management (litter material and litter depth), ventilation and temperature control, water supply and water management, stocking density, feed and nutrition. One of the most important factors in broiler production is the litter quality. Litter plays several very important roles such as moisture absorption, thermal insulation and allows bird-scratching (Bilgilier *et al.,* 2009; Shepherd and Fairchild, 2010). It affects general health status, productive parameters, carcass quality, and welfare of broilers (Bilgili *et al.,* 2009; Garcês *et al.,* 2013). The results strongly support that there is a complex relationship between the overall flock health status and the production environment. The results show that a substantial proportion of broilers displayed moderate condition of pododermatitis at a younger age, which is in accordance with previous studies (Bassler *et al.,* 2013; Kittelsen *et al.,* 2017). This indicates that potentially painful conditions are present in the flock level, which may thereby compromise animal welfare (Weeks *et al.,* 2000; Caplen *et al.,* 2013).

Conclusion and recommendation

It can be concluded from the study above that wild colocynth (*lagenaria breviflora)* fruit extract (WCFE) inclusion in drinking water of broiler chicken contribute significantly to the welfare status of the birds and had no detrimental effects on carcass and walking ability of broiler birds and can be included up to 90ml/l for optimal performance in broiler production.

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COMPOSITION, DISTRIBUTION, RELATIVE ABUNDANCE AND DIVERSITY OF BENTHIC MACROINVERTEBRATES FAUNA OF OYAN RESERVOIR OGUN STATE NIGERIA

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Abstract
Benthic Macroinvertebrates fauna of Oyan reservoir was assessed between December 2022 and March 2023 for its composition and relative abundance. The sediments were collected using Van Veen Grab from four different stations in the water body. A total of 844 benthic Macroinvertebrates fauna were recorded from four families, Pomatidae, Thiaridae, Subulinidae and Vitrinidae. Family Pomatidae having only one species; Pomatia elegans was the highest with 312 samples of species occupying 67.36% of the whole population. Subulinidae family was observed to have three species Subulina stratella,, S. Octona and Rumina decollate. Subulina octona recorded the highest composition in Station 1 with 52.94% while Thiaridge and Vitrinidae family with species Melanoides tuberculata and Phenacolimax_major recorded no samples in this station. Highest samples of the Macroinvertebrate were recorded from station 2 with total of 310 samples where family Pomatidae spp Pomatia elegans has highest composition 40.65% and the least was recorded in Vitrinidae family Phenacolimax major 0.97%. The higher Relative Abundance 36.97% of macro invertebrates fauna was recorded in Pomatia elegans while the least was recorded from Vitrinidae family 0.71% species Phenacolimax major. Margalef's index (D) recorded in the stations ranges between 0.016 – 0.035, Shannon Index (H) was 0.17 – 0.4 and the Evenness index (E) ranged between 0.22 – 0.51. These population index shows a moderately polluted water body due to anthropogenic activities of fishing company in Oyan reservoir, therefore necessary measures should be put in place in order to improve the condition of this reservoir.
Keywords: Macroinvertebrates, Composition, Relative Abundance, fauna, Oyan reservoir

Introduction

Macro invertebrates are primarily benthic fauna which are larger than microscopic organisms but are generally ubiquitous in fresh water environment and play important role in the aquatic food web (Sekiranda *et al.*, 2004). They are ubiquitous to aquatic systems and play different role like mineralization, mixing of sediments, flux of oxygen into sediments and organic matter cycling (George *et al.* 2009 cited by Iyiola and Asedu 2020). According to Davide *et al.*, 2010 they are generally classified according to size into macro benthic (less than 10.0mm) and sometimes mega benthic (greater than 10.0mm). They can be differentiated by position they occupy on or in bottom sediment, in farm for those that leave in sediment and epi-fauna for those that leave on the surface bottom sediment (Davide and Macrosigovini, 2010).

Macro benthic invertebrate are biological quality element needed for the classification of biological status of water bodies (Tim and Mois 2008). Considerable effort has been made over the last decades to document the ecology, composition, spatial destruction and biodiversity of macro benthic invertebrate communities of Nigeria rivers, (Ogbeigbu and Victor 1989, Osemwieigie and Olumukoro 2004). According to Andern *et al. (*2012), the research has established a pattern of relationship between macro invertebrate fauna, depth, substrate and organic control of sediment. The role of macro invertebrate in water bodies

cannot be underestimated, Amusat *et al. (*2021) reported the role of macroinvertebrate in circulation and recirculation of nutrition in aquatic environment. Adebisi 1989 and Oke 1990 stated that benthic organisms feed on debris in the bottom of water which they in turn serve as food for a wide range of fishes. They also accelerate the breakdown of decaying organic matters into simpler inorganic forms.

Ogbeigbu and Victor (1989) reported studies of using macroinvertebrate as bio indicator of anthropogenic impact on aquatic ecosystem and also possess higher ability to tolerate pollution induced environmental stress than plankton (Rosenberg and Resh 1998). According to Stockley *et al* 1998; macroinvertebrate decay when dead thereby releasing nutrients. Several studies have been made on composition of benthic macroinvertebrates in Nigeria as reported by Idowu and Ugwumba (2005); Andern *et al. (*2012); Amusat *et al. (*2021), but there is paucity of knowledge on the benthic macro invertebrate activities and its impact on water body of Oyan Reservoir, Ogun State Nigeria. Therefore, this study aimed at investigating the composition and Relative abundance of benthic macroinvertebrate fauna of Oyan Reservoir, Ogun state Nigeria.

Materials and methods

Study Area

Oyan Reservoir is situated in Abeokuta North Local Government area of Ogun State in the South West of Nigeria, about 20 km north west of the state capital Abeokuta. The dam crosses the Oyan River, a tributary of the Ogun River. It is located on latitude and longitude 7°15′30″N, 3°15′20″E (Fig. 1). It is used primarily to supply raw water to Lagos and Abeokuta, but has potential for use in irrigation and power generation. The reservoir is in the savannah region, with sparse trees and grasses and low fertility. It covers 4,000 hectares and has a catchment area of 9,000 km^2. According to Ofoezie and Asaolu, (2007), the dam has a crest length of 1044 m, height 30.4 m and gross storage capacity of 270 million m^3. It was designed to supply raw water to Lagos and Abeokuta, and to support the 3,000 hectare Lower Ogun Irrigation Project. The major occupation of settlers around the reservoir is fishing. Four sampling site were selected based on their fishing activities. Station 1 (Dam site), Station 2 (Imala), Station 3 (Ibaro) and Station 4 (Ilakan).

Sampling procedure

Sediments were collected monthly between the hour of 8.00 am and 11:00am from each sampling station using Van Veen Grab. Collected sediments were carefully poured into labelled polythene bag and transported off shore for sieving. The samples were sieved for macroinvertebrates collection using a sieve of mesh size 0.5mm to eliminate excess sediments until clean water is observed. Fauna collected were sorted and stored in a 4% formalin container for further identification. Macroinvertebrates were identified under 0.90mm hand lenses and compound microscope in the Fisheries. Technology Laboratory, Oyo State College of Agriculture and Technology Igboora.

Statistical analysis

The monthly Composition and Relative Abundance of macro invertebrates were calculated. Biological indices; Margalef's Index (D), Shannon – Weiner Index (H) and Evenness Index (E) were used to calculate taxa richness, diversity and evenness. Margalef's Index (D) is the measure of species richness according to Margalef (1967) and expressed:

$$\textbf{Diversity index (D)} = \frac{S-1}{lnN}$$

Where S= Number of species
N = Total number of organism

Shannon-Weiner index (H) expressed as

$$\mathbf{H} = \frac{NlogN - \sum f1logf1}{N}$$ Shannon and Weiner (1949)

Evenness index (E) is a measure of equally or evenly distribution of species in the community and expressed as:

$$\textbf{Evenness index (E)} = \frac{H}{logS}$$

Where H is Shannon – Weiner index
S is no of Species in sample

Results

Table 1: Composition of Benthic Macroinvertebrates in Oyan Reservoir, Ogun State Nigeria

Composition	S1	%	S2	%	S3	%	S4	%	Total	%
Pomatidae										
Pomatia elegans	71	32.13	126	40.65	18	10.65	97	67.36	312	36.97
Thiaridae										
Melanoides tuberculate	0	0	113	36.45	58	34.32	14	9.72	185	21.92
Subulinidae										
Subulina stratella	24	10.86	27	8.71	31	18.34	13	9.03	95	11.26
S. octona	117	52.94	18	5.81	56	33.14	12	8.33	203	24.05
Rumina decollate	9	4.07	23	7.42	3	1.78	8	5.56	43	5.09
Virinidae										
Phanacolomax major	0	0	3	0.97	3	1.78	0	0	6	0.71
Total	221		310		169				844	

Table 2: Relative Abundance of Benthic Macroinvertebrates of Oyan Reservoir, Ogun State Nigeria

Family	Species	S1	S2	S3	S4	Total	Relative Abundance (%)
Pomatidae	*Pomatia elegans*	71	126	18	97	312	36.97
Thiaridae	*Melanoides tuberculata*	0	113	58	14	185	21.92
Subulinidae	*Subulina stratella*	24	27	31	13	95	11.26
	S. octona	117	18	56	12	203	24.05
	Rumina decollate	9	23	3	8	43	5.09
Vitrinidae	*Phenacolimax major*	0	3	3	0	6	0.71
	Total	221	310	169	144	844	
	Relative Abundance(%)	26.19	36.73	20.02	17.06	100	100

Table 3: Diversity Indices of Benthic Macroinvertebrates of Oyan Reservoir, Ogun State

Indices	Station 1	Station 2	Station 3	Station 4
Number of Taxa	**6**	**6**	**6**	**6**
Number of Individuals	**4**	**6**	**6**	**5**
Margelef's Index (D)	**0.023**	**0.016**	**0.028**	**0.035**
Shannon- Weiner Index (H)	**0.26**	**0.40**	**0.25**	**0.17**
Evennes Index (E)	**0.33**	**0.51**	**0.32**	**0.22**

Composition and Relative abundance of benthic Macroinvertebrates encountered from Stations 1 to 4 is represented in Table 1 and 2 respectively. A total of 844 Fauna belonging to four families and six species were recorded from the reservoir. Highest fauna composition of 310 Population was recorded in Station 2 while the least was in Station 4. The family Pomatidae with only one species *Pomatia elegans* has the highest Relative abundance 36.97% while the least 0.71% was recorded from family Vitrinidae also with only one species *Phenacolimax major.* Station 2 has the highest Total Relative Abundance 36.73% and the least was recorded in Station 4 with 17.06% as as shown in Table 2. Family *Subulinidae* comprises of three species *Subulilna stratella, S. octona* and *Rumina decollate* cut across all the Stations showing a well distributed organism throughout the Stations. *S. octona* has the highest Relative Abundance 24.05% in the family while the least was recorded in species *Rumina decollate* 5.09%. The *Thiaridae* family also consist of one species *Melanoides tuberculata* has no representative in Station 1 and the highest representation of 36.45% was recorded in Station 2 as shown in Table 1.

Vitrinidae Family with one *Spp Phenacolimax major* recorded the lowest composition and distribution across all the Stations with no individual representative in Stations 1 and 4 while three samples were recorded in Stations 2 and 3 respectively.

The biological diversity indices of benthic Macroinvertebrates were calculated using three indices; Margelef's Index (D), Shannon-Weiner Index (H), and Evenness Index (E) as shown in Table 3. Station 2 recorded the lowest D-value of 0.016 while the highest value was recorded in station 4 (0.035). Shannon-Weiner index (H) recorded the highest in Station 2 (0.40) and least was also recorded in Station 4 (0.17). The Evenness index (E) ranges from 0.22 to 0.51 where highest index was recorded in station 2 and at least in Station 4.

Discussion

The highest abundance of *Pomotia elegans, Subulina octona* and *Malaniodes tuberculata* recorded in Oyan Reservoir maybe related to the water condition, availability of food and the quality of substrate of the water body according to Sulaiman and Abdullahi, (2011) cited by Iyiola and Asedu, (2020). Oyan reservoir is open or used for different fresh fish rearing activities by private bodies such as Premium Fish Company, Durante fish company and some others that engaged in cage culture system of fish rearing thereby increasing the availability of food and high quality of substrate in the water body. More so, the abundance of *M. tuberculata* in Station 2 could be attributed to moderately polluted area of the reservoir as reported by *Amusat et al* 2021 in Erelu reservoir recorded highest 92.73% occurrence of this species. This is in line with the report of Adebayo, (2009) reporting *M. tuberculata* as fairly tolerant benthic organisms in Eleyele reservoir Oyo State. The number of *Phenacolimax major* was generally low across all the Stations, this may be due to some ecological imbalance governing the abundance and distribution of these benthic organisms in the communities according to *Andem et al.* (2012).

Margelef's index calculated reveals low species richness as the value recorded are less than 1 which could be an indicator of heavy pollution according to Lenat *et al.* (1980) cited by Amusat *et al.* (2021). More so, this may be due to the bigger size of the lotic water body as reported by Brinhurst, (1970) cited by Tyokumber *et al.* (2002) and Andem *et al.* (2012) that the bigger the size of the lotic water body the poorer the macroinvertebrates richness. Low species diversity and Evenness was also recorded using Shannon- Weiner (H) and Evenness (E) equation is in line with Andem *et al.* (2012) that reported low species diversity in Ona River Southwest Nigeria.

The low species diversity and evenness recorded could be due to some Physico Chemical condition such as low Dissolved Oxygen which occur in fast flowing water (Emere and Nasiru 2009).

Conclusion

The result of Margelef's index (D) for the Benthic Macroinvertebrates fauna of Oyan Reservoir indicate heavy pollution as the value is less than. This may be due to pollution from organic pollutant due to anthropogenic activities of the fishing companies in the reservoir. Therefore, monitoring measure should be put in place to control the activities of these companies in order to reduce the pollution due to feeds and the drugs used in fish rearing.

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OYSCATECH GLOBAL CONSULT

ECONOMY OF PRODUCTION OF BROILER FED MIXED SAW DUST AS A SUBSTITUTE FOR WHEAT OFFAL AT FINISHER PHASE

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Abstract
A total of 90 day old broiler were used for the study to determine the economy of production of broilers fed mixed saw dust as a substitute for wheat offal at finisher phase. The experiment was carried out at the Teaching and Research Farm of Oyo State College of Agriculture and Technology, Igboora. The saw dust used in the experiment was obtained from the local saw mill at Igboora, Oyo State. The birds were weighed individually and allocated into 9 brooding units. Each units housed 10 birds and were offered one of the three dietary treatments such that there were 3 replicate assigned to each dietary treatment. The birds were fed ad-libitum throughout the experimental period, the experimental diets were fed for the duration of 8 weeks. Three substitution level of mixed saw dust substituting wheat offal at 0%, 45% and 90% levels respectively. Results showed that there were significantly ($p<0.05$) difference across the dietary treatments. Birds on diet 3 recorded the lowest values (329.45) for the cost of feed in (₦ /kg) while birds on diet 1 had the highest value (353.75). Birds on diet 3 recorded the lowest cost of production of 100kg of feed (32945.00) while the highest was recorded (35375.00) for broiler fed diet 1. Birds fed diet 1 had the highest cost (317.35) of weight gain in (₦ /kg) while birds fed diet 2 had the lowest cost (250.88) of weight gain in ((₦ /kg). The lowest cost (803.29) of feed/bird in (₦ /kg) was recorded in broiler fed diet 3 while the highest cost (953.96) of feed/birds in (₦/kg) was noticed in broiler fed diet 1. The values obtained for final live weight was significantly ($p<0.05$) different across the dietary treatments. The highest final live weight (1733.75) was recorded for broiler fed diet 1 while the lowest final live weight (1596.20g) was recorded for bird fed diet 2. The average weight gain also show significant ($p<0.05$) difference across the dietary treatments with birds fed diet 1 having the highest value (897.10) while birds fed diet 2 recorded the lowest weight gain (734.44). It could be concluded that the use of mixed sawdust is a good non-conventional feedstuff that could be substituted for wheat offal. Thus, resulting in reduction in cost of production of broiler, which eventually increase the profitability of poultry farmers and better their standard of living.
Keywords: Broiler, Economy, *Ad-libitum*, saw dust.

Introduction

The need to provide sufficient animal protein for the growing human populace is of paramount concern to animal nutritionist, scientist and agriculturist. Developing the poultry industry has been advocated to be the greatest mean of bridging the protein gap prevailing in the tropical countries (FAO, 2000). Poultry meat has a wide acceptance with little or no limitation in terms of traditional and religion taboos as compared to pork which is rejected by Muslim (Afolabi and Oladimeji, 2003). The important of poultry eggs and meat cannot be over emphasized because the products have the ability to meet the animal protein needs of the populace. The low level of protein intake of a great concern to developed countries among which Nigeria is one. Unlike plant protein, animal protein is of high biological value which is important for optimum health of man (World Bank Report, 2007). The major constraint to the expansion of the poultry industry in Nigeria and indeed other African countries is the ever-

increasing cost of feeds. This is as a result of the increase in price of the conventional feed ingredients brought about of mixed sawdust as a substitute for wheat offal in broiler have been investigated with a moderate level of success Ogungbenro *et al. (*2019). There is the need for concerted research effort in the use of unconventional ingredients as viable alternative to wheat offal in broiler production. Discovery of such viable unconventional feed ingredients will likely lessen the pressure on demand for the conventional feed ingredients Ogungbenro *et al.* (2019). Because of the critical nature of mixed sawdust in poultry diet, any successful breakthrough in discovering alternative unconventional ingredients will further lower the cost of meat. Searching for alternative non-conventional feed resources, comparing their nutritive values to the conventional feed resources incorporate them into the production of broiler feed is therefore deemed necessary. Moreover, substituting Mixed sawdust for wheat offal may help to better the standard of living of farmer (Ogungbenro *et al.,* 2019).

Materials and methods

Experimental site

The experiment was carried out at the Teaching and Research Farm, Oyo State College of Agriculture Igboora, Nigeria. The experimental area lies in savannah forest zone on latitude $7^{o}15^{I}$N and longitude $3^{0}30^{I}$E, with an elevation 140m above sea level. The average minimum temperature is about 20.5^{o}C and maximum average temperature of about 32.50^{o}C. The average humidity in the study area is 58.0%. The double maximum rainfall is about 314.3mm in June and 165.2mm in September.

Experimental Ingredient

The saw dust used in the experiment was obtained from the local saw mill at Igboora, Oyo State.

Experimental birds and management and management

A total of 90 day old broiler chicks were used for the study. The birds were weighed individually and allocated into 9 brooding units. Each units housed 10 birds and were offered one of the three dietary treatments such that there were 3 replicate assigned to each dietary treatment. The birds were fed ad-libitum throughout the experimental period.

The experimental diets were fed for the duration of 8 weeks. Three substitution level of the mixed saw dust was substituted for wheat offal at three different levels of 0%, 45% and 90% levels respectively.

Table 1: Gross composition of experimental diet (finisher phase)

Ingredient	T (0%)	T2 (45%)	T3 (90)
Maize	58.00	58.00	58.00
Soyabean	27.00	27.00	27.00
Wheat offal	10.00	5.50	1.00
Saw dust	0.00	4.50	9.00
Limestone	2.00	2.00	2.00
Bone meal	2.00	2.00	2.00
Broiler premix	0.25	0.25	0.25
Salt	0.25	0.25	0.25
Methionine	0.25	0.25	0.25
Total	100	100	100
Metabolizable energy (kcal/kg)	2908.22	2965.53	3022.82
Crude protein	19.65	19.37	19.09

A kg premix contains vitamin A; 110,000,000iμ Vitamin D; 2,500,00iμ, Vitamin E; 20,000mg Vitamin K_3; 3000mg, Vitamin B_3; 3.00mg Vitamin B_2; 7000mg, Vitamin B_6; 500mg Vitamin B_{12}; 25mg, Panthotenic acid; 10,000mg, folic acid; 800mg, Biotin; 50mg Manganese; 80,000mg, Iron; 40,00mg, Zinc; 60,000mg, Copper; 800mg, Cobalt; 250mg, Iodine; 1,000mg, Selenium (1%); 150mg, Chlorine, 200,000mg and Anti oxidant; 100,00mg.

Table 2: Cost implication table

Ingredient	Price (N/g)	T1 (0%)	T2 (45%)	T3 (90)
Maize	280	16,240.00	16240.00	16,240.00,
soyabean	480	12960.00	12960.00	12960.00
Wheat offal	300	3000	1650.00	300.00
Mixed Saw dust	30	0.00	135.00	270.00
limestone	100	200.00	200.00	200.00
Bone meal	150	300.00	300.00	300.00
lysine	4000	1000.00	1000.00	1000.00
methionine	3500	875.00	875.00	875.00
Salt	200	50.00	50.00	50.00
Broiler premix	3000	750.00	750.00	750.00
Total		35,375.00	34,160.00	32,945.00

Results and Discussion

Results

The parameters measured for the economy of production of broiler finisher fed mixed saw dust as a substitute for wheat offal is as presented in table 3. Results showed that there were significantly ($p<0.05$) difference across the dietary treatments. The lowest values (329.45) for the cost of feed in (₦ /kg) was obtained in broiler fed diet 3 while the highest value (353.75) was obtained for broiler birds fed diet 1. Lowest cost of (32945.00) was recorded for the production of 100kg of feed for broiler birds fed diet 3 while the highest cost (35375.00) was recorded for the production of 100kg of feed for broiler fed diet 1. Birds fed diet 1 had the highest cost (317.35) of weight gain in (₦ /kg) while birds fed diet 2 had the lowest cost (250.88) of weight gain in ((₦ /kg). The lowest cost (803.29) of feed/bird in (₦ /kg) was recorded for broiler birds fed diet 3 while the highest cost (953.96) of feed/birds in (₦/kg) was noticed in broiler birds fed diet 1.The values obtained for final live weight was significantly ($p<0.05$) different across the dietary treatments. The highest final live weight (1733.75) was recorded for broiler fed diet 1 while the lowest final live weight (1596.20g) was recorded for bird fed diet 2. The average weight gain also show significant ($p<0.05$) difference across the dietary treatments with birds fed diet 1 having the highest value (897.10) while birds fed diet 2 recorded the lowest weight gain (734.44)

Table 3. Economy of production of broiler fed mixed saw dust as a substitute for wheat offal

Parameters	T1 (0%)	T2 (45%)	T3 (90%)	SEM
Initial weight	1214.00^a	1201.00^b	1190.00^c	5.66
Final live weight	1962.00^c	2085.00^b	2205.00^a	57.28
Weight gain	748.00^c	884.00^b	1015.00^a	62.94
Feed intake	3174.93^a	3074.00^b	3023.47^c	36.35
Cost of feed (₦/kg)	353.75^a	341.60^b	329.45^c	5.73

Cost of 100kg of feed (₦/kg)	35,375.00[a]	34,160.00[b]	32,945.00[c]	572.76
Cost of weight gain (₦/kg)	264.61[c]	301.97[b]	334.39[a]	16.46
Cost of feed/bird	1123.13[a]	1050.08[b]	996.08[c]	30.06

[a,b,c] means on the same rows with different superscript differ significantly ($p<0.05$)

Discussion

The values recorded for the cost of feed in ₦/kg reduced as the substitution level of mixed saw dust for wheat offal increased. The result confirmed the finding of Ogungbenro *et al.*, 2019 who reported a reduction in the cost of feed in ₦/kg as the substitution level of mixed saw dust for wheat offal increased. The highest (353.75) cost of feed in (₦/kg) was recorded for broiler fed diet 1 (0% substitution level of mixed saw dust for wheat offal). While the lowest (329.45) of feed in ₦/kg was noticed in broiler fed diet 3 (100% substitution level of mixed saw dust for wheat offal). This result was in agreement with the finding of Ojewola and Ewa (2005) who reported lower cost/kg diet in diet 4, containing cashew nut meal as a plant protein source. The highest cost (317.35) of weight gain in (₦/kg) was obtained in broiler fed diet 1 (0% substitution level of mixed saw dust for wheat offal). While the lowest cost (250.88) of weight gain in (₦/kg) was obtained in broiler fed diet 2 (50% substitution level of mixed saw dust for wheat offal).

The result of this research showed that the lowest cost (803.29) of feed/bird in (₦/kg) was noticed in broiler fed diet 3 (100% substitution level of mixed saw dust for wheat offal). While the highest cost (953.96) of feed/birds in (₦/kg) was recorded for broiler fed diet 1 (0% substitution level of mixed saw dust for wheat offal). The result of this research was in line with the finding of Ogungbenro *et al. (*2016) who reported the least (147.14) cost of feed consumed/bird in (₦/kg) in diet 3 (100% substitution level of cashew nut meal soya bean meal).The result of this research was in agreement with the finding of Ogungbenro *et al. (*2013) who reported that the lowest (323.91) cost of feed consumed/bird in (₦/kg) in diet 4 (30% cashew nut meal for maize offal) based diet.

The feed intake obtained in this study showed significant ($p<0.05$) differences across the dietary treatments. The result of this study confirmed the findings of McLeod (1982) who reported that the proportion of dietary energy obtained from fats versus carbohydrates exert an effect on appetite through a physiological "appetite Control Centre" responsible to the blood levels of certain nutrients such as glucose and amino acids. The result of this study also support the finding of Carem and Hill (1964) who reported that such an effect might involve an increased ability of the chicks to convert dietary energy from fat into stored energy, thereby permitting a greater increase in dietary intake. The numerical higher feed intake observed for broiler fed diet 1 could be due to an improved palatability while high energy density of diet 3 could have slightly depressed appetite. It could be concluded that the use of mixed saw dust as a substitute for wheat offal resulted in a decreased in the cost of production of broiler which resulted in an increase in the profitability of broiler production.

Conclusion

It could be concluded that the use of mixed sawdust is a good non-conventional feedstuff that could be substituted for wheat offal thus, resulting in reduction in cost of production of broiler.

Recommendation

Based on the result of this research, it could be recommended that substituting wheat offal for sawdust at 45% and 90% showed good results. However other sources of unconventional can also be explore so as to reduce the cost of broiler production and increase profitability of farmers

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ACUTE TOXICITY OF CALCIUM CARBIDE WASTE TO SILVER CATFISH (C*hrysichthys nigrodigitatus)* JUVENILES AND HISTOPATHOLOGICAL CHANGES (LACEPEDE, 1802)

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Abstract
The indiscriminate dumping and accumulation of spent carbide is a potential threat to the survival and good health of fish. Therefore, this study investigated the effect of spent carbide on selected organs (brain and gills) and survival of Chrysichthys nigrodigitatus. Fish were exposed to powdered carbide concentration of 0.0 mg/L, 0.018mg/L, 0.0033mg/L, 0.060mg/L and 0.105 mg/L under laboratory condition for 96 hours in a complete randomized design using three (3) replicates. The LC_{50} value of 0.018 mg/L was obtained using graphic and probit method. Histological alterations in the brain of fish showed spongiosis, congestion of blood capillaries and vacuolation. The gills recorded structural changes such as stunted primary gill lamellae, congestion of gill capillaries and erosion of gill lamellae. Hence, there is a need to protect the fish and consumers by finding alternative use for carbide waste.
Keywords: *Chrysichthys nigrodigitatus*, Carbide wastes, Probit, Histopathology

Introduction

Chrysichthys nigrodigitatus (Lacepede, 1802) is a native of Nigeria and several West African countries. It is a silver coloured African catfish. The rising need to raise fish for consumption for rapidly growing populations in the developing countries has necessitated the need to intensify studies on African freshwater fishes (Akinsanya, 2007). This fish is important both in ecological and economical terms. It plays important role in dynamics determination and structure of aquatic ecosystem apart from high value placed on it as food for man. It is one of the dominant species in Oyan Lake, southwest Nigeria, apart from *Lates niloticus, Tilapia zilli and Clarias gariepinus* (Agbon and Omoniyi, 2010). Indeed, it is a price delicacy on the table of many families and command greater retail price than frozen fish, especially in Abeokuta and neighboring towns (Ikenweiwe *et al.,* 2007).

Calcium carbide is usually used in industrial acetylene production for welding of tools. It is also used during steel productions which help in reducing the amount of slag and sulfur; to reduce impurity. Production of other chemicals (Vinyl acetylene, calcium cyanide, etc.) is also facilitated by calcium carbide (Jonasson, 2006). However, the reaction of calcium carbide with water creates acetylene gas and a residue of calcium hydroxide as reported by Semikolennykh *et al*, (2012). This was a further confirmation of the claim that the main compound in spent calcium carbide is Calcium hydroxide which reacts overtime with atmospheric carbon dioxide to form non-toxic calcium carbonate (Semikolennykh *et al.,* 2012).

According to Lavoic *et al. (*2002), spent calcium carbide waste is toxic. The toxicity to soil microorganisms and larvae from cave beetle eggs (*Ptomaphagus hirtus*) at very low concentration of about 0.5% had been reported (Semikolennykh *et al.*, 2012). Consequently, this study investigated the acute toxicity of spent calcium carbide on one of the commercial fish species in the rivers and lakes of South-Western Nigeria called *Chrysichthys*

nigrodigitatus. This study was necessitated because of indiscriminate dumping of spent calcium carbide on the street of most States in Western Nigeria after being used by welders associated with car-repairs. The calcium carbide wastes find their ways, after heavy downpours of rains, into drainages and water bodies in sub-lethal amounts.

$$Cac_2 + 2H_2O \rightarrow C_2H_2 + Ca(OH)_2$$

Methodology

Two hundreds advanced juveniles of *Chrysichthys nigrodigitatus* with average weight of 120g and length (cm) of 22.5± 0.7 were purchased from Oyan Dam at Ibaro village, Ogun state Nigeria. Carbide wastes were obtained from welders at car repair centres. The fish were acclimatized for a period of twenty-one days in the laboratory; using 2mm coppen's feed of 45% crude protein diet at 5% of their body weight (Reish and Oshida, 1986). This experiment was carried out in the laboratory of the Department of fishery Oyo state college of Agriculture and Technology Igboora. A range finding test was conducted first as described by Solbe (1995) using 0.004mg/l, 0.04mg/l, 0.4mg/l and 4mg/l of carbide wastes. Definitive test involved a spacing factor of 1.8 and ten fish in each aquarium was used for the test as described by Solbe (1995). There were five treatments, 0.0mg/l (control), 0.018mg/l, 0.033mg/l, 0.06mg/l and 0.105mg/l, and in three (3) replications. Complete Randomized Design was used in the distribution of fish. 30 fish were randomized per treatment. The definitive test lasted 96 hours.. Static method after loading was applied because the test solution was not changed during investigation. Mortality of fish in each treatment was recorded every 3 hours. A regression analysis was used to relate log-concentration of spent-carbide and fish mortality. Histopathological investigation involved fixation of tissues, clearing, embedding, sectioning through a rotary microtome and staining using haematoxylin and eosin methods before viewing under a light microscope (Winsor, 1994).

Results and discussion

Water quality in experimental tanks conformed with the standard recommendation for tropical warm water fish as shown in table1 (Boyde, 1981). An insignificant increase in pH values and stable dissolved oxygen and water temperature were observed in experimental water.

The passage of spent carbide into water environment, where fish live, make it toxic to the exposed fish. The present study agrees with the acclaimed toxic ability of powdered carbide waste because the median lethal concentration (Lc_{50}) of 0.018mg/l was far below 1.0. This small value indicates high toxicity (FAO, 1977) and a threat to the survival of fish such as *Chrysichthys nigrodigitatus* in natural water bodies (Streams, Rivers, Lakes, and Lagoons) which are common around communities in Western Nigeria.

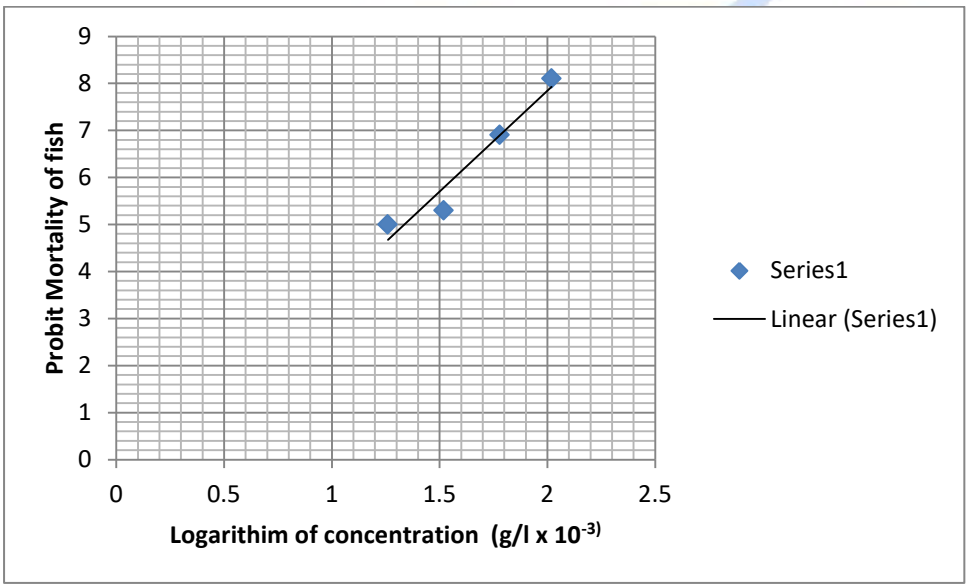
The present study revealed the histopathological changes (Plates 1 to 6) in the selected organs (Brain and Gill). The brain tissues exhibited spongiosis, congestion of blood capillaries, gliosis and alteration of vacuoles. These structural changes increased with increasing concentration of powdered carbide waste. This direct or positive association between the spent carbide solution and structural alteration agreed with the report of Ajibade and Omitoyin (2011) where increase in toxicant (*Latex of Calotropis procera* against *Clarias gariepinus* juveniles) caused structural destructions of the gill, brain and liver of *Clarias gariepinus*.

Table1: Mean water quality parameters of the experimental set-up

Treatments	Temperature (^{0}C)	pH	Dissolved oxygen
TR1	26.0	07.9	06.1
TR2	26.0	10.5	06.1
TR3	26.0	09.5	06.1
TR4	26.0	09.7	06.1
TR5	26.0	09.6	06.1

Table 2: Mortality of *Chrysichthys nigrodigitatus* (BLEEKER) exposed to various concentration of powdered carbide waste.

SS.	Tr. (mg/l)	Mortality	% Mortality	. Log C (g/l×10^{-3})	PM.
30	0	00.00	00.00	0	0
30	18	15.00	50.00	1.26	5.0
30	33	18.00	60.00	1.52	5.25
30	60	29.00	96.70	1.78	6.88
30	105	30.00	100.00	2.02	8.09



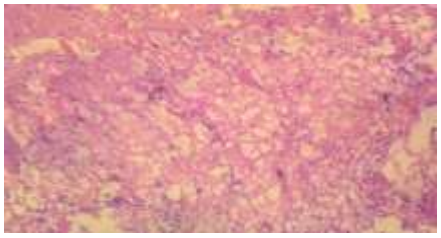


PLATE 1: Brain in the control+ (0.00 mg/l of spent carbide) exhibiting zero lesions (Mx100).

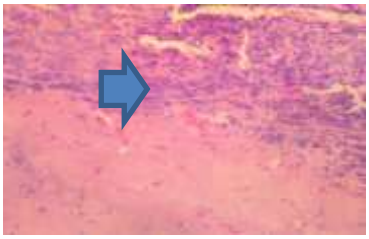


PLATE 2: Brain tissue of *C .nigrodigitatus*(0.018 g/l) capturing congestion of blood capillaries and vacuolation of neutrophil (Mx100).

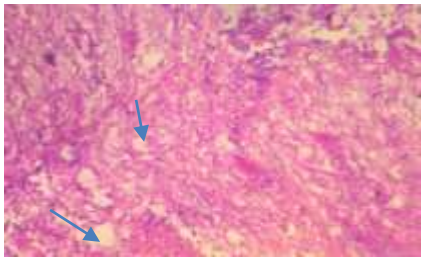
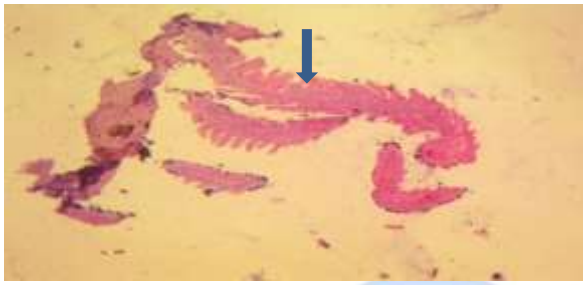


PLATE 3: Brain tissues of *C. nigrodigitatus* PLATE 4: Normal gill architecture (0.00mg/l)

(0.033 g/l)- moderate spongiform vacuolation

and mild aggregation of glial cells (box).



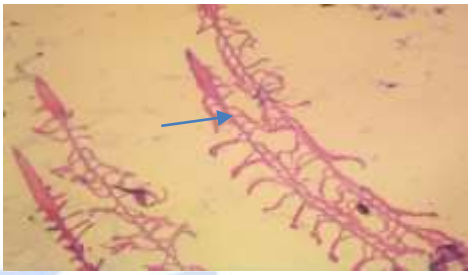


PLATE 5: Gill of *C. nigrodigitatus* (0.018 g/l) ssecondary
exhibiting stunted primary gill lamellae and
thickened secondary gill lamellae (Mx100).

Plate 6: Gill showing high alteration of secondary gill lamellae (0.1g/L)

PLATE 7: Gill of *C. nigrodigitatus* exposed to 0.060 mg/l
of spent carbide exhibiting moderate sloughing off of secondary
gill lamellae (Mx100).

Conclusion and recommendation

The study shows the ability of spent carbide in causing structural destructions of the vital organs of *Chrysichthys nigrodigitatus.* Furthermore, the attempt of the fish in jumping out of the toxic solutions between five (5) and ten (10) minutes of exposure showed irritations in the fish. Indiscriminate dumping of carbide waste in an area close to natural water bodies should be avoided to disallow poisoning in water organism such as fish. There is a need to find alternative use of carbide waste such as incorporation into flooring material for the construction. of animal house.

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ATTITUDES OF FADAMA USERS TOWARDS PROJECT COST- SHARING IN NIGER STATE, NIGERIA.

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Abstract
In the recent past years, it has been observed that Nigeria has experienced a substantial decline in its crop production. This decline coincided with the termination of the financial arrangement between the World Bank and the FADAMA project in Nigeria, creating concerns regarding the availability of appropriate and reliable funding for FADAMA users. Consequently, this research aims to in the attitudes of farmers who accessed FADAMA Projects towards project cost-sharing. A quantitative analytical study was conducted using a Multistage Sampling T involving 180 FADAMA Farmers in Niger state. The collected responses were analyzed using a 3-point Likertscale and Mean measurement. The analysis revealed that a significant proportion of farmers holpositive attitudes towards the implementation of project cost-sharing. The findings of this study hold several implications. Firstly, extension agents can utilize these findings to encourage FADAMA users to actively participate in project cost-sharing thereby enhancing their output and income. Additionally, monetary agencies can leverage these findings to provide FADAMA users with implementation of the FADAMA programmes. Therefore, this research provides valuable insights into access to funds at low-interest rates, fostering a positive attitude among farmers towards the the attitudes of FADAMA farmers regarding project cost sharing, offering practical recommendations for extension agents and monetary agencies to improve agricultural productivity and support the success of the FADAMA programme.
Keywords: FADAMA Users, Attitudes, Project Cost- Sharing, Niger State

Introduction

The **Fadama** development project is one of Nigeria's agricultural strategies to increase food production for the country's expanding population. The Federal Government of Nigeria and the World Bank worked together to launch the project's initial phase, known as **Fadama** I, in 1990. The **Fadama** potentials have an excellent capacity for minimizing the detrimental impact of rudimentary and smallholder rain-fed agriculture on rural Nigeria's teeming population. The primary goal of the **Fadama** initiative is to sustainably raise the income of rural land and water resource users (farmers).

According to (Kudi *et al.* 2008), The Hausa word "**Fadama**" refers to irrigable land, typically low-lying plains highlighted by shallow aquifers beside significant river systems.

Cost-sharing is considered a workable privatization strategy. A system of cost-sharing is one in which users of services pay a part of the price. It is a privatization technique that comprises paying a part of the fee for assistance and advice hitherto provided for free. Agriculture cost-sharing entails a partnership between the government and farmers in funding agricultural operations to achieve sustainable and predictable funding for agricultural technology delivery. Chukwuone, Agwu, and Ozor (2006) asserted that it as a viable privatization program aimed at providing appropriate and steady finance for agricultural services in Nigeria.

According to the National Population Census 2006 Nigeria is roughly of a population of 140 million, it needs help in providing an appropriate food supply for its citizens. Over the last three decades, the challenge of desertification and drought in Nigeria's dry sub-humid and

semi-arid agroecological zones has prompted the government to spend heavily on minor and medium-scale irrigation systems (Folayan, 2013).

Two out of every three inhabitants of Nigeria make less than one dollar each day. Most impoverished people in the country live in rural areas with a high poverty rate (Edache, 2006). The overarching objective of Nigerian agricultural policy is to realize transformational mechanisms required for rural areas' total socio-economic development while achieving self-sustainable growth in all agriculture sectors.

Statement of the problem

Providing adequate and secure finance for the **Fadama** project in Nigeria has been a vital issue since the World Bank's funding arrangement expired. To address this issue, cost-sharing for agricultural technology distribution is considered a viable privatization policy option. Given that the government has chiefly sponsored agricultural technology transfer in Nigeria, introducing the cost-sharing technique is considered a novel funding mechanism that also addresses some of the issues faced by **Fadama** users in the country

As a result, there is a need to examine **Fadama** farmers' perceptions of limits and strategies for successful cost-sharing of agricultural technology delivery in Nigeria to achieve a sufficient increase in food production in the country. Therefore, this study aimed to provide answers to the following questions:

(i) What are the socio-economic characteristics of ***Fadama*** users in the study area?

(ii) What are the attitudes of ***Fadama*** users towards the cost-sharing method? The specific objectives were to:

i. Describe the socio-economic characteristics of ***Fadama*** users in Niger State.
ii. Examine the attitudes of ***Fadama*** users toward the cost-sharing method.

Methodology

Carried out in Niger State, which is in Nigeria the north-central region of Nigeria is the largest State in the nation, and Minna is its capital. It also has other significant cities, such as Suleja. Bida and Kontagora. Niger, has a total land area of 76,363 km2 (29,484 sq mi), or roughly 8.3 million hectares, or 8% of the country's total land area (Wikipedia.org). The amount of arable land is about 85%. Five million ninety-five thousand eight hundred twenty-one people reportedly lived in Niger State as of 2014 (Projected 2014 National Population Census).

Sampling Techniques and Sample size

According to estimates from the Niger State **Fadama** Office (2014), there were 48, 613 registered **Fadama** farmers in Niger State at the time of the implementation of **Fadama** III between the years 2009 and 2013. The population of this study includes **Fadama** users in Niger State, estimated to be 27,717 male farmers and 20,896 female farmers. For this study, a multistage sampling procedure was used to choose the respondents. Three agricultural zones, Zones I, II, and III, make up Niger State. Two local government areas (LGAs) were randomly chosen from each of the agricultural zones based on the local **Fadama** activities of **Fadama** User Groups (FUGs), giving a total of six (6) LGAs. A total of twelve (12) **Fadama** Community Associations (FCAs) were chosen at random from each of the six (6) Local Governments in the second stage. In the third stage, two (2) **Fadama** Users Groups (FUGs) were randomly chosen from each of the twelve (12) FCAs, for a total of twenty-four (24) FUGs. To create the sample frame for the study, the executives of each of the chosen FUGs provided a list of about15 **Fadama** farmers. Yamane (1967) developed a proposed formula that was used to determine the sample size. However 180 **Fadama** farmers in total, or 55% of the sample frame which was 327 were produced as a result.

The data for this study was collected through primary sources by using a well-structured questionnaire with the assistance of a qualified enumerator.

A. Variable

Attitudes of *Fadama* Users towards the Cost-Sharing Method - measured on 3 points Likert rating scale, the positive and negative statements on project cost sharing were provided. For the positive statements (Agreed=3 points, Undecided =2 points, Disagreed=1 point) and the harmful statement (Agreed=1 points, Undecided =2 points, Disagreed=3 points). To determine the attitudes of ***Fadama*** users, whether Favourable or Unfavourable, towards the project cost-sharing, the value assigned to the 3 responses were added together to get 6 points and then divided by 3 (i.e., 3+2+1=6/3=2) to get 2 points as the mean score. Respondents with a mean score of 2 points above were grouped as those with favorable attitudes toward the cost-sharing methods. In comparison, those with below a mean score of 2 points were grouped as those with unfavorable attitudes towards the project cost-sharing method.

Attitude of *Fadama* users towards project cost sharing

Table 4.1 Shows the distribution of the mean scores and the standard deviation of the ***Fadama*** user`s attitude towards project cost sharing. The data showed the attitude of the respondents towards the twenty (20) statements bordering on cost-sharing arrangement. Among these statements, eleven (11) were positive, and nine (9) were negative. The result showed that the ***Fadama*** users were positive towards eleven (11) statements out of twenty (20). Specifically, the following positive statements elicited favorable attitudes from the farmers: ***Fadama*** users are willing to share in the cost of service they consider important to them (; participating in cost sharing of *the* ***Fadama*** project is necessary to achieve increased agricultural productivity and income (; participating in project cost sharing encourages continous and effective agricultural development (; cost sharing in ***Fadama*** project make ***Fadama*** service providers offer better service to the farmer

Table 4.1 Attitude of *Fadama* users towards project cost-sharing (n = 180)

S/N	Attitudinal Statements	Mean	Standard Deviation	Attitude
1	***Fadama*** Users are willing to share in the cost of service as they consider its importance to them	2.98	0.17	Favourable
2	Participation in cost sharing of ***Fadama*** project is necessary to achieve increased agricultural productivity and income	2.98	0.17	Favourable
3	Considering our present conditions, it is not possible for us to participate in cost sharing of the project	1.42	0.75	Unfavourable
4	Cost sharing in ***Fadama*** project creates conflict between farmers and ***Fadama*** service providers	1.56	0.88	Unfavourable
5.	Participating in project cost sharing encourages continous and effective agricultural development	2.83	0.51	Favourable
6.	Cost sharing in ***Fadama*** service providers to offer better services to farmers	2.85	0.48	Favourable
7	Cost sharing of ***Fadama*** project does not allow service providers to provide quality service	1.17	0.51	Unfavourable
8	Cost sharing method has increased ***Fadama***	2.91	0.39	Favourable

	farmers` voice in the management of the project			
9	Cost sharing in ***Fadama*** project should be restricted to only large scale farmers	1.36	0.74	Unfavourable
10	Cost sharing in ***Fadama*** project has made agricultural service to be more relevant and responsive to farmers needs	2.78	0.53	Favourable
11	***Fadama*** famers stand to loose as a result of cost sharing in the project	1.18	0.57	Unfavourable
12	Most farmers are not willing to take part in the cost sharing due to lack of fund	2.46	0.87	Favourable
13	Cost sharing in ***Fadama*** project has increased ***Fadama*** Farmers knowledge in terms of farm management	2.90	0.41	Favourable
14	Cost sharing of ***Fadama*** project brings more cooperation among farmers	2.91	0.39	Favourable
15	Project cost sharing will reduce financial burden of government and other donor agencies in Nigeria agriculture	2.32	0.08	Favourable
16	Project cost sharing is designed for benefit of few individuals. Hence, participation of many farmers are not possible	1.56	0.86	Unfavourable
17	Cost sharing in ***Fadama*** project is not the best option for funding agricultural programme	1.44	0.78	Unfavourable
18	Cost sharing in project has encouraged ***Fadama*** users to express their right as information consumers thus, ensuring project effectiveness	2.64	0.73	Favourable
19	Participating in project cost sharing has not improved the socio-economic status	1.41	0.75	Unfavourable

Source: Field survey, 2015

Conclusion

Users had a positive attitude toward project cost-Sharing, willing to share in the cost of service. More so, they had increased production and income level during their involvement in *the* ***Fadama*** project compared to the period without *the* ***Fadama*** project in existence.

Recommendations

1. Credit facilities should be made available to ***Fadama*** users at a low-interest rate to give the farmers a positive attitude toward implementing the ***Fadama*** programme.

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OYSCATECH GLOBAL CONSULT

NON–TIMBER FOREST PRODUCTS FOR POVERTY REDUCTION IN OGUN WATERSIDE LOCAL GOVERNMENT AREA OF OGUN STATE.

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Abstract
The study examined the possibility of No –Timber Forest products (NFTPs) in improving the standard of living of the people in the study area and consequently makes it better for them. Primary data were collected using a set of set of questionnaire administered on one hundred and twenty (120) NTFPs) harvester/sellers who were selected using multi – stage sampling procedures from three communities and market in the local government area and data collected were analysed using descriptive statistics. The Major results showed that although there were numerous NTFPs available to the people of this area but Beilshmie diamanni and Achatina achatina have the major economic potentials or tendencies to improve people's standard of living. It is therefore, suggested that great efforts be made by the government to multiply and sustain these products for their continue availability and for the use of the people.
Keywords: *Non- wood forest products, Livelihood, Alleviation, Nigeria.*

Introduction

Forest provides resources for people, including a renewable source of energy. Forest remains very important yet undervalued and threatened resources on which millions of people in the tropics depend for their livelihoods (FAO 2012).

In Nigeria, the rate of increase in population has brought about an increase in the demand for food (forest products inclusive) which presently the country's agriculture sector cannot meet (Federal Ministry of Agriculture, Water Resources and Rural Development (FMAWRRD) 1988). Federal Office of Statistics (2010) further revealed that food production increase at the rate of 2.5%, while food demand increase at the rate of 3.5%. The Difference between food productions and demand in Nigeria has become the basis of poverty in the country most especially in the rural areas where about 70% of Nigeria Population resides. However, because of the closeness of the rural population to the forest, they have resorted into harvesting of Non-Timber Forest Products (NTFPs) to supplement their little income from agriculture sectors. Non-Timber Forest Products (NTFPs) may not be the most important income generating products for Local people living close to the forest; they contribute significantly to household income, food security and household health care as well as provision of multiple social and cultural values. (Ojea *et al.,* 2016 ; Endmana *et al.,* 2016). Non-Timber Forest Products (NTFPs) is therefore considered a safety net that fills the gaps due to shortfall in agricultural production or other forms of emergencies (Shackleton and Shackleton 2004, Paumgattens 2008; Angelsen et al 2014). Women are found to be involved majorly in harvesting, processing and selling of these products. NTFPs is a sector that offers great promise for women, but to enhance the effectiveness of poverty reduction programmes, opportunities for the greater involvement of women are essential (IFAD 2008). Products harvested are used for food while surplus harvests are taken to market in exchange for money in order to take care of their needs and meet other family financial obligations. Therefore

income from NTFPs activities was important to rural communities (Madi *et al.*, 2010). In the developing countries 80% of the people use forest product for food and personal care (Anon 2000). For example in Ghana, *Karite* butter is used as cosmetic product distributed by the international Body Shop Chain of Shops (Anon 2000).

There is no agreed definition for NTFPs but the ones available have many things in common. NTFP refers to forest goods and services providing for wood products. These include poles, fuels, chewing stick, gum, dye, herbs, shrubs, wine, tem fibres, seed, spices, mush-rooms, condiments and so on exhaust the list.

NTFPs according to Andel (2006) are wild plant products other than timber harvested from forest, savannah and other natural vegetation type. This definition includes the use of wood for canoes, wood carving, local house construction fencing material and firewood/coal but exclude industrial timber (Andel 2006). Other NTFPs include fruit from the wild, vegetable, nuts, edible root, honey, palm leaves, medicinal plant, poisons and bush meat. Non-Timber Forest Products (NTFPs), as describe by FAO (2001) include all goods or item biological of origin as well as services used and exclude wood in all its form. According to International Economic Botany Data Collection Standard (IEBDCS), list of NTFPs uses have been categorized into: food, food additives, animal food, animal product, construction, material fuel, medicine, poison, social users and environmental users (Andel 2000). Wickens (1994) similarly reported that various uses that NTPS are put to range from food, fibre, medicine to biochemical among others.

Millions of people, especially those living in rural areas in developing countries, gather these products on daily basis for food while many regard selling them as a means of livelihoods. These products have become major sources of livelihoods for most rural dweller in the world today. However, the level of exploitation varies from one country to the other depending on availability, awareness of the product and the use they put them to.

In the year 2000 the millennium declaration by the United Nation that was adopted as the first goal was to eradicate poverty and hunger. This was aimed at cutting half of the proportion of people living in extreme poverty (less than one Us dollar per day) and those suffering between 1990 and 2010 (World Bank 2003). It was examined that NTFPs could be used as one of the means of achieving this goal. NTFPs have always played a central role as sources of income generation in rural community in the world (FAO 2012).

NTFPs contribute about 50 % of forest revenue and 70 % income to 50 million tribal household (Shiver 1993). Another related report by Kumari (1995) revealed that rattan collection in Malaysia contribute 14.8 % of the economic activity of resident in the swamp forest. In Nigeria, Ojo (1999) reported that the income of rural dweller from NTFPS was between 50- 70%. Research suggests that tree and forest are more important to rural women's livelihood than to those of men. In Andra Prades, 77% of women's income in some areas was derived from forest (FAO 2012). However, their potential in alleviating poverty among the rural dweller in sub- saharan African have not been fully harnessed unlike Asia where tremendous success has been recorded. However, it plays a major role in the life of people in this area socially and economically (Ajonina *et al.,* 2005: Avocevov-Ayisso *et al.,* 2009: Fu *et al.,* 2009: Kanmegneet *et al.,* 2007).

Therefore, this study investigated the Non – timber forest products for poverty reduction in Ogun Waterside Local Government area of Ogun State**.**

The specific objectives of the study are to:

1. examine the possibility of NTFPs in alleviating poverty in the rural area.
2. determine the level of NTFPs demand and supply in the area.
3. estimate the revenue generated from NTFPs harvest in the area.
4. identify the constraint involved to NTFPs harvest and sales.
5. identify the problems associated with NTFPS harvesting and sales.

Methodology

Study Area

The study area was carried out Ogun Waterside Local Government, One of the 20 Local Government Areas in Ogun State. It's bounded in the west by Ijebu East Local Government, in the North and East by Ondo State and in the South by Lagos state and Atlantic Ocean. The Local Government has an area of 1,00km^2 and a population of 72,935 (NPC 2006). The people of the local government are peace loving Yoruba whose occupation is majorly farming with a few engaging in trading, fishing and lumbering among others. Yoruba language is the predominantly spoken language including Ikale and Ilaje dialects. The headquarters of the local government is located at Abigi, while Ilusin, Makun-omi, Ibiade, Effire and Iwopin are among the notable towns.

Data Collection

The data used in this study were collected from a cross- sectional survey of NTFPs harvesters/sellers in the study area. The data were primary collected from one hundred and twenty (120) NTFPs marketers/ sellers (respondent) selected from three (3) markets in three (3) communities of Ogun Waterside Local Government Area in Ogun State. The sampling method used was multi-stage sampling procedure. The Sampled communities and markets (Maku-Omi, Abigi and Ibiade markets) were based on their history of NTFPs availability and marketing in the local Government Area. The second stage involved a simple random selection of Forty (40) respondents NTFPs marketers from each of the sampled communities making a total of 120 respondents from the three (3) communities. Data were collected using structured questionnaire designed to gather information from respondents.

Method of Analysis:

Simple descriptive – frequency, percentage and statistical package for social science were used to analyse the data collected.

Results and Discussion

Socio-economic characteristics:

Table 1 presents the socio-economic characteristics of NTFPs marketers in the area which clearly revealed that 63.3% of the respondents were female and as such connote that female are more involved in the marketing of NTFPs than male counterpart. This agrees with the findings of Food and Agriculture Organization (FAO 2012) that women are more involved in the buying and selling of agricultural produce. This is very logical since the NTFPs availability is in their comfort zone. About 40% of the total respondents fell within the ages of 41 and 56 years and are all married. However, 43.4% of the respondents have no formal education while 36.7% have secondary school certification. This shows that the largest proportions of the NTFPs sellers in the local government are non-literate traders. The results also show that the respondents were evenly spread across Makun-Omu, Abigi, and Ilusin communities in the study area. The largest number (50%) of the NTFPs sellers were into trading by occupation while 26.7% engaged in farming. This is logically true since the survey took place in the rural market places where the largest population of the society reside.

Table 1: Socio-economic characteristics of respondents

Variables	Frequency	percentage%
Age Group (Years)		
25 – 40	31	30.00
41 – 56	45	45.00
>57	2	30.00
Sex		

Female	44	36.70
Male	76	63.30
Marital Status		
Single	0	0
Marriage	120	120
Widowed	0	0
Divorced	0	0
Educational Level		
Non Formal	52	43.30
Primary	16	13.30
Secondary	44	36.70
Tertiary	8	6.70
Occupation		
Farming	32	26.70
Civil servant	12	10.00
Traders	60	50.00
Fishing	4	3.30
Timber contractor	8	6.70
Others	4	3.30

Source: Field Survey 2022.

Selected NTFPs Marketed

Table 2 shows the range of NTFPs marketed in the study area. Snail (*Achatina achatina*) *and* gbokonisa *(Beilschmie diamannii)* were the most commonly marketed in the area with 63.33% and 53.33%, respectively. Chewing sticks and bush meat followed with 40% and 36.67%, respectively. The implication of this is that these NTFPs were always available in these markets.

Table 2: Distribution of respondents by selected types of NTFPs Marketed

Variables	Frequency	Percentage %
Snail (*Achatina achatina)*	76	63.33
Coconut (Cocusnocifera)	32	26.67
Bush Meat	44	
Chewing Stick (*Massulariaacuminata*)	64	53.33
Gbokonisa (*Beilschmiediamannii*)		
Leave Wrapper (*Mitragynacitiata*)	20	16.67
Agbalumo (*Irringgia gabonensis*)	20	16.67
Willow Product	32	26.67

Source: Field Survey 2022

Sources of NTFPs:

The largest proportion 63.3% of the respondents revealed that NTFPs marketed were supplied to them while only 36.7% claimed to have harvested the products themselves (Table 3). This implies that most of the NTFPs accessed were bought.

Table 3: Distribution of respondents based on sources of NTFPs

Variables	Frequency	Percentage
Source	44	36.70
Supplied	76	63.30

Source: Field Survey 2022

Level of NTFPs demand/supply in the Market:

Majority of the respondents (90%) opined that the levels of demands for NTFPs were on the increase (Table 4). This seems reasonable since it is in tandem with the population of the society that keeps increasing from time to time (NPC 2006). Therefore, demand for food would be greatly affected. There is no doubt that these activities play cogent roles in solving most of the financial obligations of the respondents, which directly improve their standard of living and consequently alleviate their poverty. This is closely related to Cambell's observation as cited in Sekar *et al. (*1986) and Dishan *et al. (*2010).

Table 4: Distribution of respondents based on demand/supply of NTFPs in the market

Variables		Frequency	Percentage
Demand	Increasing	108	90.00
	Unstable	12	10.00
Supply	Increasing	4	3.30
	Unstable	116	96.7

Source: Field Survey 2022

Daily Revenue Realized from NTFPs Marketing:

Table 5 shows the daily revenue realized from NTFPs marketing by people of the area. There is no doubt that these activities play cogent roles in solving financial obligations of the marketers (respondents).This would encouraged them to selling continually these materials as a means of livelihood activities. This agrees with Hegde et al (1996) who observed that NTFPs make 50-75% of the rural dwellers income in India. The Table 5 shows that 76.70% of the respondents make daily revenue of N500 – N1000.

Table 5: Distribution of respondents based on daily revenue realized from NTFPs Marketing

Variables	Frequency	Percentage
<N500	4	10.00
N500 – N1000	92	76.70
N1000 – N5000	16	13.30

Source: Field Survey 2022

Constraints to NTFPs Marketing:

Results from Table 6 study shows that all (100%) of the respondents were of the opinion that non- availability and decrease in supply of these products were the major constraints militating against NTFPs sales in this area. Products supplied in excess of the demand forces the price to go down; this is another notable constraint (Table 6).

Table 6: Constraints associated with NTFPs marketing in the study area

Variables	Frequency	Percentage
Decrease in supply at high demands	120	100.00
Low price at surplus period	108	90

Non availability all year round	120	100
Others	---	---

Source: Field Survey 2022

Problems Associated with NTFPs Marketing:

The results shows that all the respondents were of the conviction that all the variables in Table 7 are believed to be problems confronting effective marketing of the NTFPs in the area, apart from few numbers who had a different opinion about security attributed to forest loss. This agrees with the report of Andel (2000) on NTFPs pitfalls.

Table 7: Distribution of respondents based on problems associated with NTFPs marketing in Ogun Waterside Local Area

Variables	Frequency	Percentage
Reduction in profit at high cost	120	100
Seasonability of the product	120	100
Lack of modern presentation method	120	100
Cost of transportation	120	100
Security due to forest loss	120	100

Source: Field Survey 2022

Possible Solution to the Identified Problems:

Table 8 shows the perceived solution to the above identified problems. All 100% of the respondents asserted that a good price control system will really help to solved one of these problems, while 96.675 agreed that domestication of these products will make them available all the time and this will also prevent the NTFPs from going into extinction. Provision of modern preservatives and storage technique (96.67%) is also believed to be important. This falls in line with the recommendation of Andel (2006) on price and availability of NTFPs.

Table 5: Solution to the Identify Problems in the study area

Variables	Frequency	Percentage
Provision of modern preservatives and storage technique	116	96.67
Domestication of NTFPs	119	99.67
Price control system	120	100

Source: Field Survey 2022

Conclusion

It is evident in this study that, NTFPs have great potential to improve the standard of the living of the rural dwellers in the study area and consequently alleviating their poverty level if serious attention is given to their domestication and sustainability.

Recommendation

Based inherent potentials of contribution of NTFPs towards improving the standard of living of people, It is therefore, recommended that great effort should be directed towards the domestication of NTFPs to avoid its scarcity and consequently rescue them from going into extinction.

Government should also put in place a good price control system and relevant laws guiding NTFPs and joint management scheme for their sustainability. Modern storage and preservation facilities should also be provided by the respondents to increase the shelve life of the products thereby prolonging their long time availability after harvest. With these,

poverty can be reduced among the rural dweller and in particular in our society beyond 2015 as against the projected Millennium Development Goal (MDGs).

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ASSESSMENT OF INVOLVEMENT IN CASSAVA PRODUCTION ON YOUTHS' WELLBEING IN ATIBA LOCAL GOVERNMENT AREA OF OYO STATE

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Abstract
The study examined the assessment of involvement in cassava production on youths wellbeing in Atiba Local Government Area of Oyo State. Only 80 youths were purposively sampled from the list of cassava growers association in the study area. Structured questionnaire and interview schedule was used to elicit response on respondents' involvement in cassava production, constraints faced by youths in cassava production and wellbeing in terms of objective (material and non-material components) and subjective wellbeing. Data were analyzed using descriptive and inferential statistics at p=0.05. Respondents were involved in almost all the pre-planting, planting and post- planting operations. Inadequate contact with extension agents ($\bar{x}$=2.32), pest and diseases infestation ($\bar{x}$=1.57) and poor road network ($\bar{x}$=1.50) were the major constraints respondents faced in cassava production. More than half (52.50 %) of the youths had a high objective wellbeing. Likewise, 62.50% of the youth had a high subjective wellbeing. Considering the overall wellbeing, more than half (55.00%) of the youths were better off in wellbeing relative to the sampled mean. The study revealed a negative and significant correlation between respondents' involvement in cassava production (r=-0.623, p<0.05) and well-being. Youths currently involved in cassava production are encouraged to build an effective cooperative network among themselves in the business.
Keywords: *Contribution; Youth; Involvement; Wellbeing.*

Introduction

Cassava production in Nigeria is by far larger than production in Brazil and almost double the production of Indonesia and Thailand. There are numerous industrial uses of cassava such as cassava chips, flour, starch, and cassava leaves which all have high export demand. Cassava can be substituted as feed ingredient for corn and other grains without any negative effect on poultry and piggery (Changa.*et al.,* 2020). Despite the fact that many Nigerians process cassava for a living, the new window of opportunities for export of cassava products have heightened cassava potentials in the national economy. Youth period is best understood as a period of transition from the dependence of childhood to adulthood's independence (UNESCO, 2017). Youth are supposed to be actively involved in farming activities to increase food and livestock production (Arimi and Ewebiyi, 2013). The major problem of the global economic crisis is the high increasing rate of unemployment, mostly among the youths (Abdul and Sulaiman, 2013). The prolonged and sluggish nature of economic growth in most African countries has impacted adversely on the wellbeing of young Africans.

'Well-being' is a term that is often used, there is no agreed definition and it is often used as an all-encompassing concept to describe the quality of people's lives. The measurement of well-being can be considered using two broad approaches: objective and subjective measures. There is general agreement that both approaches are necessary. The objective measures make assumptions about what is required for any individual and then sets out indicators to estimate how far the requirements have been satisfied. Subjective measures allow for differences in people's values and preferences and are seen as less paternalistic than objective measures. Poverty, food insecurity, hunger and high and rising unemployment rate remains a key

challenge to the nations' development. These ultimately have impacts on youth's wellbeing which is critical to their survival. Addressing the challenge of food insecurity, unemployment and poverty has been a topical issue in Nigeria in recent times. Hence, several efforts to engage Nigerian youths in agricultural enterprise are being put in place. These programs intended to ensure food self-sufficiency and provide necessary infrastructure to stimulate economic growth, enhance income and improve the wellbeing of the populace. These programmes includes: You Win, N-power, Tony Elumelu Foundation, National Fadama Development project (NFDP), Community based Poverty Reduction Project (CPRP), Local Empowerment and Environmental Management Project and Community and Social Development Project (CSDP) among others.

In spite of increasing awareness about opportunities in Agriculture (i.e cassava production) as a panacea for unemployment and poverty in the country, in particular, many youths are yet to embrace this opportunities. There also exists a scarcity of literature on involvement in cassava production to the wellbeing of youth. It is against this backdrop that this study assessed the involvement in cassava production on youths' wellbeing in Atiba Local Government Area of Oyo State. The general objective of this study is to assess the involvement in cassava production on youths wellbeing in Atiba Local Government Area of Oyo State. The specific objectives are to: assess youths' involvement in cassava production in the study area; identify constraints to cassava production among respondents in the study area and assess the level of cassava youth farmers wellbeing in the study area.

Methodology

The study was carried out in Atiba Local Government Areas of Oyo State. The population of the study comprised of youths between the ages of 18-40 years registered with cassava growers associations in Atiba Local Government Area of Oyo State. This age bracket is considered to be youths, according to Otumura (2000) as cited in Onemolease and Alakpa (2009) that individuals between the age bracket of 18-40 years were considered as youth. The cassava growers association in Atiba Local Governmnent Area of Oyo State has 150 registered farmers. Out of 150 registered farmers, 80 fell within the age bracket of 18-40 years. Purposive sampling was used to select all the 80 youths based on the age limits designated (18 - 40 years). 80 young cassava farmers were sampled in total**.** Data was collected through the use of carefully developed structured questionnaire and interview schedule. Variables assessed include respondents' involvement in cassava farming which was operationalized as always involved, sometimes involved and never involved with scores of 2, 1 and 0, constraints faced by cassava farmers using a three-point rating scale of not a constraint, mild constraint to severe constraints with scores of 0, 1 and 2, respectively. Wellbeing was divided into objective wellbeing (material and non-material wellbeing component) and subjective wellbeing. Material component was measured on assets, housing unit type, ownership of housing unit type, source of drinking water, residence in compound, livestock owned, power source, means of transportation, electronics, refuse disposal amongst others while non-material wellbeing of youth involved in cassava production was measured by assessing respondents; access to life essentials, psychological wellbeing, physical wellbeing, social interactions and connections. Subjective wellbeing measured respondent's satisfaction with each dimensions of wellbeing. Respondents' overall wellbeing was obtained by pooling together objective (material and non-material) and subjective wellbeing scores. These scores were standardized and added together to form an overall well-being index. Mean score was obtained. Respondents below the mean score were classified as worse off while those above the mean were classified as better off. Data collected was analyzed using descriptive statistics such as frequency counts, percentages and mean scores while inferential

statistics such as Pearson Product Moment Correlation (PPMC) was used to analyze the hypothesis.

Results and discussion

Involvement of respondents in cassava production operations

Cassava production involves the performance of several tasks. Cassava production activities were categorized into pre-planting, planting and post- planting operations. Table 1 shows that, all of the respondents (100%) were always involved in pre-planting operations (choice of site, clearing of land, stumping and ploughing), respectively. Also, all (100%) of the respondents were always involved in planting operations (planting of cassava stems). Result of the findings presented in the table shows that (100%) of the respondents were always involved in weeding, pest and diseases control, harvesting and marketing of production, respectively. However, 12.50% of the respondents were sometimes involved in fertilizer application, 17.50% of the respondents were also sometimes involved in cassava processing. About 10.00% of the respondents were also sometimes involved in keeping of records. The finding agrees with the findings of Chikezie *et al. (*2012) who reported active involvement of the youth in agricultural activities. The youth who are an embodiment of zeal, strength, innovativeness should be encouraged as they perform their role in nation building as well as in sustaining the food security of the state and Nigeria.

Table 1: Distribution of respondents based on involvement in cassava production operations

Activities	Always involved	Sometimes involved	Never involved
Pre-planting- operations			
Choice of land	80(100)	-	-
Clearing of land	80(100)	-	-
Stumping	80(100)	-	-
Ploughing	80(100)	-	-
Planting operations			
Planting of cassava stems	80(100)	-	-
Post-planting- operations			
Weeding	80(100)	-	-
Fertilizer application	-	10(12.50)	70(87.50)
Pest and diseases infestation	80(100)	-	-
Harvesting	80(100)	-	-
Processing	51(63.75)	14(17.50	15(18.75)
Marketing of production	80(100)	-	-
Keeping of records	59(73.75)	8(10.00)	13(16.25)

Source: Field survey, 2021

Constraints faced by cassava youth farmers

Table 2 shows the constraints faced by cassava youth farmers. The weighted mean value of 1.10 was used as the critical value for comparing the order of severity. From the Table, the highest constraint faced in cassava production is inadequate contact with extension agent ($\bar{x}$=2.32), pest and diseases infestation ($\bar{x}$=1.68) ranked second on the list of constraints. Poor road network ($\bar{x}$=1.50), high cost of inputs ($\bar{x}$=1.27), Inadequate land ($\bar{x}$=1.17) and inadequate capital ($\bar{x}$=1.10) ranked third, fourth, fifth and sixth on the list of constraints. This report agrees with the findings of Angba and Iton (2020) who posited that inadequate capital, high cost of input, insufficient farmland and lack of extension services as the severe constraints

faced by cassava farmers during cassava production. Similarly, Ashaye, Adeyi, Willoughby, Ola and Ayodele (2018) reported that inadequate capital, high-interest rate, inadequate transportation facilities, insufficient access to farmland and poor access to extension services as the significant barriers farmers encountered in cassava production. The area in which the constraint was not serious includes poor marketing, poor yield, and lack of improved variety. This is in contrast with the finding of Sangoyemi and Ayandiyi (2013) that identified a lack of standard marketing as one of severe constraints faced by cassava farmers.

Table 2: Distribution of respondents based on constraints faced

Constraints	Not a constraint	Mild constraint	Severe constraint	WMS	Rank
Inadequate contact with extension agents	1(1, 25)	9(11.25)	70(87.75)	2.32	1st
Pest and diseases infestation	12(15.00)	61(76.25)	7(8.75)	1.68	2nd
Poor road network	5(6.25)	54(67.50)	21(26.25)	1.50	3rd
High cost of inputs	12(15.00)	55(68.72)	13(16.25)	1.27	4th
Inadequate land for farming	12(15.00)	61(76.25)	7(8.75)	1.17	5th
Inadequate facilities or capital	17(21.25)	55(68.75)	8(10.00)	1.10	6th
Poor marketing	20(25.00)	52(65.00)	8(10.00)	1.06	7th
Poor yields	43(53.75)	43(53.75)	5(6.25)	0.65	8th
Lack of improved variety	71(88.75)	9(11.25)	-	0.14	9th

Source: Field survey, 2021

Well-being of Youth involved in cassava production

The dependent variable for the study is the wellbeing of youth involvement in cassava production. Results were presented for objective wellbeing (non-material and material components), subjective wellbeing and overall wellbeing.

Objective well-being (Non- material components) - Non material wellbeing of youth involved in cassava production was measured by assessing respondents; access to life essentials, psychological wellbeing, physical wellbeing, social interactions and connections.

Categorization of objective wellbeing

Table 3 shows the level of objective wellbeing, more than half (52.50 %) of the youths had a higher objective wellbeing relative to the sampled mean. This result implies that a little above half of the respondents had a high wellbeing when assessed using measurable criteria of observable facts of social relationships, access to life essentials, physical wellbeing, psychological wellbeing and material items (assets, housing, ability to meet basic needs).

Table 3: Level of objective wellbeing of youths

Well-being categorizes	Frequency	Percentage	Mean
Low	38	47.50	39.6
High	42	52.50	

Source: Field survey, 2021.

Categorization of Subjective well-being

Subjective well being measured respondent satisfaction with different aspects of their lives. Table 4 shows subjective well-being categorization of youths involved in cassava production. This result shows that more than half (62.50%) of the youth had a high subjective well-being relative to the sampled mean. This confirm that majority of the respondents were satisfied with psychological state, ability to meet basic needs, number of meals, quality of meal and physical health. The result of this study shows the clear distinction between combining the use of both objective and subjective measures.

Table 4: Level of subjective wellbeing of youths

Well-being categories	Frequency	Percentage	Mean
Low	30	37.50	42.3
High	50	62.50	

Source: Field survey, 2021

Categorization of respondents overall wellbeing (Objective and Subjective wellbeing)

The result for the overall well-being of youth involved in cassava production in Atiba local government area in Table 5 shows that, more than half (55.00%) of the youths were better off in wellbeing relative to the sampled mean. This suggests that many youths in cassava production in Atiba local government area are better off in well-being status.

Table 5: Level of respondents overall wellbeing (Objective and Subjective wellbeing)

Overall well-being	Frequency	Percentage	Mean
Worse off	36	45.00	27.1
Better off	44	55.00	

Correlation between respondents' involvement in cassava production and wellbeing

The PPMC result in Table 6 reveals there was negative and significant correlation between respondent's involvement in cassava production ($r=-0.623$, $p<0.05$) and wellbeing. This implies that respondents' involvement in cassava production influences their well-being. The more involved they are, the better off their wellbeing, the less involved they are, the more worse off their wellbeing.

Table 6: Correlation between respondents' involvement in cassava production and well-being

Variables	r-value	p-value	Remark
Involvement	-0.623	0.001	S

Source: Data analysis, 2021

Conclusions and recommendations

Majority of the respondents were involved in cassava pre-planting, planting and post-planting operations. Respondents were constrained by inadequate contact with extension agents, pest and diseases infestation, poor road network and high cost of inputs. More than half of the youths were better off in wellbeing. The study revealed that respondents' involvement in cassava production influences their well-being. This study recommends that adequate extension delivery services should be made available to the cassava farmers in the study area, agro-chemicals subsidies should be given to cassava farmers and should be consistent. Youths currently involved in cassava production should be encouraged to build an effective cooperative network among themselves in the business.

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OYSCATECH GLOBAL CONSULT

EFFECT OF MALE INFLORESESENCE OF OIL PALM TREE (*ELAEIS GUINEENSIS*) ON COMBUSTION CHARACTERISTICS OF THREE INDIGENOUS WOOD SPECIES.

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Abstract
Briquetting has the prospect to meet supplementary energy demands of urban and industrial sectors thereby making a significant contribution to the economic advancement of developing countries. This study evaluated the combustion properties of briquettes produced from sawdust of three indigenous wood species (Afzelia africana, Albizia gummifera and Ceiba pentandra) mixed with male inflorescence of Elaeis guineensis (palm tree) at varying proportions (25 g, 50 g and 75 g). A locally fabricated cylindrical mould was used to produce briquettes using starch as binder. Combustion properties assessed include: Percentage volatile matter (VM), percentage ash content (AC), percentage fixed carbon (FC) and heating value (kcal/kg). Combustion properties of the briquette produced were determined according to ASTM E711-8. Descriptive and inferential statistics were used for data analysis. The mean values for combustion characteristics before mixture revealed that A. africana had the highest heating value (6003.80 kcal/kg), VM (78%) and lowest AC (1.48%). At 25 g mixture ratio the heating value of A. africana + E. guineensis reduced (5929.36 kcal/kg). Conversely, at 50 g ratio A. gummifera + E. guineensis had the highest percentage of AC (2.57%) and percentage FC (18.37%). However, at 75 g there was a decrease in the combustion properties of A. africana (25 g) + E. guineensis (75 g), while there was an increase in combustion properties of C. pentandra (25g) + E. guineensis (75g). There were significant differences (P≤0.05) in combustion properties based on the proportion of the mixture. The study recommended that briquettes produced at 75g of male inflorescence of E. guineensis has a potential of improving burning characteristics of C. pentandra.
Keywords: Briquetting; *Elaeis guineensis*; Sawdust; Indigenous wood species.

Introduction

Over exploitation of wood for domestic uses has been the major driver of deforestation, desertification and erosion due to increase in population. This has led to the depletion of over 75% of the total forest cover in many sub-Saharan countries and thus leading to environmental crises (Stout and Best, 2001). The high and rapid demand for wood fuel consumption is considered as a major contributing factor to the fuel wood crisis in Nigeria (Himraj, 1993).The forest ecosystem has been significantly disrupted and altered due to the rise in the number of trees being cut down for firewood, charcoal, and furniture, which has resulted in high levels of environmental pollution. Energy from biomass which includes agricultural waste, has made the greatest contribution to national energy consumption in both developed and developing countries. The problems of acute scarcity and deficit in supply of wood have resulted in energy crisis in arid and semi arid regions of developing countries (Fuwape, 2003). The percentage composition of the combustible elements in the agricultural waste whether in loose form or briquette form are very low compare to fossil fuels (Musa,

2006). Hence, the low emissions of the oxides of the combustible elements, the emission of CO_2 form the combustion of biomass (agricultural waste) is equivalent to the amount of CO_2 absorbed during its growing cycle, so the net CO_2 released is approximately zero by mass (Weither, 2000). However, inefficient wood conversion and low biomass recovery from the timber processing in local forest industry have led to the prevalence of sawdust heap around sawmills, thereby constituting a visual blight to the local environment and a breeding ground for wood decaying organisms. Ogunsanwo (2001) reported that about 50% of the wood volume is left as residue.

Materials and methods

The study was carried out at Federal University of Agriculture, Abeokuta located next to Ogun-Osun River Basin Development Authority (OORBDA), along Osiele-Abeokuta road, off Abeokuta-Ibadan road which lies approximately on latitude 7º30' N and longitude 3º 54' E. It lies within the humid lowland rain forest region with two distinctive seasons. The mean monthly temperature varies from 22.9ºC in August to 36.2ºC in March. The relative humidity is high ranging from 75.52ºC in February to 88.15ºC in July (Aiboni, 2001).

Sample collection and preparation

Sawdust of selected species from high, medium and low density wood (*Afzelia africana, Albizia gummifera and Ceiba petandra*) of the tropical rainforest ecosystem were collected from sawmill (Surulere sawmill) camp area, Alabata road Odeda Local Government, Ogun State Nigeria. While the male inflorescence (*Elaies guineensis*) were collected from oil palm tree along FUNAAB Alabata road. Thereafter, the collected male inflorescence of *Elaies guineensis* were sundried and shredded. Male inflorescence at varying proportions (25g, 50g and 75g) was paired with sawdust obtained from each species of wood and each briquette was produced using a locally fabricated mould.

The briquettes was produced in a simple press using cassava starch as binder, the starch was prepared by stirring thoroughly the 30% of starch with 250ml of hot water at 102^0C to form prepared stock. The briquette was oven dried at a temperature of 100^0C, three (3) replicates of each sets of briquettes sample were produced, Proximate analysis was carried out at Forestry Research Institute (FRIN) Jericho, Ibadan on the briquette samples to determine the percentage volatile matter content, percentage ash content, percentage content of fixed carbon and heating value of the samples.

Table I: Proportional ratio of *Elaeis guineensis* with three indigenous wood species

Mixture ratio	**75g:25g**	**50g:50g**	**25g:75g**
Aa+Eg	Aa+Eg	Aa+Eg	Aa+Eg
Ag+Eg	Ag+Eg	Ag+Eg	Ag+Eg
Cp+Eg	Cp+Eg	Cp+Eg	Cp+Eg

Note: Ag= *Albizia gummifera* (Ede) Aa= *Afzelia africana* (Apa)
Cp= *Ceiba petandra* (Araba) Eg= *Elaeis guineensis*

Proximate Analysis

Proximate analysis was carried out on the briquette samples to determine the percentage volatile matter content, % ash content, % content of fixed carbon and heating value of the samples using the formula below and the procedure of ASTM E711-87 was adopted.

Percentage Ash Content

$PAC = \frac{C}{A}100\frac{C}{A}100$ (ASTM, 2007)

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Percentage Volatile Matter

$PVM = \frac{A-C}{A}100\,\frac{A-C}{A}100$ (ASTM, 2007)

Percentage Fixed Carbon

Fixed Carbon = $100\% - (PAC + PVM)100\% - (PAC + PVM)$ (ASTM, 2007)

Heating Value/ Caloric Content

Specific Heat of Combustion (HV) was calculated using the formula:

HV = $2.326\ (147.6c + 144\ v)2.326\ (147.6c + 144\ v)$ (ASTM, 2007)

Statistical Analysis

The experimental design adopted was Randomized Complete Block Design (RCBD). Data were subjected to two-way analysis of variance at 0.05 probability level. Where significant differences were encountered, the means were separated using Duncan test.

Result and Discussion

Combustion Properties of selected wood species and *Elaeis guineensis* before mixture

The values of combustion properties of each wood species and *Elaeis guineensis* before mixture are presented in Table. The mean percentage ash content ranged from 1.48% - 2.51%. *A. gummifera* had the highest mean value of percentage ash content (2.51%) while *A. africana* had the lowest mean (1.48%). Mean value of Percentage fixed carbon ranged from 13.20% -18.27% and *E. guineensis* had the lowest fixed carbon of 13.20%. Investigation of the heating value shows that *A. africana* had the highest mean heating value of 6003.80 kcal/kg with mean values ranging from 631.48 kcal/kg - 6003.80 kcal/kg. *Afzelia africana* having the highest percentage volatile matter (78.05%). The ash content of briquettes produced from both A. *gummifera and E. guineensis* were significantly different from that of others. The percentage volatile matter composition of the briquettes and other combustion properties varied significantly from each other.

Mean value of combustion Properties of each wood species mixed with 25g *of Elaeis guineensis*

Table 3 showed the mean heating value for the mixture. It was observed that the specific heating value of the samples ranged from 648.21 kcal/kg - 5929.36 kcal/kg, *A. africana* + *E. guineensis* had the highest heating value of 5929.36 kcal/kg while *C. pentandra* +*E. guineensis* had the lowest value of 648.21 kcal/kg and volatile matter (78.05%) Mixture of *E. guineensis* had significant effects on the combustion properties of the briquettes produced from the species.

Mean value of combustion Properties of each wood species mixed with 50g *of Elaeis guineensis*

The combustion properties of each wood species with 50% *E. guineensis* mixture are presented in Table 3. The study showed that the mixture with *A. gummifera* had the highest ash content (2.63±0.07) followed by mixture with *C. pentandra* (1.79± 0.03) while *A. africana* had the least (1.71±0.07). However, the highest percentage volatile matter (79.14±0.15) was recorded by *A. africana* which had the least ash content (1.71± 0.07) while the least (29.48±0.45) was recorded by mixture of *C. pentandra* and *E. guineensis*.

Investigation of the carbon content of the mixtures showed that *A. gummifera* had the highest (18.34±0.08) followed by *A. africana* (17.22 ±0.02) while *C. pentandra* had the least (16.23±0.03). Mean heating value showed that mixture of *A. africana* had the highest heating value of 5980.15±43.12 followed by *A. gummifera* which had 3174.50±188.99 while *C. pentandra* had the least value of 643.12 ±1.81. The study showed that the mixture had significant effects (P≤0.05) on all the parameters considered.

Mean value of combustion Properties of each wood species mixed with 75g *of Elaeis guineensis*

The combustion properties of each wood species with *E. guineensis* mixture are presented in Table 3 . The study showed that the mixture of *A. gummifera* had the highest ash content (2.67± 0.07) followed by mixture of *A. africana* (1.74±0.03) while *C. pentandra* had the least (1.30±0.02). However, the highest percentage volatile matter (79.28±0.11) was recorded by *A. gummifera*. while the least volatile matter was recorded by mixture of *C. pentandra* and *E. guineensis* (29.68±0.38). It was observed that, heating value of *C. pentandra* increased with increasing mixture of *E. guineensis*, while the heating value of *A. gummifera* and *A. africana* decreased with increasing mixture of *E. guineensis.*

Table 2: Mean value of combustion Properties of each wood species and *Elaeis guineensis* before mixture

Samples	Ash content (%)	Volatile matter (%)	Fixed carbon (%)	Heating Value (kcal/kg)	Density(g/cm^3)
Ag	2.51±0.08^c	72.53±0.06^c	18.25±0.04^d	3027.60.±69.50^c	0.61±0.34^b
Aa	1.48±0.04^b	78.05±0.23^d	17.31±0.03^c	6003.80±42.35^d	0.64±0.46^a
Cp	1.59±0.03^b	30.19±0.29^a	16.19±0.05^b	631.48 ±12.23^a	0.22±0.79^a
Eg	2.26±0.04^a	55.53±4.56^b	13.20±0.17^a	1972.80±17.41^b	0.18±0.06^a

Table 3: Mean value of combustion Properties of each wood species and *Elaeis guineensis* after mixture

Ratio	Ash content (%)			Volatile matter (%)			Fixed carbon (%)			Heating Value (%)		
	25g	50g	75g	25g	50g	75g	25g	50g	75g	25g	50g	75g
Ag+Eg	2.57± 060^a	2.63± 0.07^c	2.67± 0.07^c	72.99± 0.54^b	73.62± 0.57^b	73.66± 0.51^b	18.37 ± 0.11^c	18.34± 0.08^c	18.37 ±0.05^c	3089.14± 137.17^b	3174.50± 188.99^b	3068.66± 292.52b
Aa+Eg	1.43± 0.02^b	1.71± 0.07^b	1.74± 0.03^b	78.23± 0.26^a	79.14± 0.15^c	79.28± 0.11^c	17.38 ± 0.10^b	17.22± 0.02^b	17.24 ±0.01^b	5929.36 ± 21.22^c	5980.15± 43.12^c	6006.20± 25.53c
Cp+Eg	1.68± 0.06^b	1.79± 0.03^a	1.30± 0.02^a	29.36± 0.46^c	29.48± 0.45^a	29.68± 0.38^a	16.18 ± 0.06^c	16.23± 0.03^a	16.29 ±0.03^a	648.21 ± 0.93^c	643.12± 1.81^a	691.75±4 .01a

Conclusion

The introduction of male inflorescence of *E. guineensis* with faster combustion rate to produce briquettes is laudable, Male inflorescence of *Elaeis guineensis* which is generated largely can be utilized for the production of briquettes most especially to augment burning characteristics of *Ceiba petandra* and *Albizia gummifera.* Male inflorescence of *Elaies guineensis* lowered the physical properties of the sawdust examined. The higher the proportion of *Elaies guineensis* mixed with the species of sawdust the lower the weight, length and density. The quality of briquettes produced from the mixture of Male inflorescence of *Elaies guineensis* and the three indigenous wood species were highly

influenced by the proportion of Male inflorescence of *Elaies guineensis*. As the proportion of male inflorescences of *Elaeis guineensis* increases the percentage ash content increases and the heating value reduces for *Albizia gummifera* and *Afzelia africana* mixture in contrast to that of *ceiba pentandra* mixture.

Recommendations

This work was carried out to examine the physical and combustion properties of briquettes produced from mixture of male inflorescence of *Elaies guineensis* and sawdust of low, medium and high tropical hardwood species. The quality of the briquettes was influenced by the quantity of male inflorescence of *Elaies guineensis.* It is therefore recommended that:

i. Male inflorescence of *Elaies guineensis* is a more efficient way of utilizing the biomass materials due to the higher heating values generated.
ii. In order to utilize *ceiba petandra* as a possible biomass briquette a large proportion of *Elaies guineensis* would influence its calorific value.
iii. Use of wood waste should be promoted especially in areas where they are not yet popular in order to reduce over exploitation of forest for fuel wood.
iv. Small scale briquetting plants be integrated into sawmills to utilize the sawdust heap for energy generation.

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EFFECTS OF CASSAVA PROCESSING EFFLUENTS ON SOME SELECTED SOIL PROPERTIES AT OJA-OBA, IGBOORA, NIGERIA

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Abstract
This research work was carried out to determine the effects of cassava processing effluents on soil pH, Organic Carbon (OC) and Total Nitrogen (TN) at the cassava processing mill, Oja-Oba, Igboora. The experiment was carried out at the department of Soil Science Technology, Oyo State college of Agriculture and Technology, Igboora. Soil Samples were collected from 0 -10, 10-20, 20-30, 30-40, 40-50, 50-60m away from the point of discharge of the effluent and the control sample taken from the adjacent soil without cassava processing effluent. Three samples were collected from each distance range and analyzed for pH, OC and TN. Soil pH (1:2) in water determined by glass electrode pH meter, Organic carbon was determined by chromic acid oxidation method and Total N was by regular macro kjedahl procedure. All the data collected were subjected to Analysis of variance (ANOVA) and means separated using Duncan's Multiple Range Test at 5% level of probability. The study showed that the pH of the study area felled from strongly acidic to slightly alkaline with the highest pH value of 8.2 recorded at 30 – 40m away from the point of discharge of the effluent while the lowest of 5.52 was recorded in soil taken from the point of discharge (0-10m) of the cassava processing effluents. The highest amount of OC was recorded in the control (39.60 g kg^{-1}) while the lowest of 6.30 g kg^{-1} was recorded at 40-50m away from the point of discharged. Total nitrogen of the processing mill at Oja-Oba ranged from 0.90 to 2.10 g kg^{-1}. The amount of pH, OC and TN observed in the study site are comparable to the previous observation in similar sites where pH, OC and TN decreased with cassava processing effluents.

Keywords: Soil, organic carbon, total nitrogen, cassava effluents, *Manihot esculentus*

Introduction
Soil and water bodies are particularly polluted with toxicants from food processing and allied industries (Salami and Egwin, 2007). Major pollutants from food processing includes hydrocarbons, palm oil mill effluent, human and animal wastes, wood waste, waste water from agro-allied industries as well as cassava mill effluent from cassava processing activities (Arimoro and Osakwe, 2006).

Cassava (*Manihot esculentus*) belongs to the family Euphorbiaceae (Nwaugo *et al.* , 2008) and is widely cultivated in the tropical and subtropical regions of the world for its starchy tuberous roots with more than 200 calories/day of food value (Osuafor, *et al*., 2020). It is a staple food of nearly one billion people in Africa, South America, Asia and Pacific (ANU, 2007) and in Nigeria, the estimated cassava production is approximately over 59 million tons (Adetarami *et al*., 2022). Nigeria has become the largest producer of cassava globally since 2017 with a production capacity of about 20.4% of the global cassava output (Olutosin and Sawicka, 2019). The highly perishable nature of harvested cassava roots and the presence of cyanogenic glucosides in bitter cultivars call for immediate processing of the storage roots

into more stable and safer products. Cassava can be processed by either washing, exposure to air, heating or pressing.

In Nigeria, cassava is processed into traditional delicacies which include *garri*, *fufu*, *lafun* flour etc, some of which are fermented products (Oti, 2002). Among all the products obtained from cassava, *garri* is the most common in Nigeria and its production is done in varying scales, small, medium and large (Uzoije *et al*. 2011). During cassava processing, much effluent and solid wastes are generated and released into the environment. One of the major recipients of this effluent is the soil (Orhue *et al*., 2014). On the average, 2.62 m^3 ton-1 of solid residue and 3.68 m^3 ton-1of water residues are generated via cassava processing in Nigeria (Horsfall, 2006; Isabirye *et al*., 2007). Cassava effluents when discharged into the soil result in changes in soil properties (Nwakaudu *et al*., 2012). For instance, Eghoaye and Dada, (2007) investigated cassava effluent polluted soils and observed an increase in soil acidity, potassium, sodium, phosphorous, and organic carbon and a decrease in calcium, nitrogen and magnesium. Akpan *et al*. (2011) reported increased pH, N, organic carbon, exchangeable acidity and decreased Mg, K, P in soil treated with cassava mill effluent. In another study (Ogboghodo *et al*., 2001), cassava effluent was found to increase the number of organisms in the soil ecosystem which may be associated with an increase in soil pH, organic carbon and total nitrogen.

Furthermore, in the past few years, there has been a great upsurge in the production of cassava leading to establishment of more cassava processing mills in the southern parts of the country with the consequence of an extensive ecological pollution associated with the effluent discharge into the soil (Igbinosa and Igiehon, 2015). However, there is little or no information on the effects of cassava processing effluent discharge on some selected soil properties in this area. The objective of the study therefore was to investigate the effects of cassava processing effluents at cassava processing mill at Oja-Oba, Igboora, Nigeria.

Materials and Methods

Location

The study was conducted in the Oyo State College of Agriculture and Technology, Igboora Oyo State, Nigeria, Igboora is located between Latitude 7^0 40' N and Longitude 3^0 30' E, 27.5m above the sea level. The natural climate is characterized by both the wet and dry seasons with the rainy season beginning from April lasting till October while the dry season begins from October and ends in April.

Soil Sampling

Surface samples (0-20cm) were collected at the site from 0 -10, 10-20, 20-30, 30-40, 40-50, and 50 - 60m away from the point of discharge of the effluent. The control was taken from the adjacent field (plot where there is no cassava effluent discharge). Three soil sample were collected. The sample collected were air dried and passed through a 2mm sieve.

Soil Analysis

The dried soil samples were analyzed for soil pH (1:2) in water determined by glass electrode pH meter (IITA, 1982). Organic carbon was determined by chromic acid oxidation method. (Walkley and Black, 1934). Total Nwas by regular macro kjedahl procedure.

Statistical Analysis

All data collected were analyzed using ANOVA and significant means separated using Duncan Multiple Range Test (DMRT) at 5% level of probability.

Results and Discussion

The pH value of soil around cassava processing mill at Oja Oba

The result in Table 1, showed the effects of cassava processing effluent on the soil pH around cassava processing mill Oja-Oba, Igboora. The result showed that the highest pH value of 8.2 was recorded from the samples taken at 30 – 40m away from the point of discharge while the lowest value of 5.52 was observed from the point discharge (0-10m). These values were significantly different at 5% level of probability. The pH in the study site therefore ranged from strongly acidic to slightly alkaline based on FAMRD, (2012) fertility classification.

Total Nitrogen (N) amount in soils around cassava processing mill at Oja Oba

The amount of total nitrogen as influenced by cassava processing effluent discharge at Oja-Oba is presented in Table 1. The result showed that the amount of Total Nitrogen was highest in control sample (2.10 g kg^{-1}) while the lowest result was recorded in the sample taken at 40 – 50 and 50 – 60 m (0.6 g kg^{-1}). The amount of nitrogen observed in the study area are comparable to the report of Eghoaye and Dada, (2007) who observed a decrease in N content with cassava processing effluent. The Total Nitrogen content in the study area ranged from low to moderately high according to FMARD, (2012) fertility classification.

Total Organic Carbon (OC) amount in soils around cassava processing mill at Oja Oba

The result in Table 1 showed the total Organic Carbon as influenced by cassava processing effluent at the processing mill at Oja-oba in Igboora. The results showed that the highest amount of OC recorded in the control (39.60 g kg^{-1}) while the lowest of 6.30 g kg^{-1} was recorded in the sample taken at 40-50m away from the point of discharge of the cassava processing effluent. The organic carbon in all the samples taken ranged from low to very high and fell in line with that of fertility classification by FMARD, (2012).

Conclusion and Recommendation

The study revealed that cassava processing effluent could increase the soil acidity in the study area. Nitrogen content in soils around cassava processing effluents was reduced compared to the control. Cassava processing effluents contributed to the amount of organic carbon present in the soil. The soil in the area could support crop production based on the amount of pH, OC and T N present in the soil around the cassava processing mill at Oja-Oba in Igboora.

Table 1: Level of pH, Total N and Organic Carbon of soils around cassava processing mill at Oja Oba, Igboora

Treatment (m)	pH	TN (g kg^{-1})	OC (g kg^{-1})
0 – 10	5.52 c	1.50ab	24.40b
10 – 20	6.62abc	0.920bc	11.30bc
20 – 30	7.56 ab	0.90bc	10.40c
30 – 40	8.20 a	0.73c	9.20c
40 – 50	7.70ab	0.60c	6.30c
50 – 60	7.79ab	0.60c	6.70c
Control	5.84bc	2.10a	39.60a

Means with the same letters are not significantly different at 5% level of probability using DMRT

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EVALUATION OF BIOCHAR AS NUTRIENT SINK

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Abstract
The utilization of biochar technology in Nigeria for improving soil quality and crop productivity has primarily relied on the achievements in soil fertility. However, the limited knowledge regarding the actual gains achievable through realistic application rates of biochars, as well as the lack of understanding regarding other advantages and concerns, has led to a relatively low acceptance of biochar technology in Nigeria thus far. This article aims to review the significant opportunities and challenges associated with implementing biochar technology in broad acre farming and various other sectors within Nigeria. Additionally, the effects of biochar on key factors such as Available Phosphorus, Exchangeable Cations, and pH in plants are examined. Animal manures and biochars derived from waste exhibited higher levels of nitrogen, phosphorus, and potassium compared to crop filtrate. Furthermore, biochars derived from manure and waste sources (including municipal and industrial waste) contained greater amounts of micronutrients compared to crop residues. Therefore, it is crucial to prioritize immediate attention to fully realize the immense potential of biochar technology in agriculture and other sectors throughout Nigeria.
Keywords: Biochar, Available Phosphorus, Exchangeable cataion and pH

Introduction

Biochar is carbon (C)-rich, solid material produced by thermal decomposition of organic material or biomass in the absence, or under limited supply, of oxygen (Lehmann and Joseph 2009). Biochar is generally produced with the intent of long-term C storage in soil and other potential benefits to soils, including the physical, chemical and biological fertility. Recently decades, application of biochar to soil has drawn attention from the scientific community. Research has focused on cost-effectiveness and environmentally friendly features, such as enhancing carbon sequestration and remediating contaminated soil. Biochar will influence nutrients in soil in several ways: as a source of nutrients for plants and soil microorganisms (Li *et al.,* 2017); as a nutrient sink, thereby impacting the mobility and bioavailability of nutrients (Gul and Whalen 2016); and as soil conditioner, thereby altering soil properties that influence the reactions and cycling of nutrients in the soil (Lusiba *et al.,* 2017). As source, biochar supplies nutrients such as nitrogen (N), phosphorus (P), potassium (K), and other trace elements inherently present in the original feedstock used for biochar production (Purakayastha *et al.,* 2019). While some nitrogen and sulfur in the feedstock materials are lost through gaseous emission during pyrolysis (Al-Wabel *et al.,* 2013; Leng *et al.,* 2020), most nutrients are released during the weathering of biochar in soil, and become available for plant uptake (Zhao *et al.,* 2018). As nutrient sink, biochar retains nutrients, thereby reducing their losses through leaching and gaseous emission. The nutrient retention capacity of biochar depends on its porosity and surface charge (cation and anion exchange capacity) (Yu *et al.,* 2018). Biochar application reduces the loss of N, P, and K through leaching, and N through nitrous oxide emission (Beusch *et al.,* 2019; Yao *et al.,* 2012; Yuan *et al.,* 2016). The nutrient

content of biochar depends on the nature of the feedstock materials and the pyrolytic conditions (pyrolytic temperature, residence time, gaseous environment) (ElNaggar *et al.*, 2019). Biochar application influences various soil properties including pH, bulk density, CEC, water retention, and biological activity and in turn affect nutrient retention of soils. The study is therefore aim to evaluate the biochar effect as nutrient sink.

Materials and Methods

The research was carried out at the research laboratory of Oyo State College of Agriculture and Technology in Igboora, Nigeria. The experiment followed a Completely Randomized Design (CRD) and was replicated four times. The equipment used included filter paper, funnels, beakers, distilled water, treated soil, and sample bottles. The treatments applied were as follows: Control, Biochar (2 tons/ha) -C +B50 (medium dose), and Poultry Manure.

To begin the experiment, 50 grams (50g) of treated sterile soil was measured and placed in funnels lined with filter paper, which were then set up on conical flasks. Each day, 20 milliliters (20 ml) of distilled water were added using a 100ml measuring cylinder for a duration of fifteen days. The filtrates from the soil passed through the filter paper into the conical flask and were transferred into labeled sample bottles on a weekly basis. These samples were later analyzed in the laboratory for pH, % Organic carbon, % Total Nitrogen, and % Sulphur.

The collected data were subjected to analysis using Duncan's Multiple Range Test (DMRT) at a 5% probability level, and means were separated accordingly.

Result and discussion

Table 4.1 presents the findings of the soil analysis, which revealed the physical and chemical characteristics of the soil before planting, allowing us to assess its fertility level. The soil pH was measured at 6.1, and the soil exhibited the following properties: organic carbon content of 4.51g/kg, total nitrogen content of 0.17g/kg, available phosphorus content of 13.3g/kg, and sulfur content of 0.04%. The levels of exchangeable cations were as follows: calcium (Ca) - 3.2, magnesium (Mg) - 0.65, and potassium (K) - 0.43. The soil also contained extractable micronutrients in the following quantities (in mg/kg): manganese (Mn) - 68.5, copper (Cu) - 0.028, iron (Fe) - 110.0, and zinc (Zn) - 0.019. The soil composition consisted of 81% sand, 11% silt, and 8% clay.Furthermore, Table 4.1 presents the analysis of soil amendments, specifically compost and enriched biochar, in order to assess their nutrient status. The compost had a pH value of 6.1, while the biochar exhibited a pH value of 7.8. The total nitrogen content for compost and biochar was 0.098% and 0.056% respectively, and the available phosphorus content (in mg/kg) was measured at 0.42 and 0.16 for compost and biochar respectively. The exchangeable potassium (K), sodium (Na), and magnesium (Mg) levels (in cmol/kg) were determined as 2.8, 0.1, and 0.33 for compost, and 1.165, 0.028, and 0.14 for biochar. Additionally, the cation measurements for compost and biochar were as follows: calcium (Ca) - 1.65 and 0.73, iron (Fe) - 0.01 and 0.018, copper (Cu) - 0.01 and 0.011, zinc (Zn) - 0.01 and 0.019, and manganese (Mn) - 0.026 and 0.51 respectively.All the treatments applied exhibited high significance ($P \leq 0.05$) for the considered nutrient elements and pH, except for phosphorus (P), organic carbon percentage, and total nitrogen in the case of Biochar and Control. Additionally, the pH was not significant for the application of poultry manure and the control group

Discussion

Excessive use of phosphorus fertilizers in agricultural fields has led to the leaching of phosphorus into aquatic systems (Karunanithi *et al.*, 2015; Loganathan *et al.*, 2014). The application of biochar has been shown to modify phosphorus availability in soils by reducing

leaching through sorption/adsorption. This study aimed to determine the variation in soil phosphorus leaching among different treatments, including Biochar treated (18.183), Control (17.827), and poultry waste biochar (20.813). In a column study, biochar derived from Brazilian pepperwood at 600 °C reduced the total phosphate amount by approximately 20.6% in the soil amended with biochar (Yao *et al.,* 2012). Another study by Doydora *et al. (*2011) found that applying peanut hull biochar increased the phosphate amount in the soil solution by 39%. The possible mechanisms suggested for the influence of biochar on phosphorus availability include changes in soil pH, which affects the interaction of phosphorus with other cations, enhanced retention through anion exchange, and phosphorus precipitation (Atkinson *et al.,* 2010). In natural environments, phosphorus is strongly adsorbed onto the surface of iron (III)-(hydr) oxides in soils (Jaisi *et al.,* 2010). Additionally, the addition of biochars has been shown to reduce the amount of phosphorus sorbed onto ferrihydrite by 30-40% (Cui *et al.,* 2011).

Nitrate leaching is a significant cause of nitrogen loss from soils, resulting in groundwater pollution (Cheng *et al.,* 2018). The surface properties of biochar facilitate the adsorption of ions in the soil solution. Electrostatic and capillary forces on the biochar surface reduce nutrient leaching from soils. For instance, the application of Brazilian pepperwood biochar reduced nitrate leaching by 34% through adsorption (Yao *et al.,* 2012). Biochar-amended soils adsorb nitrate through their anion exchange sites, thereby reducing nitrogen losses and increasing nitrate retention. Moreover, the application of woody biochar can decrease nutrient leaching by increasing water retention, as reported by Lehmann *et al. (*2003). Biochar has the ability to retain inorganic nitrogen ions, thereby reducing nitrogen leaching and runoff in soils (Steiner *et al.,* 2008). According to Table 2, the application of biochar reduced nitrate leaching by 6%, with variations observed in the Biochar treated (0.0800), Control (0.0800), and poultry waste biochar (0.0433) treatments. Other studies have also demonstrated the reduction of nitrate leaching through the application of biochar derived from different sources, such as apple branches (Cao *et al.,* 2019). In agricultural soils, mixed poultry waste biochar reduced nitrogen leaching by 11% (Laird *et al.,* 2010), while in an apple orchard and tropical Arenosol, it decreased leaching by 72% and 46%, respectively (Ventura *et al.,* 2013; Beusch *et al.,* 2019). However, it should be noted that the addition of biochars may affect the leaching of different nitrogen forms differently, as shown by Cheng *et al. (*2018), where nitrate-nitrogen leaching was decreased but ammonium-nitrogen leaching was increased in biochar-amended soil due to changes in cation exchange capacity with increasing biochar temperature.The present study also revealed differences in potassium leaching among different treatments, such as Biochar treated (0.6000), Control (0.5733), and poultry waste biochar (0.4633). Biochar can initially increase potassium leaching in crop fields, leading to groundwater pollution in the short term (Angst *et al.,* 2014; Guo *et al.,* 2013). For example, the application of poultry waste biochar in an acidic and low-fertility soil resulted in leaching of potassium, electrical conductivity, pH, and organic carbon to a depth of 60 cm, although the concentrations gradually decreased at a depth of 120 cm. This variation might be related to differences in nutrient uptake by plants at different depths. The addition of biochar resulted in increased potassium leaching by 0.01305%, organic compound by 0.00272%, and pH by 0.2775%, which can be attributed to the high soluble potassium content in the biochar. It is worth noting that the leaching loss of organic carbon induced by biochar decreases with increasing biochar production temperature (Cheng *et al.,* 2018). Therefore, the leaching of nutrients in biochar-amended soil depends on various factors, including the type and rate of biochar application, soil type, and soil depth.The addition of poultry manure biochar decreased the concentrations of organic carbon and electrical conductivity in the soil. However, when biochar (1%) was added to the control, it increased the concentrations of organic carbon and electrical conductivity. Furthermore, the concentration of organic carbon

and electrical conductivity increased after the addition of 50 t ha−1 biochar (Noyce *et al.*, 2017). Additionally, the application of poultry biochar increased the uptake of micronutrients (iron, copper, zinc, and manganese) in the soil (Gao *et al.*, 2016). Concentrations of organic carbon and electrical conductivity after biochar addition can be observed in Tables 3 and 5.All filtrate and soil analyses conducted in this experiment were statistically significant for all the considered treatments. This study provides evidence that plant nutrients can leach into the soil, as observed in the analyzed filtrates, and this leaching is highly significant across the treatments.

Table 4.1: The particle size and chemical analysis of the soil used

Soil Properties	**Value**	**Critical range (Chude *et al.*, 2012)**	**Remark**
Ph	6.1	6.6 – 7.2	Slightly acidic
Organic Carbon (g/kg)	4.51	10 – 14	Low
Total N (g/kg)	0.17	1.6 – 2.0	Low
Available P (mg/kg)	13.30	7 – 20	Moderate
Percentage S (%)	0.043		
Exchangeable cations (cmol/kg)			
Ca	3.20		
Mg	0.65		
K	0.43	0.3 – 0.6	High
Exchangeable acidity	0.20		
Extractable Micronutrient	(mg/kg)		
Mn	68.50		High
Cu	0.028		Low
Fe	110.00	30 – 35	High
Zn	0.019		Low
Particle size distribution	(g/kg)		
Sand	81.0		
Silt	11.0		
Clay	8.0		
Textural class (USDA)	Loamy sand		

Tab. 4.2: Chemical Analysis of Compost and biochar

	Soil Amendment	
Property	**Compost**	**Biochar**
Ph	6.1	7.8
Total Nitrogen	0.098%	0.056%
Organic Matter	6.65%	-
Available P mgkg^{-1}	0.42	0.16
Exchangeable K (cmolkg^{-1})	2.8	1.165
Exchangeable Na (cmolkg^{-1})	0.10	0.028
Exchangeable Mg (cmolkg^{-1})	0.33	0.14
Ca	1.65	0.51
Fe	0.73	1.99

Cu	0.01	0.01
Zn	0.018	0.011
Mn	0.026	0.01

Table 1: Response of some soil properties to treatment application

Treatment	Available Phosphorus	Exchangeable cataion	Potassium	%Organic Carbon	Total Nitrogen	pH
Poultry Manure	20.81^{xx}	52.00^{xx}	0.46^{xx}	0.390^{xx}	0.043^{xx}	6.96^{ns}
Biochar	18.18^{xx}	45.67^{xx}	0.60^{ns}	0.810^{ns}	0.080^{ns}	7.34^{xx}
Control	17.83^{xx}	50.00^{xx}	0.57^{ns}	0.807^{ns}	0.080^{ns}	7.05^{xx}
L.S.D	0.064	0.666	0.032	0.007	0.013	0.28

Table 2: Filtrate properties after treatment application

Treatment	Available Phosphorus	Exchangeable cataion	Potassium	%Organic Carbon	Total Nitrogen	pH
Poultry Manure	0.58^{xx}	249.0^{xx}	2.01^{xx}	0.49^{xx}	0.067^{xx}	7.58^{xx}
Biochar	0.54^{xx}	218.7^{xx}	1.817^{xx}	0.88^{xx}	0.103^{xx}	7.45^{xx}
Control	0.603^{xx}	206.3^{xx}	1.14^{xx}	0.370^{xx}	0.047^{xx}	6.93^{xx}
L.S.D	0.008	0.925	0.021	0.019	0.012	0.37

There are significant different among the treatments considered for filtrates analysis

Table 3: Filtrate and some soil properties after treatment application

Treatment	Available Phosphorus		Exchangeable cataion		Potassium		%Organic Carbon		Total Nitrogen		pH	
	Filtrate	**Soil after experiment**	**Filtrate**	**Soil after experiment**	**Filtrate**	**Soil after experiment**	**Filtrate**	**Soil after experiment**	**Filtrate**	**Soil after experiment**	**Filtrate**	**Soil after experiment**
Poultry Manure	0.58^{xx}	20.81^{xx}	249.0^{xx}	52.00^{xx}	2.01^{xx}	0.46^{xx}	0.49^{xx}	0.390^{xx}	0.067^{xx}	0.043^{xx}	7.58^{xx}	6.96^{ns}
Biochar	0.54^{xx}	18.18^{xx}	218.7^{xx}	45.67^{xx}	1.817^{xx}	0.60^{ns}	0.88^{xx}	0.810^{ns}	0.103^{xx}	0.080^{ns}	7.45^{xx}	7.34^{xx}
Control	0.603^{xx}	17.83^{xx}	206.3^{xx}	50.00^{xx}	1.14^{xx}	0.57^{ns}	0.370^{xx}	0.807^{ns}	0.047^{xx}	0.080^{ns}	6.93^{xx}	7.05^{xx}
L.S.D	0.008	0.064	0.925	0.666	0.021	0.032	0.019	0.007	0.012	0.013	0.37	0.28

All the main values of filtrate and soil analysis after experiment are statistically significant for all the treatment considered except

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SOIL CLASIFICATION UNDER DIFFERNET LAND USE SYSTEM AT OYO STATE COLLECGE OF AGRICULTURE AND TECHNOLOGY, IGBOORA.

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Abstract
Several works have been done to cover large parts of Southern Nigeria were over generalized and carried out at reconnaissance scale with most parent materials been generally regarded as basement complex. However, little or no information on soil classification was developed for Igboora soil. Soils of the College's Farms are under intensive cultivation with exacerbates of soil erosion and other soil degradation effects. The objective of this study is to provide invaluable information on soil classification under five different land use, aimed to guide the potentials of the soil, which could assist in better management for production system. Different soil properties in five land use (cassava, maize, cassava interplanted with (ipw) maize, fallow and orchard at five depths were observed on some soil properties important to crop growth. Soil profiles were described and sampled for morphological, physical and chemical analysis. The observation showed that soil at maize plot (pedon-2) and cassava plot ipw maize plot (pedon-3) were characterized by shallow depths, whereas those at fallow (pedon-4) and orchard (pedon-5) exhibited thickness with depth B_t and B_w horizon. Apart from parent material, climate and relief that influence soil characterized significantly, human activities such as terracing, deforestation and cultivation without proper land management practices also act as major determinant factors that influenced the soils of the area. Pedon-1,2,3 had been classified as ultisols while pedon-4 and 5 was inceptisols. Both had significant influence on crop production.
Key words: Land use, parent materials, morphological and characterised

Introduction

Soil classification is the systematic arrangement of soils into groups or categories on the basis of characteristics (Msanya *et al.*, 2003). The purpose of the soil classification is to organize the properties soils so that this knowledge can be used to predict the behaviour and performance of soils. Such predications are of value to growers, engineers, land owners extension agents, and government officials.

The main purpose is to establish groups or classes of soils under study in a manner useful for practical and applied purpose in (a) predicting their behavior (b) identifying their best uses (c) estimating their productivity and (d) providing objects or units for research and for extending and extrapolating research results.

Crop production in Igboora is still carried out through deforestation marginal lands and unclassified soils with inadequate investments in soil conservation measures which also aggravates soil erosion. Also the farming system is traditional; modern agricultural technology is not applied in most parts of the town. As a result many agricultural soils in Igboora have reached a critical point of degradation. Nowadays, shortage of land for cropping and grazing have forced the farmers to reduce the fallowing period on the flatter areas and remove crop residue for household fuels and animals feed which in turn have led to the reduction of soil nutrients and crop productivity. The situation at the study area is worse and the soil resources have degraded at an alarming rate due to inadequate classification that will

enhance continuous cropping. This study, therefore, was involved at Oyo State College of Agriculture and Technology (OYSCATECH) Teaching and Research Farm and surrounding Farms in Igboora area with the aim of classifying the soil using the USDA soil Taxonomy and the World Reference Base for soil resources; to determine the potentials and limitation of the soils in the study area for agricultural productivity following the standard system of land capability classification.

Materials and methods

The study was conducted at the Teaching and Research Farm, of Oyo State College of Agriculture and Technology, Igboora in Ibarapa Central Local Government area of Oyo state, Nigeria. It is located at about 240/km away from the Oyo State capital city, Ibadan, in the South-western Nigeria and 5/km away from town.

Teaching and Research Farm is characterized by sub-equatorial climate with a average temperature fluctuating between 675.4mm-100mm (Oyo State College of Agriculture and Technology, Igboora meteorological station, 2019). Igboora is situated in the derived savannah transition zones of the Southwestern Nigeria. The rainfall has a characteristic bimodal distribution with peaks occurring in July/September and October and a period of lower precipitation mostly in August. Dry season lasts from November to March.

The annual rainfall distribution enables two distinct cropping seasons. The first planting start from late April to early August while the second shorter season starts from late August to November. The length of cropping season is about 211-270days.

Through a reconnaissance field survey the land was demarcated using transect walks, anger observation and description, the representative study site on the basis of altitudes, landforms and other physiographic attributed were established during the field work proper at each observation site, were studied and data collected on landform soil morphological characteristics (including soil colour, texture, consistence, structure, porosity, and effective soil depths), elevation, slope gradient, parent material (lithology), natural vegetation, natural drainage, erosion and land use crop were recorded. These data were filled in form adopted from the FAO guidelines from description (FAO, 2006). Sampling site were located by international coordinate determined by using Global Positioning System (GPS) (Model GARMIN etrex 20). From the reconnaissance survey, sites that represent the major landforms and soil were selected along a transect from Eastern part of teaching and research form to western part.

Particle size analysis was determined by hydrometer method (Bouyoucos 1962 as modified by Gee and Bauder, 1982). The pH of the soil was determined in pH in water (1:2.5 soil to water ratio.

Soil Profile Excavation

Based on the information obtained from free reconnaissance survey, transverse were cut and spaced at 50meter apart at each delineated unit and points of observation were fixed at the intersection of the perpendicularly running transects. After this, soils with similar characteristics are grouped together as same mapping unit. Soil profile pits were located and dug (1.5m x 1.5m x 2.0m) to represent each of the identified delineations on the farms. The selected units and their respective soil profiles are: pedon-1 (Cassava plot), pedon-2 (Maize plot), pedon-3 (Maize ipw Cassava), pedon-4 (Fallow) and pedon-5 (Orchard), in Teaching and Research Farm, Igboora (Table 1). Soil profiles pits were studied and described according to FAO guidelines for soil description (FAO, 2006). Collected soil samples were described for morphological characteristics, physical and chemical properties.

Results and discussion

Field description and laboratory analytical data were used to classify the soils of the study areas according to the USDA soil taxonomy and the world reference base for soil resources. Soil diagnostic horizons, properties and materials used in soil classification were presented in Table 1 present summary of the diagnostic properties of the studied soils, which allowed the classification of the soils up to the TIER-2 of the FAO Worlds Reference Base Classifications Scheme. At the lowest categories, the soil of the study area had been classified up to the family level of soil taxonomy. At first (order) level of the USDA soil taxonomy the soil have been classified as ultisols (pedon-1 2 and 3) and inceptisol (pedon-4 and 5).

The soil profiles, had thick (0-65cm) surface horizons moist colour of 7.5YR and 10YR, dark and very weak to medium structure, the organic carbon content of the surface horizons of the pedon ranged from 0.39 to 2.28%. The region is characterized by hyper thermic temperature and udic moisture regimes based on the estimates made using the mean annual and monthly temperature and moisture distributions of the region, respectively. Thus, the three pedon were classified as udepts on the bases of soil moisture regime at the suborder level. Further, the pedons did not have a densic, paralithic contact within 150cm; and did not have a clay decrease of 15% or more from the maximum clay content; hence, they were classified as humults, dystrhumults and typic dystrhumults at suborder, great groups and subgroups, level respectively.

Table 1: Summary of diagnostic features soils and classification according to USDA soil Taxonomy of soils in the study area

Pedon No	Diagnostic horizon (s)	Other diagnostic features	Order	Suborder	Greatgroup	subgroup	Family
Pedon-1: Cassava plot	Orchric Epipedon Argillic Horizon	Summit of the landscape, with Ap horizon, 0-65cm depth had sediment, derived savannah. Cultivated cassava, slight sheet erosion, well drained, graavelly loamy sand, weak fine and medium granula structure, non-sticky and non plastic (wet) firm (moist), udic hyper thermic STR, presence of clay sexquioxide cutans, lithic contact.	Ultisol	Humults	Palehumults	Typic palehumults	Fairly level, slight sheet erosion, well drained, gravelly loamy sand, weak, fine and medium granula structure, non-sticky and non plastic (wet) firm (moist relatively thick medium acid, typic palehumlts
Pedon-2: Maize plot	Udic epipedon argillic horizon	Summit of the landscape with Ap horizon, 0-65YR, sediment, derived savannah. Cultivated with maize, sheet	Ultisol	Humults	Palehumults	Typic palehumults	Mountainous, very deep, loamy over clayey, strongly acid, udic, thermic, typic palehumults

		erosion, well drained gravelly loamy sand, fine and stick and non-plastic (wet) firm (moist), relatively thick, medium acid udic SMR, Hyper thermic STR, presence of phyllosilicate clay, lithic contact					
Pedon-3: Maize ipw Cassava	Udic epidedon argillic horizon	Summit of the landscape with Ap horizon, 0-65cm had 7.5YR, 65-125 had 10YR, sediment, derived savannah with cultivated maize IPW cassava, slight sheed erosion, well drained very week, medium and clear and smooth structure, loamy sany, medium acidic, too low in organic matter too thin or too dry, petroferric contact, udic SMR hyper thermic STR	Ultisol	Humults	Palehumults	Typic Dystrudepts	Fairly level, slight sheet erosion, well drained, gravelly loamy sand weak, fine and medium granula structure, non-sticky and non plastic (wet) firm (moist relatively thick medium acid, typic palehumlts, udic thermic, typic palehumults.
Pedon-4: Fallow land	Mollic Epipedon, cambic horizon	Gently slope sediment. Derived savannah with fallow, rill erosion colour, humus rick (>1% OM) slightly acidic, high base saturation, presence of clay hums and clay sexquioxide cutans, udic, SMR, hyper thermic STR.	Inceptisol	Udepts	Dystrudepts	Typic Dystrudepts	Gently slope, sediment well drained very thick darck colopur humus rich, slightly acidic, high base saturation, sexquioxide oside urtan
Pedon-5: Orchard	Mollic Epipedon, cambic horizon	Gentle slope, 0-65cm had 2.5YR. Derived savannah cultivated with orchard rill erosion,	Inceptisol	Udepts	Dystrudepts	Typic Dystrudepts	Steeply dissected, very deep, clayey over loamy medium to

	well drained, very thick, dark colour, humus rick base saturation, presence of clay hums and clay sexquioxide cutans, udic SMR, hyper thermic	slightly acid, udic, thermic, Typic haslustepts

Since the ultisol and inceptsol were the soil order of the studied area, orchard and fodder crops should be encourage in these areas. This will help in stabilizing the soil from erosion by their extended roots and reduce leaching of cations. The use of progressive and bench terraces should be promoted for soil and water conservation, particularly in highly mountainous area of Ibarapa

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ASSESSMENT OF FOOD-FRAUD RELATED ISSUES AMONG CASSAVA FARMERS IN IBARAPA COMMUNITIES OF OYO STATE, NIGERIA

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Abstract
Food fraud is the commonly adopted terminology for discussing intentional deception in the sales, advertising or labelling of food or food ingredients to achieve an economic benefit. It is an evolving problem in Nigeria that has led the food and processing agricultural sub-sector internationally unaccepted. The aim of this study is to investigate the current trend and unnoticed area of fraud in cassava value chain activities in the study area. A total of 98 cassava farmers were systematically sampled. Structured interview guide was used to collect data on socio-economic characteristics of cassava famers, food fraud related activities in cassava production practices in the study area and farmer's perception to zero fraud cassava production practices. Data were analyzed using descriptive statistical tools. From the results; mean age of the cassava farmers in the State was 45years. More than average (52.3%) of the cassava farmers were male and literate. Area of fraud identified in cassava value-chain activities were fake description/name of cassava stem cutting for planting, poor and unprofessional processing line of major cassava products, incompliance with regulatory agency in term of quality content of product. Perception of farmers to fraud related issues in cassava production as matter of concern had grown to be subject of relevance to production activities of the cassava farmers as majority (70.4%) of the cassava farmers had high level of esteem/perception to zero food-fraud related activities in the study area. Recommendation are made for farmers to take advantage of international best practices for better sale and commercialization, adopt improved crop varieties, and to process and sustain better quality cassava produce.
Keywords: *Food-Fraud, Cassava Value-Chain*

Introduction

Fraud in connection with food is not recent. For economic gain, most early food laws and codes concentrated on adulterants. Food fraud is a continuous race between food fraudsters who devise new ways to defraud their customers, and officials and careful buyers who try to catch them. To deal with this, legal interventions alone are not enough, as awareness campaign can go a long way to bridge the gap. The 2006 World Food Summit agreed to the definition of food security as access by all people at all times to enough and nutritionally adequate and safe food for an active and healthy life (FAO, 2010). There is a lack of published reviews about food fraud in Nigeria, especially concerning adulterations in different categories of food products and production. This study examined economically motivated food fraud in the area of cassava value-chain production sub-sector in the study area. In addition, alternatives are proposed to minimize these incidents based on good practices, traceability systems and development of methods to detect food fraud and adulteration in cassava production practices. Cassava-dependent farmers in remote locations have no access to knowledge in identifying different type of cassava varieties of fresh roots

and traditionally processed their cassava products, thereby limiting linkage for industrial supply and export standard of their produce. These further limit their distance to more rewarding markets because of their characteristic (poor quality and safety). Many years of research that were focused on improving cassava-value-chain productivity have not effected the much-needed impact on cassava sustainability and international best practices in cassava production and processing. Farmers therefore have a limited opportunity as the market for traditionally processed products is restricted to village-level and household consumption; even when opportunities for better sale is available from the commercial sector, inability of smallholders to adopt improved crop varieties, process and produce better quality foods are subject to food fraud; thereby limiting cassava production sector from international acceptance. The general objective of the study is to identify areas of fraud related issues in cassava value-chain production among cassava farmers in Ibarapa Communities of Oyo State, Nigeria.

Literature review

Fraud in the context of food means that a deception in any form, from the origin of food/product. Food composition and how it has been obtained and/or prepared, shall be truthful, i.e. nothing of lesser economic value must be added, or removed if it is of higher economic value (Ezedinma, *et al.,* 2006) If food is fraud, i.e. the information about origin, composition provided to customers is not true and if this description is done with the intention to deceive the customer for financial gain, food fraud known as economically motivated adulteration is committed. The fight against food fraud calls for a global approach involving cooperation and consultation among all stakeholders at all levels of the food chain. Investigations carried out by Europol (2010) suggest that organized crime syndicates are increasingly behind cases of food fraud and adulteration. Consequently, the detection and prevention of food fraud requires strategic planning and investment at national level (FAO, 2010).

Theoretical Model

Quality- Quantity Interaction Model

Food security is an all-encompassing concept/model that can generally be addressed at global, regional, national, sub-national, community, household and individual levels (Smith, 2004). The development of the model of food security was initially done with a relatively clear focus on national and international food supply. In the 1970s, food security was mostly concerned with national and global food supply. However, in the 1980s, the focus shifted to questions of access to food at household and individual levels. The relationship between product quality and quantity is vertical issue in producer quality decision but has not obtained enough concerns. Spence (1975) and Sheshinski (1976) offered the original quality quantity interaction model. The two studies stimulated a series of follow-up theoretical and empirical studies (The, 2022). He obtained the relationship between quality and quantity from the social welfare perspective. However, quality and quantity are dependent on producer behaviors. Therefore, different from those prior studies, we capture quality quantity interaction from the primary objective function of a profit maximization firm under monopoly conditions. The conclusions can be expanded to other market structures by employing competition except in perfectively competitive market because firms in market are priced receivers.

Methodology

The Study Area

The study was carried out in Ibarapa Area of Oyo State. The area is made up of Three (3) Local Government Areas namely: Ibarapa East, Ibarapa Central and Ibarapa North Local Government Areas (LGAs) in Oyo State, Nigeria. The vegetation of the area is largely savannah, thus allowing the cultivation of wide array of arable and perennial crops. The rainfall pattern in the study area follows a tropical pattern with an annual rainfall ranging from 1000m to 143mm and fairly high temperature. The occupation of the people is largely farming (predominantly subsistent farming) with some pockets of commercial activities.

Population, Sampling Techniques and Sample Size

The population of the study comprised cassava farmers in the three local government areas that made-up the study area. Stratified sampling procedure was used to sample Twenty- Five percent (5%) of the registered cassava farmers in the selected blocks/L.G.A. in the selected study area. The blocks selected were Igboora, Igangan and Eruwa blocks. The list of members of the Nigeria Cassava Grower Association in the selected blocks were 1, 001, 800, and 699 cassava farmers, respectively. The stratified selection of five percent gave us a sample selection of 50, 40 and 35 cassava farmers from Igboora, Igangan and Eruwa blocks, respectively. A total sample size of 93 cassava farmers was sampled.

Method of Data Collection and Analysis

Data were collected via the use of questionnaire and interview schedule for the illiterate. The data collected was analyzed with descriptive statistical tool. The descriptive statistics used were frequency count, percentage distribution and mean score.

Results and discussion

Distribution of cassava farmers by their personal characteristics

Result on personal characteristics of the cassava farmers as presented on Table 1 revealed the following: The mean age of the cassava farmers was 48 years, with minimum and maximum years of 28 years, and 85 years, respectively. Also, 57% of the respondents were male while 47% were female. Majority (97%) of the respondents engaged in farming as their major occupation while 3% were into non-farming activities, with mean farming experience of 23 years. Furthermore, educational status of the respondents shows that 11% of the respondents had tertiary education, 34% had secondary education while 4% had primary education 9% had no formal education.

Multiple responses on cassava value chain activities engaged in by the respondents revealed 24% of the cassava farmers were into cassava cultivation while 53% were into processing and 22% were into marketing of cassava produce. Table 1 further revealed that 74% of the respondents engaged in cassava cultivation, 1% of the respondents were into stem multiplication, 64% of the respondent were into cassava flaxes (Garri) processing, while 46% of the respondents further processed part of their cassava into Tapioca, 34% of the respondents were into High Quality Cassava Flour (HQCF) Production, 48% of the respondent were into *lafun*(Cassava Flour) production, 56% of the respondents were into cassava tuber merchant production, 6% of the respondents were into cassava produce sales in the study area.

Table 1: Personal Characteristics of the Cassava Farmers (n = 93)

Characteristics	Frequency	Percentage	Mean
Age			
25-45	31	31.6	
46-65	41	41.8	
66-85	21	21.4	45 years
Sex			
Male	51	52.0	
Female	47	47.3	
Level of Education			
Primary Education	4	4.1	
Secondary Education	34	34.7	
Tertiary Education	11	11.2	
No Formal Education	49	50.0	
Major Education			
Farming	92	98.9	
Non farming Activities	1	1.0	
Farming Experience in Years			
1-20	36	38.7	
21-40	50	53.8	
41-60	7	7.5	23 years
***Cassava Value-Chain Activities (Production/Cultivation)**			
Cassava Tuber Production	74	75.5	
Stem Multiplication	1	1.0	
Cassava Flask	63	64.3	
Tapioca	46	46.9	
HQCF	3	3.1	
Cassava Flour (*Lafun*)	48	48.9	

*** Multiple Responses**
Field Survey, 2022

Food Fraud Related Issues in Cassava Value chain among the Respondents

Results on Table 2 show area of food-fraud in cassava production value chain in the study area. Majority (90.8%) of the respondents felt there was deception on the part of cassava tuber buyers on starch content analysis, in order to offer cheaper price so as to cheat the sellers. Also 82.7% of the respondents expressed their awareness to food-fraud in the area of incompliance to environmental resolutely agency on best practices in food production value chain. The Fraud transpire through poor and unprofessional processing line of major cassava processing products which can directly or indirectly, leading to export rejection on cassava produces. Furthermore, 85% farmers expressed their exposure to food-fraud related issues in the area of fake description of cassava stem cutting varieties for planting, leading to unethical production principle.

Table 2: Area of Food-Fraud in Cassava Production Value Chain (n =)

S/N	Area of Food-Fraud Related Issues	Frequency/Percentage
1	Starch Content Analysis	89 (90.8%)
2	Poor Production Practices in Cassava value-chain	81(82.7)
3	Fake Description in Stem Cuttings	82(83.7)

Multiple Responses
Figure in parenthesis are in Parentage
Field Survey, 2022

Respondents Perception to Zero Food-Fraud in Cassava Value chain Production

Table 3 revealed distribution on perception of the respondents to zero food-fraud in cassava value chain activities in the study area. Variables on farmers perception on zero food-fraud in cassava value chain activities was operationalized and captured in proxy (Increased income as results of strict adhere to zero food fraud practices; Acceptability of brand produce/product by customer or consumer was as a result of zero food-fraud practices; Food-fraud activities form a major setback for cassava commercialization). The variables was measured on 5- likert scale of strongly disagree, disagree, do not know, agree, strongly agree. Result revealed that majority (76.5%) of the respondents strongly agreed to possibility of zero food-fraud and would result to increase in income of those who adhere to international best practice in area of cassava value chain production activities. Furthermore, 61.6% of the respondents agreed that abstaining from food-fraud issue in cassava value chain production activities brand the producer or processor from the consumer and customers. Also, 63.43% of the respondents strongly agreed that activities of food-fraud form a major setback to cassava commercialization and cassava agriculture production sub-sector in particular in the study area.

The results obtained was further analyzed for the minimum score, maximum score and mean score of the respondents perception to zero food-fraud cassava production in the study area. The Results further gave overall perception of farmers to food-fraud related activities in cassava production activities in the study area. Majority (70.4%) of the respondents were optimistic to zero food-fraud activities in cassava production. In contrast 29.6% of the respondents express impossibility to zero food fraud in cassava production activities in the study area.

Table 3: Perception of Farmers to Zero Food-Fraud Activities in the Study Area.

Level of Perception	Frequency	Percentage
Low Level of Perception (24 – 30)	29	29.6
High Level of Perception (31- 34)	69	70.4
Total	98	100

Mean = 31; Minimum Score = 24; Maximum Score = 34Source: Field survey, 2022

Conclusion

Based on the outcome of the research, it can be concluded that socio-economic characteristics of the respondents (age, marital status, education level, and household size, major and minor occupation) determined in the study area of cassava value-chain production activities of the

farmers. Furthermore, it was revealed that major areas of cassava food-fraud related issues was identified to be starch content analysis, poor production practices in cassava value-chain and fake description in stem cuttings sales. The research concluded that there is optimism to zero food-fraud related activities in cassava production.

Recommendations

Based on the outcome of the research, literacy awareness on food-fraud related activities should be encouraged by government and NGOs for food sustainability and meeting international best practices in agricultural production, indirectly increasing farmers' per capital income and increased government gross domestic product and export promotion.

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EFFECT OF PLANT POPULATION ON THE PERFORMANCE AND YIELD OF Corchorus *olitorius* L.

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Abstract
This experiment was conducted at the Teaching and Research Farm of the Faculty of Plant and Environmental Sciences, Oyo State College of Agriculture and Technology Igboora, Oyo State Nigeria during the planting season of 2021 to evaluate the effect of plant population on the growth and yield of Corchorus olitorius. A Randomized Complete Block Design (RCBD) experiment involving four plant populations (2.5, 5.0 7.5 and 10.0) plants per hectare (pph) was laid out with three replication. Data were collected on plant height, girth, leaf area, number of vegetables per hectare and weight of vegetables (kg/ha).Plant population significantly affected all the growth parameters considered with the exption of plant height. The optimum yield was observed from the population of 10kg/ha and produced the highest number of vegetables. However, increasing plant population increased yield of the vegetable thus the use of 10kg/ha is recommended for Corchorus olitorius production in the area.
Key words Plant height, Stem girth, Number of vegetable, Fresh weight, plant population

Introduction

Jute mallow (*Corchorus olitorius)* is an important leaf vegetable found in the wild and cultivated in many tropical countries of West Africa and Asia (Schippers; 2000, Fondio and Grubben, 2004). The leaves are mucilaginous like okra fruit, which is prepared as sauce. The leaves of Jute mallow is rich in calcium, galactose galaturonic acid, glucose, glucuronic acid, rhaminose, magnesium, iron and contain high percentage of vegetable protein (Fondie and Grubben, 2004; Ndiouv and Afolayan, 2008). The consumption of jute mallow in sufficient quantities produce taste palatability increased appetite and produce fair amount of fibers (Nath, 1993). It also play key role in neutralizing the acid produced during digestion of proteinous and fatty foods and also produce valuable roughages which promotes digestion and helps in preventing constipation (Hillocks, 1998)

Corchorus olitorius vegetable is popularly known as ewedu in the South Western part of Nigeria, where the soiled and mashed fresh leaf is a delicacy. High plant population is known to affect behavior of individual plant in terms of vegetative growth and reproductive development (Enyi, 1997). The quantity of seed planted per unit area of land (per hectare) will determine the growth, development and yield of the crop (Tamim, 2021). Excessive high seed rate will lead to very high population of *Corchorus olitorius* per unit area of land while low seed rate will also lead to low yield of the crop.

In Nigeria, optimum plant population considerations are not usually attained because plant population density is at the discretion of the farmer. In the face of declining trends in Nigeria self-sufficiency in vegetable production coupled with under nourishment of people with

malnutrition and hungry in the country, farmers production efficiency must be significantly increased in order to cope with rising demand. There is therefore, the need to determine the optimum plant population through appropriate determination of optimum seed quantity that will give the population. Hence, this study was initiated to determine the optimum plant population for the performance and yield of *Corchorus olitorius* in the environment.

Materials and method

Seeds of *Corchorus olitorius* were obtained from Towobowo market, Igboora in Oyo State, Nigeria. The experiment was an open field trial, carried out at the Research Farm of Faculty of Plant and Environment Sciences in Oyo State College of Agriculture and Technology Igboora, during 2021 planting season to examine the effect of plant population on the growth, development and yield of *corchorus olitorius*. The site was manually cleared with hoe and cutlass, and the weeds were packed along the borders to ensure a clean seed beds for sowing the crops. The land area used for the experiment was 8m x 6m. Seed beds dimension 1.5m x 1.5m were constructed with 15cm bed depth with a space of 0.5cm in between plots and replicates to facilitate movements of farm operations.

The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replicates and the treatments were 2.5, 5.0, 7.5, and 10kg of seed rates per hectares .The seeds were weighed and planted on September 8, 2021 by broad casting the seeds on beds. Appropriate and adequate cultural practices such as watering, weeding, fertilizer application, erosion control, disease control e. t. c. were maintained throughout the experimental period.

Two plants were randomly collected per plot for data collection on growth and yield parameter of the crop. This was done through the harvesting of the two crops by destructive sampling techniques by careful uprooting the plant plot by plot at 5 weeks after planting (WAP) just before the onset of the reproductive processes of the crops commences.

Plant height was measure using meter rule. Stem girth per plant was determined by using vernier caliper to measure the stem circumference using the formular C = 2^r. leaf area per plant. Leaf area per plant was determined by measuring the leaf length and breadth of crop and multiplied both together to get the average leaf area which was again multiplied with the total number of leaves per plant to get the total leaf area per plant. Number of leaves per plant was recorded through physical counting of leaves. Number of vegetable per plot was determined by physical counting while total fresh weight of vegetables was determined by weighing each harvest on the counter balance scale and summing up all the weights per plot at the end of the harvest.

Result and discussion

Table 1 shows the growth parameter of *Corchorus olitorious* in response to seed rates at 5 WAP. Seed rates did not significantly affect plants hieght. However, plants girth and leaf area are significantly different as a result of the effect of the different seed rates. The lowest seed rate (2.5) produced the biggest plant girth followed by 5.0 and 7.5kg/ha in that order while the smallest girth resulted from 10kg/ha seed rate and this similar pattern was also noticed from the leaf area recorded. The trend observed from the leaf area recorded occurs because the leaves had enough spaces to spread out to trap the environmental factors for growth especially where the seed rate was low. Also, the result of the girth may be because competition for growth factors and edaphic factors increased with increase in plant population (high seed rate) hence, the lower seed rates performed better.

Table 1: Effect of plant population (seed rate) on the growth of *Corchorus olitorius* at 5 weeks after planting (WAP)

Treatment	Plant height	Girth	Leaf area
Kg/seed rate	(CM)	(CM)	$(CM)^2$
-2.5	30.46a	2.93a	7094.06a
5.0	34.30a	1.39b	909.41b
7.5	36.23a	0.72c	529.23c
10.0	39.46a	0.36d	262.82d

Means with the same letters in the same column are not significantly different at 5% probability level.

The effect of seed rates on *Corchorus olitorius* is presented in Table 2. Increase seed rate resulted in higher number of vegetable and weight of vegetable produced in kg/ha Yield per plant was highest in 10 kg seed rate per hectare (6287.02) for number of vegetables produced and 13037.02 recorded for weight of vegetable in kg/ha. The difference among seed rate was significant and the highest was obtained from 10kg/ha of seed rate while the use of 2.5kg/ha seed rate had least yield per hectare for both number of vegetable and weight of vegetables produced per hectare. Thus, in this trial, yield was increase through higher rates of seed rates. Increasing seed rate per hectare gave rise to increase in the number of vegetables and weight of vegetables recorded.

Table 2: Effect of Plant population (seed rate) on the yield of C*orchorus olitorius*

Treatment	Number of vegetable	Freshweight of vegetable
(Kg/ha seedrate)	(/ha)	(kg/ha)
2.5	2059.20b	6296.29a
5.0	2814.81b	9037.03c
7.5	3092.58b	11851.84b
10.0	6287.02a	13037.02a

Means with the same letters in the same column are not significantly different at 5% probability level.

The above findings observed ascertain the previous work that indicated seeding rates to be significantly affected biological yield (Ayaz *et al.,* 1997). Higher seeding rates compensated for reduced tiller development and promote main stem spike which can be favourable especially for cultiver that tend to produce fewer tillers in rice production (Stanggenborg *et al.,* 2003). Thus Zhen wen *et al. (*1988) further confirmed that a close relationship exists between wheat stands and yield components.

Conclusions and recommendation

From the result, it can be concluded that as seed rate increases, there is corresponding reduction in the girth and leaf area of *Corchorus olitorius* while number of vegetable plants and yield per hectare increase with increase in seed rate. This study indicated that ‘ewedu” production can be increased to ensure food sustainability through appropriate plant population (seed rate). In this study, the optimum number of vegetables per hectare (6, 287.02) and herbage yields (13037.02) was produced from the use of 10kg/ha of seed rate. The use of 10kg/ha of seed rate is recommended to ewedu farmers in the region of investigation.

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EVALUATION OF GROWTH AND YIELD OF THREE SELECTED OKRA (*Abelmoschus esculentus* (L.) Moench) VARIETIES

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Abstract
Study was carried out on the growth and yield differences of three okra varieties; L-47-4, LD- 88, and Ado local for better selection. The seeds (L-47-4 and LD 88) were obtained from (NIHORT) while Ado Local was from farmers shop at Igboora. The study was carried out at the Teaching and Research Farm, Oyo State College of Agriculture and Technology, Igboora, Nigeria. Three okra seed varieties were sown, arranged in a Completely Randomized Design (CRD) and replicated four times. Okra seeds were harvested at the physiological maturity. Data collected were plant height, number of leaves, stem diameter, leaf area, number of fruits, weight of dry fruit, weight of 100 seeds and seed yield per plant. Data collected were subjected to Analysis of Variance (ANOVA) and the means were separated by Least Significant Difference (LSD) at 5% level of significance. Ado local performed better in number of leaf (9.25), stem diameter (4.25 mm), and leaf area. L-47-4 had the highest plant height and yield components (days to flowering (49.50), length of fruit, weight of fruit, number of seeds per pod and weight of 100 seeds) among the three varieties of okra considered. Ado local can be recommended for human consumption and livestock feed because of it significant higher leaf production and moderately leaf area. L-47-4 is recommended for industrial use in the production of fibre because of it large leaf area and taller plants production. Also, L-47-4 had the highest length of fruit, weight of fruit, number of seed per pod and weight of 100 seeds and thus, recommended for commercial production in the study area.
Key words: Growth, Yield, Plant height, Okra, Varieties.

Introduction

Okra (*Abelmoschus esculentus* L.) belongs to the *Malvaceae* family. It is native to tropical Africa where it serves as staple vegetable crop (Kochhar, 1986; Hammon and Van Stolen, 1989). Hammon and Van Stolen (1989) also reported that there are 2,283 accessions out of which 2,029 were collected from the African continent of which 1,769 are from West Africa. The crop is therefore heavily represented in West Africa than other parts of the world (Hammon and Van Stolen, 1989). It is an annual crop with life-span ranging from 1 to 5 months depending on the species. The seeds are round, greyish and relatively large (about 1.5 to 3 mm). Worldwide, okra product as fresh fruit vegetable was estimated at 4.8 million tonnes, but most of the production was in India (70%) followed by Nigeria (15%), Pakistan (2%), Ghana (2%) and Iraq (1.7%) (Gulsen and Denton, 2007). According to Grubben and Denton (2004), *Abelmoschus esculentus* (L.), accounts for 90-95% of the global production while West African okra contributes the remaining 5-10%.

Grubben and Denton, (2004) reported that okra production in West and Central Africa has reached about 500,000 – 600,000 tonnes annually with West African okra making up half of the amount. The potential of the seeds as a new source of plasma replacement or blood volume expender was emphasized by Siemonsma and Kouame (2004), West African okra is a

popular vegetable in Nigeria, most of the okra pods available are harvested from wild unselected plants with associated low pod yields and poor pod qualities. The importance of the crop as a vegetable lies in its wide acceptability due to its flavour and viscosity which aids easy consumption of bulky and relatively hard foods like cassava pastes and pounded yam (NIHORT, 1987). In addition to being rich in vitamins A, B and C, the leaves also contain higher quantities of protein (2.7 to 3.0%) than the pods, a significant amount of riboflavin and folic acid (Martin *et al.*, 1979; Adelusi *et al.*, 2006; Hegazi and Hamideldin, 2010). These popular uses of okra have fueled an increasing demand for the crop and a search for sample in viable ways in order to increase the supply of the product and identify favourable farming conditions. Thus, attention has gradually shifted towards improving the genetic quality of the species through plant breeding and selection.

Materials and methods

The study was carried out at the screen house, Oyo State College of Agriculture and Technology, Igboora, Nigeria (Latitude 7° 29‘N and Longitude 3° 3‘E). Three lines of okra were used to assess the differences in growth and yield in LD-88, L-47-4 (NIHORT), and Ado local seeds during the late season of year 2021. Soils were collected randomly by soil auger at 0-15 cm distance at different locations on the site. The soil was bulked, air dried and sieved through 2 mm sieve before the three varieties of okra (*Abelmoschus esculentus* L.) were sown in pots with the capacity of 7 kg soil while the experiment were laid out in a Completely Randomized Designed (CRD) with three (3) varieties of okra that were replicated four (4) times. Two seeds were sown per pot. After germination, seedlings were thinned to 1 per pot at 2 weeks after sowing (WAS). Okra seedlings were watered late in the evening, cypermethrin was applied as pesticide and removal of unwanted plants were carried out regularly. Data collected commenced at 3 weeks after sowing (WAS) until physiological maturity on plant height, number of leaves, stem diameter, leaf area, days to flowering, length of fruits, weight of fruit, number of seeds per pod , weight of 100 seeds and seed yield per plant. Data collected were subjected to analysis of variance (ANOVA) and significant means were separated using Least Significant Difference (LSD) at 5% level of probability.

Results and Discussion

Production of okra with optimum yield requires varieties with standard genetic information and good environments in which such varieties can strive and perform optimally. The three okra varieties evaluated for this study varied in some growth and yield traits which suggested genetic variations existed among them. Although, significant differences did occur in some characters but did not show in other characters.

Number of Leaves of Three Varieties of Okra

The number of leaves of the three okra varieties at 3, 4, 5, 6, 7 and 8 weeks after sowing (WAS) revealed that Ado local produced highest number of leaves at 7 and 8 weeks after sowing with 8.50 and 9.25 respectively, while L-47-4 produced the least number of leaves (4.75) at 3 WAS as shown in Figure 1.

Stem Diameter (mm) of Three Varieties of Okra

The stem diameter at 3, 4, 5, 6, 7 and 8 weeks after sowing showed that Ado local had the highest stem diameter of 4.25 mm produced at 8 weeks after sowing while L-47-4 had the lowest stem diameter of 1.25 mm at 3 weeks after sowing (Figure 2).

Leaf Area Performance (cm^2) of Three Varieties of Okra

Leaf area measured at 3, 4, 5, 6, 7 and 8 weeks after sowing revealed that L-47-4 had the highest leaf area of 147.79 cm^2 at 7 WAS but LD-88 had the least leaf area of 16.09 at 3 WAS (Figure 3).

Plant Height (cm) of Three Varieties of Okra

L-47-4 produced the tallest plants (34.75 cm) at 8 WAS as well as the shortest plants with 15.00 cm at 3 WAS (Figure 4).

Performance of Yield Parameters of Three Varieties of Okra

Ado local flowered very late (69.50 days), while L-47-4 flowered earlier at 49.50 days. L-44 had the highest fruit length per plant (9.75 cm), Ado local had least fruit length per plant of 6.65 cm. However, L-47-4 had the highest fruit weight of fruit 5.4 g while Ado local had lowest fruit weight of 4.62 g. L-47-4 had the highest seeds per pod (58.25), while Ado local had the least seeds per pod 55.75. L-47-4 had highest weight of 100 seeds of 5.18 g, Ado local had least weight of 100 seeds of 3.55 g as shown in Figure 5.

L-47-4 had proved to be an improved variety as it had been reported by some learned authors for better performance. Omotoso and Johnson, (2015) reported a significant increase in plant height for L-47-4 over TAE-38 variety. Increased number of pod as well as pod weight in improved variety (47-4) was higher than TAE-38.

Conclusions and recommendation

The varieties evaluated in this study expressed differences in their genetic composition as observed in the number of leaf, stem diameter, leaf area, plant height, days to flowering, fruit length, fruit weight, number of seed per pod and weight of 100 seeds. Ado local however, performed wonderfully well in number of leaf, stem diameter, and leaf area. L-47-4 had highest performance in plant height and yield parameters (days to flowering, length of fruit, weight of fruit, number of seeds per pod and weight of 100 seeds amongst the three varieties of okra tested though, not statistically different from other varieties. Ado local variety is therefore recommended for human consumption and as livestock feed in the study area because of it higher leaf production and moderately leaf area. L-47-4 is also recommended for industrial use in the production of fibre because of large leaf area and production of taller plants. Similarly, L-47-4 had the highest length of fruit, weight of fruit, number of seed per pod and weight of 100 seeds and can be recommended for commercial production in the study area for its higher fruit production.

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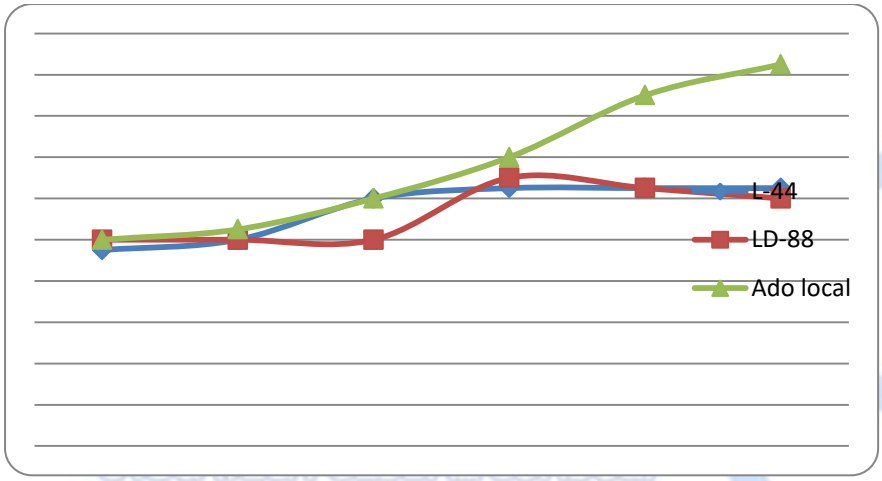
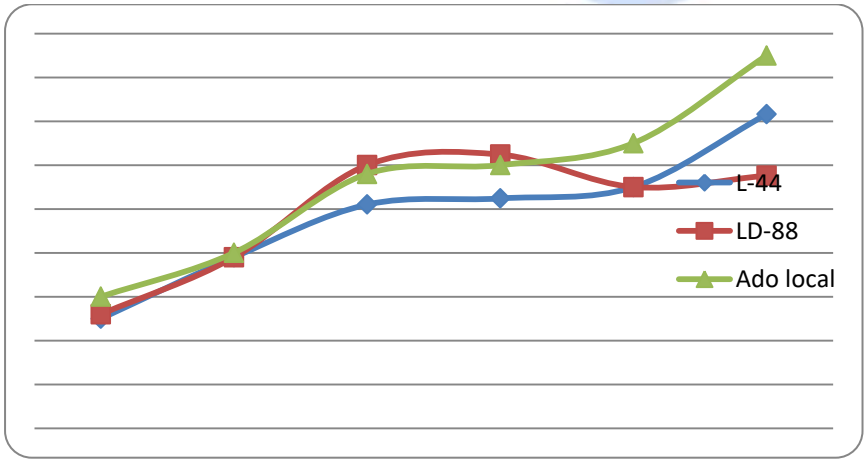
Figure 1: Performance of Number of Leaves of three Varieties of Okra



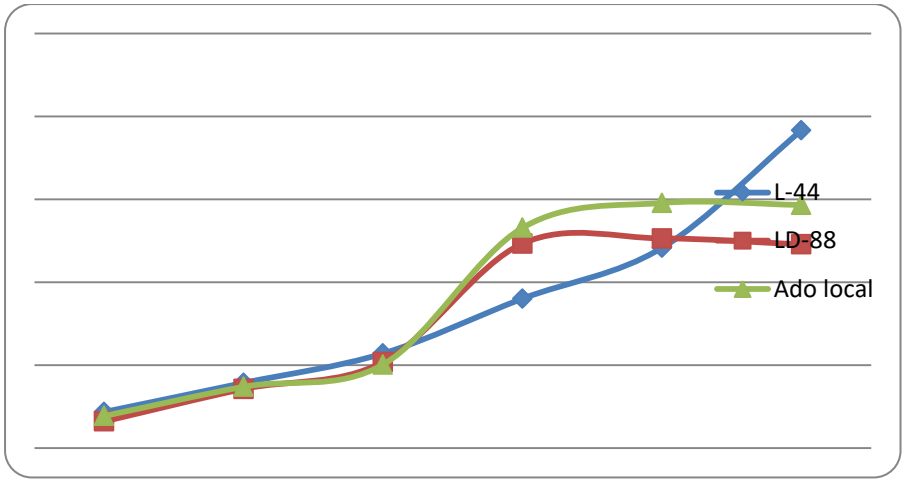
WAS= Weeks after sowing

Figure 2: Performance of Stem Diameter (mm) of Three Varieties of Okra



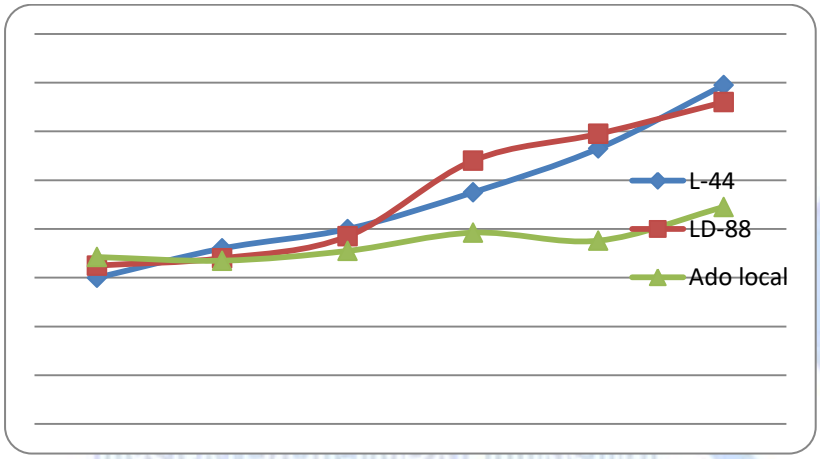
WAS= Weeks after sowing

Figure 3: Performance of Leaf Area (cm^2) of Three Varieties of Okra



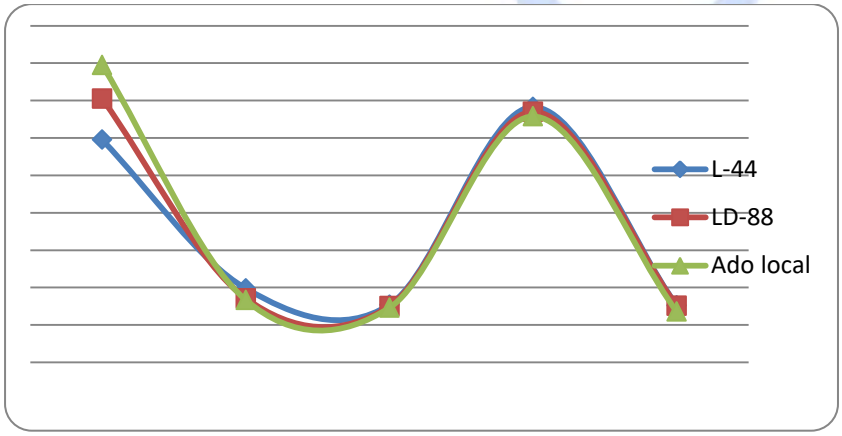
WAS= Weeks after sowing

Figure 4: Performance of Plant Height (cm) of Three Varieties of Okra



WAS= Weeks after sowing

Figure 5: Performance of Yield Parameters of Three Varieties of Okra



DFW = DAYS TO FLOWERING, LF/PLT= FRUIT LENGTH /PLANT, WGTF= WEIGHT OF FRUIT, NS/POD= NUMBER OF SEED /POD, WT100SD= WEIGHT OF 100 SEEDS/ SEED YIELD /PLANT

ADMINISTRATION, COMMUNICATION AND MANAGEMENT

WORK ENGAGEMENT STRATEGIES AND EMPLOYEE PERFORMANCE: A STUDY OF SWEETCO FOODS LIMITED, IBADAN, OYO STATE, NIGERIA

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Abstract
The success of any organization lies in the quality and adequacy of its workforce. The study investigated the effect of work engagement strategies on employee performance with particular reference to Sweetco Foods Limited, Ibadan, Oyo State, Nigeria, using a survey research design. Data were obtained using structured questionnaire administered to a sample size of one hundred and forty (140) staff obtained from the population of two hundred and fifteen (215) employees using Taro Yamani formula at 0.05 level of significance. The study adopted both descriptive statistics as well as inferential statistics. Findings revealed that work engagement strategies proxied by employee compensation, work environment, training and career development as well as employee involvement and participation have significant effect on employee performance. Therefore, it was recommended that the organization should input more strategies and techniques, resources and materials to maintain the current standard of work engagement with a view to meeting up with the increasing employee demands and expectations for efficiency and effectiveness.
Keywords: Engagement Strategies; Compensation; Employee Performance, Training.

Introduction

A reputable business entity recognizes the fact that organization's fortunes and goodwill are dependent on quality of human resources. Companies with engaged workforce tends to have low turnover and increased retention that translates to high productivity, profitability, growth and customer satisfaction. Githinji and Muli (2018) asserted that employee engagement is embarked upon to bring about a situation in which the employee, by free choice, has an intrinsic desire to work in the best interest of the organization. Armstrong (2012) posited that employee performance helps organization get better results in the competitive business environment; it aligns individual objectives to that of the organization and encourages them to uphold corporate core values. Higher employee performance promotes favourable economic growth, significant profitability, and greater social advancement and relations (Sharma and Sharma, 2014). The capacity to successfully manage relationships with employees can determine the long-term competitive edge in the market. At some point, the competition for the top specialists is frequently stronger than attempts to attract the client. Employers may improve their chances of attracting and keeping valuable individuals by creating a welcoming, advanced, and enabling work environment that promotes employee engagement (Motyka, 2018). Amid an increasingly competitive business climate, a work engagement strategy is essential to any organisation's continued existence and sustainable development (Gupta and Shaheen, 2017).

Engagement begins with business leaders demonstrating a strong commitment to the inclusion of employees as part of the organization's strategic plan (Taneja, Sewell and Odom, 2015). According to them this encompasses open communication and the introduction of ideas from employees on the business's strengths, weaknesses, opportunities, and threats (SWOT).

Business leaders should view employee engagement as a long-term commitment between managers, leaders, employees, and the business (Taneja *et al.*, 2015). Organisational goals and objectives can only be achieved with the availability of competent and skilled employees that are productively engaged and committed to organisation goals, work, research and creativity. Employees will also be more productively engaged, if encouraged to be actively involved in work processes and invigorated into the organisation's culture and practices (Vance, 2006; Gupta and Shaheen, 2017). Strategic engagement of employees remains sine-qua-non for building appropriate work behaviour and disposition. Therefore, the driving force of work engagement cannot be over-emphasized. This defines the relationships between the organisation and its workforce; thus, an engaged employee is physically, psychologically, socially, intellectually and emotionally fascinated and passionate about work (Hakanen, Schaufeli and Ahola, 2008) and they also strive to protect the interests and values of the organisation (Olivier and Rothmann 2007).

The Resource-Based View (RBV) theory suggests that performance is driven by the resource profile of the firm, whereas the source of superior performance is embedded in the possession and deployment of distinctive resources that are difficult to imitate. Resource-Based View theory posits that firms achieve sustainable competitive advantage if they possess certain key resources and if they effectively deploy these resources in their chosen markets (Barney, 2007). Schaufeli and Bakker (2004) advanced the three-component theory of engagement that work is a fulfilling state of mind characterized by vigour, dedication and absorption.

On the empirical front, Gruman and Saks (2011) researched a sample of 65 organisations in different industries; the top 25% on an engagement index had a greater return on assets, profitability, and more than double the shareholder value compared to the bottom 25%. According to the findings of Valentin, Valentin and Nafukho (2015) businesses lose approximately $300 billion per year due to disengaged employees.

Utilising different performance metrics, Schwartz (2011) conducted a study between 2007 and 2008 among 90,000 employees in 18 countries, found that companies with the most engaged employees had a 19% increase in operating income during the previous year, while those with the lowest levels had a 32% decline. Few studies on employee engagement in Nigeria included the work of Damaro (2022) using three (3) engagement strategies - meritocracy, employer branding, and succession planning - to assess employee retention in four (4) oil and gas firms and it was found that the strategies of employee engagement significantly influence employee retention in the organisation. The findings by Ashraf and Siddiqui (2020), Chandra (2019) were corroborated by same. Despite this, some organisations find it difficult to engage employees productively in Nigeria. Essentially, there are few studies conducted in manufacturing industries on work engagement strategies with none in food production. Hence, this study examined the effect of work engagement strategies on employee performance with particular reference to Sweetco Foods Limited, Ibadan, Oyo State, Nigeria. It specifically tested four hypotheses: (H_{O1}): Employee compensation does not have significant influence on employee performance of Sweetco Foods Limited, Ibadan; (H_{O2}): There is no significant relationship between training and career development and employee performance; (H_{O3}): Work environment does not influence employee performance; and (H_{O4}): Employee involvement and participation does not have significant influence on employee performance of the Sweetco Foods Limited, Ibadan, Oyo State, Nigeria.

Materials and methods

The study examined relationship between work engagement strategies and employee performance, in Sweetco Foods Limited, Ibadan, Oyo State, Nigeria, using descriptive survey design. The study has theoretical linkage with the resource-based view, Hertzberg's dual factor and three components theories of engagement. The study's population of two hundred

and fifteen (215) was sampled to obtain one hundred and forty (140) using Taro Yamani formula. The study employed primary data through the administration of questionnaires and face-to-face interviews to the staff, as respondents. The functional and linear transformation forms of the model are expressed in equations (1) and (2) respectively, as follows:

$Y = F(X_1, X_2, X_3, X_4)$ …….. (1)

$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$ …….. (2)

Where: Y = Employee Performance at Sweetco Food Ltd.

X_1 = Employee Compensation

X_2 = Training and Career Development

X_3 = Work environment

X_4 = Employee involvement and participation

β denotes regression coefficient and ε represents error term.

On a priori ground, $\beta_1, \beta_2, \beta_3, > 0$ *while* $\beta_4 < 0$.

Results and Discussion

Table 1: Socio-demographic Characteristics of Respondents

Characteristics	Category	Frequency *(n)*	Percentage *(%)*
Gender	Male	81	58
	Female	59	42
Age (Years)	20 – 30	16	11
	31 – 40	58	42
	41 - 50	31	22
	51 – 60	19	14
	Above 60	16	11
Education	GCE/SSCE	30	21
	NCE/OND	45	32
	HND/BSc	53	38
	Higher Degree	12	9
Department	Production	24	17
	Procurement	58	41
	Finance	8	6
	HRM	31	22
	Audit	8	6
	Marketing	11	8
Work Experience	0 – 2 years	25	18
	3 – 5 years	61	44
	6 – 11 years	42	30
	12 years and Above	12	8

Source: Researchers' Computation, 2023

Table 1 revealed the socio-demographic characteristics of 140 respondents. The distribution by gender indicated that 81 (58%) were male while 59 (42%) were females; thus the majority were male. The distribution of respondents by age indicated that 16 (11%) of the participants were in the range of 20 - 30years, 58 (42%) were within the age range 31 – 40years, 31 (22%) of the respondents were in the age range 41 - 50 years, 19 (14%) were in the age range 51 – 60 years while those older than 60 years represented 16 (11%). This shows that most staff at the Sweetco Food Limited were within the age range of 31years – 40 years. The proportion of respondents with GCE/SSCE qualifications were 30 (21%), 45 (32%) were NCE/OND holders, 53 (38%) were HND/BSC holders while 12 (9%) held higher degrees. It implies that majority of the respondents held HND/BSc qualifications. Based on distribution by departments, 24 (17%) were in Production, 58 (41%) were in Procurement, 8 (6%) were in

Finance, 31 (22%) were in Human Resource, 8 (6%) were in Audit and 11 (8%) were in Marketing departments. The spread across departments indicated the highest number of staff in the procurement department. Similarly, based on work experience, 25 (18%) had between 0 and 2 years, 61 (44%) had 3 to 5 years, 42 (30%) had 6 to 11 years, while 12 (8%) of them had 11 years and above. Thus, majority of the respondents had 6 to 11 years' work experience.

Test of Hypotheses

This section reveals the findings following the test of hypotheses formulated to validate this work.

Hypothesis One (H_{O1}): Employee compensation does not influence employee performance.

Table 2: Linear Regression Test of influence of Employee compensation on employee performance.

Variables	Co-efficient	Standard Error	t-statistics	P-value
Constant	5.109	3.086	24.452	0.000
Employee compensation	4.233	3.042	11.489	0.001

R square: 0.807 No. of Observation: 140
Adjusted R square: 0.802 R: 0.901
F-statistics: 101.221

Table 2 shows the linear regression to predict the influence of employee compensation on employee performance. As the model shows F (1, 138) = 101.221, $p < 0.05$, it indicates that employee compensation does influence employee performance with the significance values reported less than 0.05 ($p = .001 < 0.05$). Thus, we accept the alternative hypothesis to validate that employee compensation has significant positive influence on employee performance of the Sweetco Foods Limited, Ibadan, Oyo State, Nigeria**.**

Hypothesis Two (H_{O2}): Training and career development does not have significant relationship with employee performance.

Table 3: Test of a significant relationship between training and career development and employee performance.

	Variable	Mean	SD	N	1	2	P
1	Training and career development	4.214	1.574	140	1		0.000
2	Employee performance	4.010	0.792		0.759*	1	

*P<0.05

Source: SPSS computation 20.0

Table 3 indicates positive relationship between training and career development and employee performance. Also, p-value 0.000 is less than 0.05 (significant level); thus, the null hypothesis that training and career development has no significant relationship with employee performance was rejected while the alternative hypothesis was accepted.

HypothesisThree (H_{O3}): Work environment does not have significant influence on employee performance of the Sweetco Food Limited, Ibadan, Oyo State, Nigeria**.**

Table 4: Linear Regression Test of influence of Work environment on employee performance.

Variables	Co-efficient	Standard Error	t-statistics	P-value
Constant	3.214	2.140	11.452	0.000
Employee compensation	3.017	2.004	9.489	0.001

R square: 0.577 No. of Observation: 140
Adjusted R square: 0.702 R: 0.807
F-statistics: 92.014

The model indicates F (1, 138) = 92.014, $p < 0.05$ impying that work environment does influence employee performance, this is because the significance values reported is less than 0.05 ($p = .001 < 0.05$). We therefore reject the null hypothesis and accept the alternative that work environment does influence employee performance**.**

Hypothesis Four (H_{O4}): Employee involvement and participation does not influence employee performance.

Table 5: Linear Regression Test of influence of employee participation on employee performance.

Variables	Co-efficient	Standard Error	t-statistics	P-value
Constant	6.214	2.140	11.452	0.000
Employee compensation	5.001	2.004	9.489	0.001

R square: 0.717 No. of Observation: 140
Adjusted R square: 0.614 R: 0.504
F-statistics: 82.323

The model shows F (1, 138) = 82.323, $p < 0.05$ indicating that employee involvement and participation do influence employee performance as the significance values reported are less than 0.05 ($p = .001 < 0.05$). Thus, we accept the alternative hypothesis that employee involvement and participation do influence employee performance**.**

Conclusion

The study examined work engagement strategies and employee performance at Sweeto Food Limited, Ibadan, Nigeria. From the analysis of the four hypotheses tested, it was found that work engagement strategies proxied by employee compensation, work environment, training and career development and employee involvement and participation have significant influence on employee performance in the study study location. The findings of Damaro (2022), Ashraf and Siddiqui (2020), and Chandra (2019) corroborated same. Thus, it was recommended that the organization should adopt more strategies and techniques to commit ample resources and materials to maintain the current standard and to improve to meet up with increasing employee demands and expectations for efficiency and effectiveness.

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EFFECT OF SMALL SCALE BUSINESSES ON POVERTY ALLEVIATION AND INSECURITY IN NIGERIA (A STUDY OF IBARAPA CENTRAL LOCAL GOVERNMENT AREA)

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Abstract
Small-scale businesses, often operated by micro-entrepreneurs, have emerged as vital forces in addressing diverse socio-economic issues, high poverty rates and persistent insecurity facing Nigeria. This study explores the significant roles that small-scale businesses play in mitigating poverty and insecurity in Nigeria. The study employed a descriptive and quantitative approach as first hand data was retrieved from the respondents. The study employed the use of questionnaires on a 5-point Likert scale, from the target sample size using Taro Yamanne formulato determine 147 small scale businesses registered in Ibarapa Central Local Government Area, Igboora, Oyo State. The data were analyzed using SPSS software via frequency counts and presented in tables and percentages, while regression t test was carried out in order to achieve the research objectives. It was revealed that there was significant relationship between small scale business and poverty cum insecurity in Ibarapa Central Local Government Area, Igboora, Oyo State. Thus, the study recommended that government and financial institutions should develop innovative financing mechanisms such as microfinance and loan guarantee programs to curb the incessant poverty rates and insecurity. These initiatives can provide entrepreneurs with the necessary capital to start or expand their businesses, ultimately reducing poverty and insecurity.
Keywords: *Small Scale Business, Alleviation, Insecurity and poverty*

Introduction

Nigeria, with vast population and abundant resources possesses immense potential for economic growth. However, the country also grapples with high poverty rates and persistent security concerns. Small businesses, characterized by their local and often informal nature, have emerged as vital agents of change in these areas Through job creations, income generations, and community empowerments, small businesses serve as powerful tools for poverty alleviation and fostering stability. Poverty and unemployment are significant drivers of insecurity, including crime, violence, and social unrest. By providing employment opportunities and economic stability, small-scale businesses can reduce the vulnerability of individuals to engaging in illicit activities or being recruited into criminal networks. Furthermore, these businesses contribute to social cohesion and community development, fostering a sense of belonging, empowerment, and collective responsibility among community members.

One of the primary ways small businesses address poverty is by providing employment opportunities. Nigeria's unemployment rate has remained persistently high, particularly among the youth population. Small businesses, with their agility and flexibility, are well-suited to absorb labor and create jobs. By offering employment, these enterprises provide individuals with a means to escape poverty, improve their living standards, and contribute to the overall economic development of the country.

Small-scale businesses provide a means of livelihood for individuals and families, lifting them out of poverty and reducing dependence on government welfare programs. By generating income, these businesses enhance the overall economic well-being of individuals and communities, thereby contributing to poverty reduction efforts.

Small businesses stimulate economic growth at the local level. They contribute to the diversification of Nigeria's economy, reducing its overreliance on the oil sector. By operating in various industries, such as agriculture, manufacturing, and services, small businesses enhance productivity and create new economic opportunities. This diversification promotes inclusive growth, allowing individuals from marginalized communities to participate in the economic mainstream, reducing income disparities and ultimately mitigating poverty.

In addition to poverty reduction, small businesses also play a crucial role in addressing insecurity in Nigeria. Poverty and insecurity are closely intertwined, with poverty often serving as a breeding ground for various forms of unrest and criminal activities. By creating employment and economic opportunities, small businesses reduce the vulnerability of individuals to engage in illicit activities driven by desperation and lack of alternatives. As more people find gainful employment and secure livelihoods, the overall security landscape of Nigeria improves, fostering stability and social cohesion.

Moreover, small businesses enhance community resilience by promoting local ownership and entrepreneurship. By empowering individuals to start their own businesses, these enterprises foster a sense of ownership and pride within communities. This sense of ownership translates into increased vigilance and cooperation among community members, leading to improved security outcomes. Furthermore, small businesses contribute to community development by investing in infrastructure, education, and healthcare, strengthening the social fabric and providing a foundation for long-term stability.

As micro-entrepreneurs grow their businesses, they stimulate economic activity, encourage local production and consumption, and foster entrepreneurship. These activities create a positive cycle of economic growth, leading to increased spending power and improved living standards. Moreover, small-scale businesses often source their inputs locally, thereby empowering smallholder farmers and local suppliers, further bolstering economic resilience.

Challenges Faced by Small Scale Businesses in Nigeria:

Small scale businesses in Nigeria face a number of common challenges, which can be broadly categorised into three main areas: financial, operational, and regulatory. Financial challenges include accessing capital, managing cash flow, and achieving profitability. Operational challenges include finding and retaining skilled staff, dealing with red tape and bureaucracy, and coping with infrastructure deficiencies. Regulatory challenges relate to getting the required licences and permits, complying with government regulations, and paying taxes. While each small business will have its own unique set of challenges to overcome, these are some of the most common ones faced by businesses in Nigeria. By being aware of these challenges and taking steps to address them, small businesses can increase their chances of success.

Strategies for Overcoming these Challenges:

There are many challenges faced by small businesses in Nigeria, but there are also some strategies that can help overcome these challenges. One of the biggest challenges is access to finance. This can be overcome by looking for alternative sources of finance, such as microloans, crowd funding, or government grants. Another challenge is finding and retaining good staff. This can be overcome by offering competitive salaries and benefits, and providing training and development opportunities. The final challenge is navigating the complex regulatory environment. This can be overcome by seeking out expert advice and assistance,

and staying up-to-date with changes in regulations. By following these strategies, small businesses in Nigeria can overcome the challenges they face and thrive.

Small-scale businesses have proven instrumental in addressing poverty and insecurity challenges in Nigeria. Their contributions to job creation, income generation, and community development play a pivotal role in fostering economic stability and resilience. Policymakers and stakeholders should recognize the importance of supporting and empowering small-scale businesses through tailored interventions, including access to finance, business development services, and infrastructure support. By harnessing the potential of these businesses, Nigeria can unlock new pathways towards sustainable poverty reduction and enhanced security for its citizens. Based on these aforementioned, the study explored the transformative effects of small businesses in reducing poverty levels and fostering security within the Nigerian context using Ibarapa Central Local Government Area, Igboora, Oyo State as a case study. It specifically sought to: (i) examines how these businesses create employment opportunities, particularly in rural and underserved areas (ii) examines the indirect impact of small-scale businesses on insecurity reduction (iii) analyzes the ripple effects of small-scale businesses on local economies.

Empirically, Ololade Tolulope Ibi-Oluwatoba , Abiodun Thomas Ogundele, Olaoye Claudius Awoniyi,. Isaac Olaitan Okeya (2020) researched on the effects of small scale enterprises on poverty reduction in Nigeria using annual time series data sourced from the CBN Annual Report of various issues. The model built was estimated using auto-regressive distributed lag bound test and Vector Error Correction Mechanism (VECM). It was found that there exists a long-run relationship between SME's and poverty reduction. The study recommended that microfinance banks should provide loans and overdrafts to SMEs to solve the problem of poverty. Corroborating this notions Alabi, Ezekiel(2019) in his study on Entrepreneurship Development: An Antidote to Insecurity in Ondo State, Nigeria. The result revealed that entrepreneurship development programmes provided a model on how entrepreneurial opportunities could be effectively and efficiently utilized jointly to predict better national security which accounted for 60% variance of insecurity reduction in the study area. It was therefore, recommended that citizens should be exposed and motivated to develop interest in the skill-based activities towards self-employment which can encourage them to identify entrepreneurial opportunities in order to reduce the rate of criminal activities.

In the research carried out by Ubulom and Enyoghasim (2012) on developing entrepreneurial skills through business education programme to curb youth restiveness for sustainable Niger Delta development, it was found that equipping youth with entrepreneurial skills through business education programmes as well as harnessing entrepreneurial opportunities for their use is capable of curbing the problem of youth restiveness and other crimes.

John-Akamelu and Muogbo (2018) evaluated the contribution of small and medium-scale enterprises in poverty eradication in Nigeria. Primary data were sourced from the population size of 150 through the administration of a questionnaire to employees of some selected SMEs' S in Anambra state, and the sourced data were analyzed using the Chi-square method. Findings revealed that small and medium enterprises provided employment opportunities, training ground, and harness utilization of local resources, thereby helping in reducing the poverty rate in Nigeria.

Aigboduwa and Oisamoje (2013) examined the historical trend in the development of SMEs in Nigeria and identified several opportunities and competitive advantages now exclusively reserved for Nigerian companies under the Nigerian content Act 2010. The study emphasized the need for access to funding for development of the capital base of SMEs, and suggested that the Act would offer a turning point in the realization of all the policy trusts formulated for growing SMEs in Nigeria in the future.

Materials and methods

The study hired a descriptive and numerical approach, in which questionnaires were distributed to the targeted sample of 147 business centers, in Igboora through the aid of a Likert scale questionnaire (5-point scale).

Taro Yamane formula is = $\frac{N}{1+Ne^2}$

Where: N= Population size

e = Margin of error

N = 230,

e= 0.05

$$n = \frac{230}{1+230(0.05)^2} = 147$$

The data was retrieved, cleaned and inspected to ensure that they are reliable for the study. The study used the SPSS software to analyze the data presenting it in a table format showing frequency and percentages. The study objectives were analyzed quantitatively through the aid of a Multiple Regression Analysis.

Results

This section briefly discusses the survey results. The first section of the survey searches the demographic information on the survey attendees.

Section I: Demographic Information

Table 1: Socio-demographic characteristics of the respondents

Gender Size	**H/C**	**%**	**Age**	**H/C**	**%**	**Education Profile**	**H/C**	**%**	**Marital Status**	**H/C**	**%**
Female	78	53.1	Below 30yrs	25	17	High School	61	41.5	Single	41	27.9
Male	69	46.9	31-40yrs	37	25.2	Undergraduate Degree	36	24.5	Married	78	53.1
Total	**147**	**100**	41-50	43	29.3	Graduate Degree	50	34.0	widow	12	8.2
			50-60yrs	23	15.7	**Total**	**147**	**100**	divorced	16	10.1
			61 above	18	12.2				**Total**	**147**	**100**
			Total	**147**	**100**						

Field Survey 2023

The gender of this sample size is approximately in the middle of 53.1%female and 46.9%male. 29.3% of the respondents were between 41-50 years old. 41.5% of the respondents have at least High School Certificate and 53.1% of the respondents were married.

Section II: Influence of Small Scale Business on Poverty reduction.

Table 2

S/N	**STATEMENTS**	**SA**	**A**	**U**	**D**	**SD**
1	Small businesses address poverty by providing employment opportunities in your Community	67 45.6%	62 42.2%	4 2.7%	10 6.8%	4 2.7%
2	Small-scale businesses provide a means of livelihood for individuals and families in your community	82 55.8%	53 36.1%	3 2.0%	5 3.4%	4 2.7%
3	Small businesses stimulate economic growth at your community	73 49.7%	64 43.5%	- -	10 6.8%	- -

4	As micro-entrepreneurs grow their businesses, they stimulate economic activity,encourage local production and consumption, and foster entrepreneurship	67 45.6	68 46.3	4 2.7%	7 4.8%	1 0.7%
5	Small businesses enhance community resilience by promoting local ownership and entrepreneurship	76 51.7%	52 35.4%	3 2.0%	16 10.9%	-

Field Survey 2023

From Table 2 a total number of 67 persons (45.6percent) strongly agreed that Small businesses address poverty by providing employment opportunities in their Community while 82 persons (55.8percent) strongly agreed that Small-scale businesses provide a means of livelihood for individuals and families in our community. A total of 73 persons (49.3percent) also strongly agreed that Small businesses stimulate economic growth at their community and 68 persons (46.3percent) agreed that as micro-entrepreneurs grow their businesses, they stimulate economic activity, encourage local production, consumption and foster entrepreneurship while 76 persons (51.7percent) agreed Small businesses enhance community resilience by promoting local ownership and entrepreneurship.

Section III: Influence of Small Scale Business on insecurity Challenges

Table 3

S/N	STATEMENTS	SA	A	U	D	SD
1	Small-scale businesses can reduce the vulnerability of individuals to engaging in illicit activities or being recruited into criminal networks in your community	66 44.9 %	64 43.5 %	3 2.04 %	7 4.76 %	7 4.76 %
2	Small-scale businesses have proven instrumental in addressing poverty and insecurity challenges in Nigeria	90 61.2 %	51 34.7 %	- -	6 4.1%	- -
3	Nigeria can unlock new pathways towards sustainable poverty reduction and enhanced security for its citizens	81 55.1 %	44 29.9 %	7 4.76 %	9 6.1%	6 4.1%
4	As more people find gainful employment and secure livelihoods, the overall security landscape of Nigeria improves, fostering stability and social cohesion	81 55.1 %	54 36.7 %	3 2.0%	5 3.4%	4 2.7%
5	Small businesses also play a crucial role in addressing insecurity in Nigeria	63 42.9 %	72 49%	4 2.7%	2 1.4%	8 5.4%

Field Survey 2023

From Table 3, 66 persons (44.9percent) strongly agreed that Small-scale businesses can reduce the vulnerability of individuals to engaging in illicit activities or being recruited into criminal networks in your community while 90 persons (61.2percent) strongly agreed that Small-scale businesses have proven instrumental in addressing poverty and insecurity challenges in Nigeria. A total of 81 persons (55.1percent) agreed that Nigeria can unlock new pathways towards sustainable poverty reduction and enhanced security for its citizens and 81 persons (55.1percent) strongly agreed that as more people find gainful employment and secure livelihoods, the overall security landscape of Nigeria improves, fostering stability and social cohesion while 72 persons (49percent) agreed that small businesses also play a crucial role in addressing insecurity in Nigeria.

Testing of Hypotheses

Table 4 **Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin Watson
1	.760[a]	0.577	.0.552	0.62750	1.858

Source: SPSS version 21

a. Predictors: (Constant), Small Scale Business
b. Dependent Variable: Poverty and Insecurity.

The result of the regression test between Small Scale Business and Poverty and Insecurity in Table 4 that the R^2 (R- Square) is 0.577 (57.7percent) which indicates the independent variable Small Scale Business predicts and influences Poverty and Insecurity by 57.7 percent.

Table 5 **ANOVA[a]**

Model		Sum of Square	df	Mean Square	F	Sig
1	Regression	9.802	3	3.267	18.298	.005[b]
	Residual	36.619	93	0.394		
	Total	46.421	96			

Source: SPSS version 21

a. Predictors: (Constant), Small Scale Business
b. Dependent Variable: Poverty and Insecurity.

Analysis of variance (ANOVA) was employed to examine the implication of the regression model as pertains to variances in means of the dependent and independent variables as shown in Table 5. The ANOVA examination fashioned an F-value of 18.298 which is significant at p=0.005. This portrays that the regression model is significant at 5percent error level. Thus, the regression model is statistically substantial in ways which Small Scale Business impacts the Poverty and Insecurity.

Table 6 **Coefficients**

Model	Unstandardized Coefficients		Standardized Coefficients	
	B	Std. Error	Beta	Sig.
1. (Constant)	1.393	0.492	.555	.000
Small Scale Business	0.094	0.129	.549	.004

Source: SPSS version 21

a. Predictors: (Constant), Small Scale Business
b. Dependent Variable: Poverty and Insecurity.

Multiple Regression: $Y = a + b_1X_1\ b2X2 + B_3X_3 + ... + B_tX_t$

Poverty and Insecurity =1.393+S (.094)

The result of the estimation of the independent variables to each of the dependent variables, as to how it individually impact Poverty and Insecurity from Table 6 indicates that all Small Scale Business have a significant impact on alleviating Poverty and reducing Insecurity. As their p- value result is 0.004; this is highly significant as it is lesser than Alpha value of 0.05. Therefore, Small Scale Businesses have substantial impact on alleviating Poverty and reducing Insecurity.

Conclusion

Small-scale businesses play a significant role in alleviating poverty and reducing insecurity in Ibarapa Central Local Government communities. They provide employment opportunities,

foster economic growth, and contribute to the overall well-being of individuals and societies. By empowering local entrepreneurs and creating a favorable business environment, small-scale businesses can effectively address the challenges of poverty and insecurity in Ibarapa Central Local Government.

Recommendations

By implementing these recommendations, policymakers, governments, and organizations can harness the potential of small-scale businesses to alleviate poverty and reduce insecurity. Small-scale businesses, when properly supported, have the capacity to create jobs, stimulate economic growth, and provide opportunities for marginalized individuals, leading to more inclusive and resilient societies. Therefore, the following recommendations are suggested:

i. Governments and organizations should create an enabling environment for small-scale businesses to thrive. This includes offering training programs, mentoring, access to capital and simplifying bureaucratic procedures. By nurturing entrepreneurship, more individuals can establish their businesses and contribute to poverty reduction.
ii. Governments and financial institutions should develop innovative financing mechanisms such as microfinance and loan guarantee programs.These initiatives can provide entrepreneurs with the necessary capital to start or expand their businesses, ultimately reducing poverty and insecurity.
iii. Governments and organizations can facilitate market linkages by establishing platforms, fairs, and online marketplaces where entrepreneurs can showcase their products and connect with potential customers. This exposure will enhance their market reach and income potential thereby contributing to poverty alleviation.
iv. Governments should collaborate with educational institutions and private sector organizations to develop relevant training programs that will address market demands and equip individuals with entrepreneurial skills.
v. Governments should prioritize infrastructure development in rural and underserved areas, enabling entrepreneurs to conduct business activities effectively and access larger markets.
vi. Governments and organizations should facilitate networking events, business associations, and platforms where entrepreneurs can exchange ideas, experiences, and best practices. This collaboration can help small-scale businesses overcome common challenges and collectively contribute to poverty reduction and improved security.

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OYSCATECH GLOBAL CONSULT

ASSESSMENT OF INCORPORATING ENTREPRENEURSHIP DEVELOPMENT SKILLS FOR SELF EMPLOYMENT INTO (OTM) PROGRAMMES CURRICULUM IN OYO STATE COLLEGE OF AGRICULTURE AND TECHNOLOGY, IGBOORA

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Abstract
The study examined the assessment of incorporating entrepreneurship development skills for self- employment into Office Technology and Management (OTM) Programme curriculum in Oyo State College of Agriculture and Technology, Igboora, Oyo State. The study had two specific objectives from which two research questions were raised to guide the study. The research design for the study was descriptive research design while twenty seven (27) students from the study area were used as population for the study. The instrument used for data collection for the study was the questionnaire. The data collected were statistically coded into Statistical Packages of SPSS. The package was used to run table of frequencies and percentages to analyse the bio-data of the respondents while, mean and standard deviation were used to answer research questions using an index score of 2.5 for agree which indicated that students in the study area have acquired one entrepreneurship skill or the other and entrepreneurship skills have great effect on the OTM students as it will improve their productivity. Based on the findings of the study, it was recommended, among the others, that Entrepreneurship skills acquired by Office Technology and Management (OTM) students be improved in Oyo State College of Agriculture and Technology, Igboora, Oyo State and the effect of entrepreneurial skills on Office Technology and Management (OTM) students be continuously assessed.

OYSCATECH GLOBAL CONSULT

Keywords: Entrepreneurship Development Skills, Self-Employment, Office Technology and Management (OTM)

Introduction

Education is regarded as a powerful instrument of social changes and national development. This holds for all societies, developed and less developed to the extent that promoting and sustaining quality education is never left to chances (Ezene, 2014). He stated further that it is believed that the quality of life in the society can be greatly enhanced through education.

Tertiary Education in Nigeria is the education given after secondary education in the Universities, the Colleges of Education, the Polytechnics or the Monotechnics, including those institutions offering correspondence courses. The goals of tertiary education, among the others, are to contribute to national development through high level relevant manpower training, development and inculcation of proper values for the survival of the individuals and the societies, and to impart both physical and intellectual skills which will enable individuals to be self-reliant and useful members of the society (Ezene, 2015).

As with many areas of education, entrepreneurship development education has a general education as well as a professional education component. The organization of entrepreneurship development education in tertiary education varies from one institution to the other. For instance, in the colleges of education, EDE is taught as a general studies education with a course code of GSE 224, in some other institution. It is coded VTE 220 and

BED 310 offered as I and II respectively. In the polytechnics, EDE is offered the National Diploma (ND) and Higher National Diploma (HND) level as EED 126 (Introduction to Entrepreneurship), EED 216 (The Practice of Entrepreneurship) and EED 413 (Entrepreneurship Development).

Office Technology and Management (OTM) programme is an aspect of Business Education programme which equips graduates with the right skills to engage in various works in the office as well as self-employment. Office Technology and Management (OTM) programmes were targeted at empowering students with employability and entrepreneurship skills, imparting knowledge and ability necessary for gainful employment or self-reliant. Ideally, Office Technology and Management (OTM) graduates can be gainfully employed into the various fields. This suggests that Office Technology and Management (OTM) graduates should be able to conveniently work in any organizations (Ademiluyi, 2021). According to Dibbari, Dangata and Egere (2013) Office Technology and Management (OTM) program occupies a reasonable space in the Nigerian economy and permits the entire life of a nation. This implies that Office Technology and Management (OTM) touches all spheres of human endeavours.

Curriculum is the sum of the learning activities and experiences that a student has under the auspices or direction of the school (Savita, Kalidas, Sushil and Purushottan, 2019). Accepting the foregoing implies that we must consider a curriculum as encompassing general (academic) education as well as career and technical education (Savita *et al.*, 2019). The concept also supports the motion that a curriculum should focus on developing the whole person. It is not enough to have the curriculum to include courses and experiences that are exclusively related to career and technical education. General studies are clearly a part of every curriculum as they serve to provide the student with a broad knowledge base both for life and for earning a living. Likewise, the curriculum builder must keep in mind how general and career and technical studies are intertwined. Curriculum must fulfill the expectations of education to meet the standard set for the education of various levels like institutional, national, and international. Curriculum is a foundation of a broader arena of education which should focus on developing the whole person.

Okocha and Ile (2011) observed that the aims of various governments to eradicate poverty and increase the standard of living of citizens through the establishment of poverty reduction programmes have failed due to lack of entrepreneurship skills by graduates of the educational system. These authors observed that millions of jobs are awaiting to be done because people with the right education and training cannot be found.

There is no doubt that the greater the entrepreneurial process among the citizens, the greater the opportunities for economic development. Entrepreneurship is the life blood of any economy. Entrepreneurship education was introduced into the educational curriculum as a compulsory course in higher institutions of learning in Nigeria over a decade ago. Today, on the federal government directives, all universities, polytechnics and colleges of education have made entrepreneurship education a general course for students, irrespective of disciplines and levels. This was aimed at reducing the rate of graduate unemployment, endemic poverty and the numerous social vices associated with poverty.

Statement of the Problem

In Nigeria today, Government has incorporated entrepreneurship development skills into tertiary institutions' curriculum to provide students with the skills to become self-reliance and self-employed. Unfortunately, the trainings given to Office Technology and Management (OTM) students while in school and which is expected to equip them adequately for the world of work and also enable them to become self-employed seem to be, in greater part, theoretically-based (Egbule, Utebor and Enwemasor, 2017).

In the light of these problems, it is feared that OTM students may not possess substantial Entrepreneurial Development skills and competencies necessary for the achievement of their entrepreneurial goals and aspirations. Therefore, this study is to see how the acquisition of the entrepreneurial skills influences the entrepreneurial intentions of the OTM students in Oyo State College of Agriculture and Technology, Igboora. The relationships between these variables are the practical skills available to the students of OTM in the polytechnics and the possibility of building and developing the entrepreneurial intentions and possibly venturing into establishing their own enterprises is therefore investigated.

Objectives of the Study

The main objective of the study is to assess the incorporating Entrepreneurship Development skills for self-employment into OTM programme curriculum. While the specific objectives are to:

i. identify the entrepreneurship skills acquired by the students of Office Technology and Management (OTM) department.
ii. assess the effects of the learning entrepreneurial skills on Office Technology and Management (OTM) students.

Research Questions

Two research questions guided the study:

i. What are the entrepreneurship skills acquired by the students of Office Technology and Management (OTM) department?
ii. What are the effects of learning entrepreneurial skills on Office Technology and Management (OTM) students?

Methodology

This study adopted a descriptive survey research design. The population for this research comprised 27students (ND II, 24 students, HND II, 3 students) from Oyo State College of Agriculture and Technology, Igboora in Oyo State. There was no sampling for the study. All the respondents were used for this study because, the size of the population is manageable to carry out the study. The research instrument for this study was a structured questionnaire developed by the researcher titled: Assessment of Incorporating Entrepreneurship Development Skills for Self Employment into Office Technology and Management (OTM) Programme Curriculum. The questionnaire items were generated based on the literature review and it was divided into two sections A and B. Section A of the instrument sought the bio-data of the respondents which includes: Gender and Educational Level while Section B of the questionnaire was further divided into 2 parts: Part 1 covers research question 1and it consists of ten (10) items which identify entrepreneurship skills acquired by the students of Office Technology and Management Department. Part 2consists of eight (8) items used to assess the effects of the learning of entrepreneurial skills on Office Technology and Management students in Oyo State College of Agriculture and Technology, Igboora, Oyo State. The instrument was faced and content-validated by two experts in the Department of Office Technology and Management, Oyo State College of Agriculture and Technology, Igboora, Oyo State. Reliability test was carried out to determine the consistency of the instrument in collecting the data as required. Data collected were subjected to analysis using Cronbach alpha method and a value of 69% was obtained. This showed that the instrument was reliable. Data were analysed using Mean and Standard deviation coded in Statistical Packages for Social Sciences (SPSS) to answer research questions. Decision rule: for research questions one and two the rating scale for mean responses was structured on

Strongly Agreed (SA) 3.50 – 4.00, Agreed (A) 2.50 – 3.49, Disagreed (D) 1.50 – 2.49, Strongly Disagreed (SD) 0.0 – 1.49 and any item with a mean score of 2.50 and above were accepted while any item with a mean score below 2.50 were rejected.

Results

Research Question1: What are the entrepreneurship skills acquired by students of Office Technology and Management (OTM) department?

Table 1: Mean responses and Standard Deviation that indicate the entrepreneurship skills acquired by students of Office Technology and Management (OTM) department

S/N	Item Statement	N	Mean	SD	Remarks
1.	Students of OTM must learn how to relate with people to make them successful in their working place.	27	3.70	.465	Accepted
2.	Students of OTM must possess the ability to create and build something from practically nothing, through creating values by pulling together a unique package of resources to exploit opportunities.	27	3.30	.869	Accepted
3.	With the introduction of entrepreneurship skills, the into the OTM curriculum, students must have the ability to create and use a basis spreadsheet that fulfills a specific purpose.	27	3.41	.844	Accepted
4.	With the incorporation of entrepreneurship education, students must have computer skills to succeed running their own businesses.	27	3.44	.641	Accepted
5.	OTM students must possess technical skills such as; E- mail, management, analytical, Email and keyboard shortcut to succeed as entrepreneurs.	27	3.52	.643	Accepted
6.	Office Technology and Management (OTM) students require technical skills and competencies in the areas like information and communication technology(ICT), keyboarding, office practice, data processing, word processing, webpage designing and office automation for the success of business.	27	3.52	.509	Accepted
7.	Office Technology and Management (OTM) students must learn and acquire the skill of saving which leads to investment.	27	3.63	.492	Accepted
8.	Office Technology and Management (OTM) students must possess record management skills for optimal record keeping.	27	3.70	.465	Accepted
9.	As an entrepreneur, OTM students must possess communication skills in order to make intelligent selection of communication channel.	27	3.41	.747	Accepted
10.	The students of OTM, as entrepreneurs operate in all kinds of changing environments and must adapt to change in order to survive.	27	3.48	.580	Accepted

Source: Field Survey, 2023

Table 1 above shows the entrepreneurship skills acquired by students of Office Technology and Management (OTM) department. The table revealed that all the ten (10) items are accepted indicating with the mean scores of 2.50 and above. The standard deviation of 0.465 to 0.869 all indicated that the respondents were close in their responses.

Research Question 2: What are the effects of entrepreneurial skills on Office Technology and Management (OTM) students?

Table 2: Mean responses and standard deviation that show the effects of entrepreneurial skills of Office Technology and Management (OTM) students

S/N	Item Statement	N	Mean	SD	Remarks
1.	Students of OTM should be able to cope with the charging times and applying the skills acquired in setting up and sustaining enterprises.	27	3.63	.492	Accepted
2.	Entrepreneurship skills help the OTM students organise and work more effectively and efficiently.	27	3.67	.480	Accepted
3.	It enhances the entrepreneur maintenance of harmonious work relationship among individual.	27	3.70	.465	Accepted
4.	It enhances productivity towards organizational goals and objectives.	27	3.63	.492	Accepted
5.	Entrepreneurship skills help the OTM students to take risks, developing skills and setting up new ventures.	27	3.70	.465	Accepted
6.	With the incorporation of entrepreneurship, there is productive employment and sustainable poverty reduction.	27	3.59	.501	Accepted
7.	It identifies and solve problems using critical and creative thinking.	27	3.37	.565	Accepted
8.	OTM students must be able to organise business opportunities and mobilize both human and materials resources to exploit the identified opportunity.	27	3.48	.580	Accepted

Source: Field Survey, 2023

Table 2 above shows the effect of entrepreneurial skills of Office Technology and Management (OTM) students. The table revealed that all the eight (8) items are accepted indicated with the mean scores of 2.50 and above. The standard deviation of 0.465 to 0.580 all indicated that the respondents were close in their responses.

Discussion of Findings

The research question one identifies the entrepreneurship skills acquired by the students of Office Technology and Management (OTM). The result showed that all the mean scores were all above the cut-off point of 2.50 which indicated that all respondents have acquired one entrepreneurship skill or the other. This study agrees with Akpotowoh (2016) who opined that the entrepreneurship skills acquired in office technology and management programmes promote training in entrepreneurship as well as equip graduates with requisite skills to establish and run businesses of their own and this includes among the others: Human relations skills, Creativity and Innovativeness, Technical Skills and Financial skill.

The research question two, assessed the effect of entrepreneurial skills on OTM students. The findings show that all the respondents believed that entrepreneurial skills have great effect on OTM students as they improve their productivity in the nearest future. This result agreed with Ekpe and Mat, 2012 who opined that Entrepreneurial skills acquisition can lead to self-employment especially when the individual is motivated and has positive influence of friends, relatives, advisor and mentors.

Conclusion

The study examined the assessment of incorporating entrepreneurship development skills for self-employment into Office Technology and Management (OTM) programme

curriculum in Oyo State College of Agriculture and Technology, Igboora, Oyo State. Based on the findings of the study, it was revealed that students of Office Technology and Management have acquired one entrepreneurship skill or the other in order to improve their productivity, also, the effects that entrepreneurial skills have on Office Technology and Management (OTM) students in Oyo State College of Agriculture and Technology, Igboora are enoumous.

Recommendations

Based on the result of the findings, the following recommendations were made:

1. Entrepreneurship skills acquired by students of Office Technology and Management (OTM) should be improved upon.
2. The Effects of entrepreneurial skills of Office Technology and Management (OTM) students should be continuously assessed.
3. Office Technology and Management (OTM) students must be encouraged on the use of the entrepreneurial skills acquired.

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EFFICIENT ADMINISTRATION AND FINANCIAL MANAGEMENT TO ALLEVIATE POVERTY AND INSECURITY IN NIGERIA.

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Abstract
The paper examined the effects of government intervention through effective financial administration in alleviating poverty in Nigeria with a view to providing information on how the poverty situation affected the Nigerian people. The paper also assessed the effect of insecurity in Nigeria by providing information on the causes and effects on the Nigerian economy. The paper equally investigated the effects of changes in government in Nigeria on the policies introduced by various administrations. Descriptive analysis was used for the study. The paper concluded that the level of poverty and insecurity is increasing in Nigeria despite the introduction of various programmes being financed by the Nigerian government.
Keywords: Administration, Financial Management, Alleviate, Poverty and Insecurity

Introduction

There is a serious rise in poverty levels as well as insecurity throughout the World which has been traced to a lack of efficient administration and financial management. The rise in poverty and insecurity levels is a serious concern to researchers for the purpose of providing solutions to the problems emanating from the two mentioned problems.

There is no specific definition of poverty, but it could be described as the inability of a nation to cater for its citizenry, and basic necessary social amenities such as basic needs of food, water, shelter, good road, good healthcare, and employment. It is a state where the populace cannot boast of having good food to eat on their table. An individual is confronted with the inability to fend for him/herself the basic needs of life, no good roads, access to good health facilities being denied, no facilities for good education, and a lack of jobs for able and employable individuals, (Akintola and Yussuf 2002)**.** This problem of poverty now leads to depression on the side of the poor and oppression on the side of the few rich ones. Poverty continues to increase on a daily basis in Nigeria and this has manifested in the people begging for arms to eat every day. In Nigeria today graduates from higher institutions participate in National Youth Service Corps before qualifying for the job. The National Youth Service Corps moblised 66,000 graduates in 2020 (University World News, African Edition 2020) being products from higher institutions in Nigeria. This implies that the number of unemployed youths in Nigeria is increasing on a yearly basis. Poverty is one of the causes of insecurity in Nigeria.

Insecurity is a state of lawlessness where some people create problems for the citizens of the same country. Like a saying that the idle mind is a devil's workshop. People believe that since the system has failed, they should be able to look for alternative means of surviving within the system. People can no longer move freely from one location to another today with the fear of insecurity. Insecurity has taken so many dimensions in Nigeria. The Boko Haram fighters which started in the Northern part of the Country in 2002

(https://www.britannica.com/topic/Bok-Haram 2023) where our military have to engage in an unconventional war with the group. To those people that started this war, the meaning of Boko Haram is "Westernization Is Sacrilege". This simply means that Western education is un-Islamic. The group later changed its name to ISWA or ISWAP (Islamic State in West Africa or Islamic State of West Africa Province) in 2015. To the group, their aim was that Western education is not good and it is also a sin against Islam. The group captured some local governments in the north. The initial intention they claimed was to fight high levels of injustices and corruption in Nigeria claimed to have been brought to Nigeria through Western Education. Quite a number of people lost their lives and some are still in captivity. The war actually started in Maiduguri which is the capital of the northeastern state Borno. The group claimed that Western education widened the gap between the rich and the poor which led to the highest level of poverty in Nigeria. It is an unconventional war because the armed forces are handling this war strategically for innocent lives to be saved. The group attacked police officers, military officers, correctional centres, individuals, and communities.

The Niger Delta crisis also started in the 1990s between the oil exploration companies and some minority groups who felt they have been cheated and exploited, that is, the Ijaws and the Ogonis. Some militant groups were formed in the southern Niger Delta immediately after the civilian took over in 1999 and allied themselves with politicians locally. Each of these groups was using a legitimate way of fighting the government and the oil exploration companies. Such legitimate means are environmental destruction, poverty, and government corruption. They used these factors to attack and destroy oil pipelines and other properties belonging to oil companies in the area. The crisis in the Niger Delta reduced the oil production quota of Nigeria in OPEC drastically. Nigeria derived her foreign exchange earnings from oil production since the discovery of oil in 1956. The oil production was on average in 2020 at 2.5 million barrels per day. But during the crisis, the production fell below 2.00 million barrels. (NURPRC, 2022).

Other factors that can be further classified under insecurity in Nigeria are kidnapping, banditry, and ritual killings. Kidnapping is a big problem in Nigeria. It is regarded as a lucrative business. They are in groups called bandits. They are all over Nigeria. People are being kidnapped for ransom. In the Niger Delta, the bandits took the expatriates working for oil companies hostage forcing the oil companies to carry out community development projects. ln other parts of the Country, politicians, businessmen, and businesswomen were held hostage forcing their families to pay some monies before they were released. At times the demand from these bandits was so high that the families will have to go on borrowing before paying the ransom based on negotiation. The sad thing at times was that some people held hostage were been killed even after the ransom had been paid. Some citizens were abducted and used for ritual money. (Oyewole, 2016). Some held hostage at the end of it all turned out to be poor, deformed, mad, or dead (Gbinije, 2014). Churches and mosques were attacked and members were killed during the attacks. Examples of these attacks were the attack on the mosque in the northeast killing 15 worshipers and abducting some members of the mosque and the Owoh Catholic Church attack in Ondo state in… where over 100 people were killed including children just to mention a few. Military formations and police stations

were attacked across the country. Students in various schools were kidnapped and taken away. Such were the 276 Chibok, a city in the northeastern region school girls kidnapped on April 14, 2014, out of which 112 are still missing as of today.

Further attacks came from the clashes between headers and various communities where cattle were being reared and the belief was that the headers came from outside the country to attack Nigerians through neighbouring countries. These attacks were recorded in Jos Plateau State, Igangan, Oyo State, and incessant attacks on Benue state communities and some other communities in Nigeria.

The activities of IPOB (Indigenous Peoples of Biafra) in the east are another threat to Nigeria's security. The group is of the opinion that they are fighting for the course of the Igbos in Nigeria. They believe that the Igbos are marginalized in Nigeria and that they should be given equal opportunity to be part of the decision-making body in Nigeria. They disrupted the activities of the people in the east through kidnapping, restriction of movement of people, and disturbing marketplaces and businesses. The solution to solve the problems of poverty and insecurity in Nigeria can be linked to lack of effective financial administration on the programmes introduced by the government in Nigeria. to alleviate poverty and insecurity. Hence, the problem is more of non- effective financial administration.

Financial administration can be defined in so many ways depending on the angle at which refers to the act of pooling resources together to achieve a goal or an objective. It is used in running the business in such a manner that the set standards of that business are achieved within the resources available. There is one thing to release fund for a purpose, but there is always a problem when it comes to management of the fund. Financial administration assists in the establishment of goals to channel the funds to, formulation of policies to utilize the fund, implementation of the policy formulated to achieve the proper allocation of the fund and putting a strategic control in place to able to monitor whether the fund released was used for the purpose for which.

General review of the poverty alleviation programmes and security architecture in Nigeria

The Nigerian government at both local, state, and Federal has taken a series of steps to cushion the effects of poverty in Nigeria such as poverty alleviation programmes and also reduce the level of insecurity. Immediately after the civil war ended, the Head of State, General Yakubu Gowon introduced National Accelerated Food Prgoramme (NAFPP) and Nigerian Agricultural Cooperative Bank (NACB) in the year 1971 to provide food for the populace. After General Gowon, General Murtala Muhammed introduced the 3rd National Plan programme to reduce the rising inflation and to encourage privatization in 1976. In his attempt to reduce corruption in the public service, he sacked more than 10,000 workers on the accounts of health, incompetence, age, and corruption. This act was the beginning of corruption in the public service because the public servants believed that anybody could be thrown out at any time and therefore you should make use of the time you are in office to acquire wealth. Another setback was a major importation of rice popularly called "Uncle Benz" from Thailand because this was regarded as paying money to develop other economies

instead of developing Nigeria's economy. Although the regime of General Murtala was short-lived because he was assassinated on 13th February 1976 through a military coup. After General Murtala Muhammed, General Olusegun Obasanjo introduced Operation Feed the Nation in 1976 (OFN). The programme was designed to increase food production as well as food security for an economy that dependent wholly on revenue from oil production. The programe was targeted at young graduates from Universities in Nigeria to make use of the opportunity and encourage them to go to rural areas and teach peasant farmers how to farm in order to increase food production. Operation Feed the Nation programme did more damage to rural farmers than good because the graduates from the higher institutions were not well trained in modern-day farming to be able to extend their experiences to the farmers who were only interested in producing what to eat rather than producing to sell outside their farming areas thereby showing a pointer to the government that there were shortages of food all over the Country. (Girigiri, 2000). Operation Feed the Nation Programme was also seen as a programe introduced to make the beneficiaries be the existing rich people and the average Nigerian farmer could not benefit and this was why the programme was re-named "Modernization of Hunger" (Nzirimo, 1981). The Green Revolution came under the regime of Alhaji Sheu Shagari in 1979 with the aim of providing more food for the Nigerian people, more importantly, boosting fibre and crop production, and discouraging importation. But the military officers, senior civil and public servants, politicians and rich businessmen and women, and their friends and families benefited from this program but have nothing to do with agriculture. They used the opportunities to acquire many hectares of land under the pretext of using them for farming to increase food production in the country. The poor masses still suffered under this programme. But the programme came to an abrupt end when there was a military coup that ousted the administration of President Sheu Shagari in 1983 (Adibe and Mozie, 2008) and the new military government was headed by General Muhammadu Buhari.

The Government of General Muhammadu Buhari was toppled in 1986 in a coup that brought in General Ibrahim Badamosi Babangida as the new Head of State. In order to stabilize the sharp drop in oil revenue realized from the foreign exchange earnings, the government introduced The Structural Adjustment Programme. During the oil boom era, Nigeria got about 90% of its revenue from oil while little came from agriculture and manufacturing but when there was a collapse in the revenue from the exportation of oil, the gap created by the sharp drop in purchasing power could not be accommodated by revenue from Agriculture and Manufacturing. The Nigerian government was of the opinion that the country can provide basic social services to the people like other developed countries by taking measures that will restructure and stabilize the use of resources by both private and public sectors. The SAP was targeted at reducing inflation, exchange rate depreciation, and excessive public spending and also provided a route to the best economic growth and poverty reduction. The Nigerian economy was deregulated for the local currency to find its fit through the demand and supply in the market. The foreign exchange market was divided into two viz: First-Tier Foreign Exchange Market and the Second-Tier Foreign Exchange Market. Foreign Currencies were bought from the two markets at different rates. The official rates were used in the First-Tier Market for official transactions by the government while other transactions were done through the Second-Tier Market where demand and supply

determined the exchange rate. This policy failed because it could not achieve the objectives of dividing the foreign exchange market into two. The powerful individuals purchased foreign currencies from the First-Tier Market only to be sold at the parallel market to make more gains. The Manufacturing sector suffered in this regard as well as the Agricultural sector because the cost of getting foreign exchange was expensive thereby increasing the cost of production. The Structural Adjustment programme was regarded as a failure because of its inability to address the issue of human development but rather increased socio-economic problems such as income inequality, denial of the poor to have equal access to food, shelter, education, health, and other necessities of life (Garba, 2006; Omotola, 2008). The Directorate of Foods Roads and Rural Infrastructure (DIFFRI) was equally introduced in 1986 to open roads in rural areas for farmers to be able to farm and transport their farm products to cities at a minimal cost thereby increasing agricultural production in rural areas at the cheapest cost, provision of jobs to rural dwellers to prevent urban migration. The programme had a major setback because the funds meant for it were allegedly diverted into private hands (Girigiri, 2000; Garba, 2006; Omotola, 2008; Chukwuemeka, 2009). In 1986, also, the Federal Government introduced the Nigerian Agricultural Land Development Authority (NALDA)aimed at assisting farmers with the production of agricultural products by providing input materials and developing land till the point of planting by subsidizing the cost to enable them to produce on a larger scale. But because of the peculiar Nigerian problem, the programme failed to achieve its aim of being unable to serve the underprivileged, (Garba,2006; Omotola, 2008; Chukwuemeka, 2009). In addition, the National Directorate of Employment (NDE) was introduced in 1986 as well to reduce the high rate of unemployment that be-deviled the country. The programme adopted four basic approaches which included a Labour-Based Works programme, Vocational Acquisition Training, Entrepreneurial (Business) Training, and Rural employment. Many people might have benefited from this programme but the major setback is the lack of monitoring of the beneficiaries or the follow-up plans. Many that took the loan found themselves in the worst situation (Garba, 2006; Eze, 2009). Mrs Maryam Babangida and Mariam Abacha introduced the Better Life For Rural Women and Family Support Programme (FSP) in 1986 and 1993 respectively to bail out Nigerians from high levels of poverty. The Federal Government under the late General Sani Abacha introduced Family Economic Advancement Programme (FEAP) in 1993 with the aim of reducing the poverty level in Nigeria. But all these programmes could not reduce the poverty level in Nigeria because of their administration (Nwekeaku and Mbanasor, 1999).

An anti-poverty programme called Poverty Alleviation Prgoramme (PAP) was launched in 1999 by the civilian administration to combat and correct the errors and mistakes arising from past poverty alleviation programmes. The programme was later re-named as National Poverty Eradication Programme (NAPEP) and the essence was to provide jobs for 200,000 able but unemployed people (Obadan, 2001; Chukwuemeka, 2009). NAPEP appeared to be well designed because of the four sectored schemes captured under it such as Natural Resources Development and Conservation Scheme (NRDCS), Youth Empowerment Scheme (YES), Rural Infrastructure Development Scheme (RIDS), and Social Welfare Service Scheme (SOWESS) (Asaolu, Elumilade, and Adereti, 2006). Other programmes that were introduced to eradicate the poverty level include National Economic Empowerment and

Development Strategy (NEEDS), State Economic Empowerment and Development Strategies (SEEDS), and Local Economic Empowerment and Development Strategies (LEEDS) for Federal, state, and local government administration respectively. The objectives of these prorgamme at each level were in addition to poverty reduction to generate employment, wealth creation, fighting corruption, enforcement of the law, growing the private sector, improving the welfare of the citizenry, health, education, empowerment, and security and the programme was described as the local version of MDGs by AFPODEV, (2006). The programme laid emphasis on the collaboration between federal, state, and local governments, donor agencies, the private sector, civil society, NGOs, and other stakeholders. According to Marcellus, (2009), these programmes have no significant impact on the vulnerable ones. The health care system was deteriorating, the roads are bad, education became unavoidable, and electricity power supply was erratic.

The seven-point agenda came under the administration of President Umar Musar Yardua which was tagged as the development agenda and was targeted at improving the general well-being of Nigerians and transforming the country to become one of the biggest economies in the world by the year 2020. The key areas of focus on the agenda were critical infrastructure such as power, transportation, national gas distribution, and telecommunication, to address the present situation in the Niger Delta through amicable settlement, food security, and human capital development, reform of land tenure, national security and poverty alleviation, and wealth creation. This agenda was criticized by researchers for lack of proper monitoring and Oshewolo, (2010) concurred that resource constraints might have served as a hindrance to the government's capacity to be able to address the wide coverage of the programme. The transformation Agenda was introduced to cover the administration from 2011 to 2015 under President Goodluck Ebele Jonathan. The agenda focused on strong, inclusive, and non-inflationary growth, employment generation and poverty alleviation, and re-orientation of the citizenry. This agenda faced some difficulties at the implementation stage mostly the citizenry was not involved when formulating the agenda, and there was an absence of accountability in the government, a high level of corruption, and incessant insecurity just to mention a few (Gyong, 2012).

The Trader money was introduced by the government of President Muhammdu Buhari in May 2016 and the essence was to assist the traders, artisans and farmers in order to improve their business to improve their standard of living. This programme was re-launched in September 3, 2018. (www.thisdaylive.com). Unfortunately, this programme could not achieve its objectives because the fund did not reach the needy and could not go round the country as expected. The money according to the trader was too small for them to improve their various businesses. The government of President Muhammdu Buharis also set aside N60b for farmers to improve their productivity in order to boost the country's food security, improve farm products and increasing exports. Despite this effort, Nigeria still depends largely on importation and the level of food security has not improved and therefore poverty level is on the increase.

The Nigerian government spent huge sums of money on security through the acquisition of sophisticated weapons to combat insurgence in the North and other parts of the country generally. But despite all the efforts to alleviate poverty and reduce insecurity in Nigeria, poverty is increasing on a daily basis and there is rising in the insecurity situation.

Conclusion and recommendations

The paper concluded that there is no significant effect of financial administration on poverty alleviation and insecurity in Nigeria.

The paper recommended as follows:

(a) That there should be continuity of policies by successive governments instead of each government trying to version out new policies and thereby jettison the policies of the past government.
(b) The masses should be involved from the beginning when a programme is to be introduced.
(c) There should be proper accountability from the government side
(d) Each policy must be properly monitored.
(e) The policy of the government should be people-oriented and should not be allowed to be hijacked by the rich individual.

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CLIMATE CHANGE MITIGATION TO ALLEVIATE POVERTY AND INSECURITY AMONGST FARMERS IN IMO STATE, NIGERIA

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Abstract
In recent time, climate change has become an important topic of discuss. Climate change affects several countries in varying degrees. Increased human activities have been observed to be a major factor that contributes to the climate change. However, variation in rainfall pattern, excessive heat, rise in sea level, flooding, drought, erosion among others are been experienced in several countries of the world. Currently in Nigeria, climate change is evident and the government has been in the frontline battling with the challenges of mitigating this without much progress. The search for more suitable climate change mitigation strategies becomes essential. Hence, the study is set to address climate change, mitigation and how it assists in poverty and insecurity alleviation. Drawing data from literatures and in-depth interview, the study identified the dilemma of climate change in relation to poverty and insecurity in Nigeria. Ways to mitigate the challenges were offered. The paper concludes that urgent actions should be taken by government to address the issues of climate change, poverty and insecurity in Nigeria in order to avoid an impending tragic situation.
Keywords: Climate change, Mitigation, Insecurity, Poverty

Introduction

Climate change has in the recent time become the greatest environmental challenge the world is battling with. It is like a pandemic that besieged the entire countries of the world without exemption. According to Intergovernmental Panel on Climate Change IPCC (2001) the global average surface temperatures have increased between 0.6 and 0.2 degree Celsius since the late 19th century, and about 0.2 to 0.3 degree Celsius over the past 25 years. United Nations Climate Change Secretariat UNCCS (2019) noted that climate hazard include droughts, floods, hurricanes, severe storms, heat-waves, wildfires, cold spell-sand landslides. As global temperature continues to increase, these extreme events are predicted to occur more often and with greater severity. Lai (1998) noted that rainfall erosivity, drop size distribution and kinetic energy for two rainy seasons in Nigeria is measured using the rainfall data. It was assumed in this study that the fluctuations in rainfall and temperature regimes are basically, the atmospheric forces that are responsible for the climate variability and change in Nigeria as the case in other parts of the world. According to Onah *et al. (*2016) the primary priority areas of government's policies on climate change are climate change adaptation and Mitigation. Furthermore, Mitigation means the human interventions to reduce the sources of climate change or enhance sinks of green-house gases.

The swing in the climatic patterns majorly caused by emissions from greenhouse gas is referred to as climate change. Greenhouse gas emissions cause heat to be trapped by the earth's atmosphere and hence, it has become the key driving force instigating global warming. The emissions experience emerged from natural systems as well as human activities. According to Yue and Gao (2018) the natural systems involves forest fires, oceans, earthquakes, permafrost, mud volcanoes, wetlands and volcanoes. Furthermore, Edenhofer *et al. (*2014) stated that human activities are predominately associated to energy production, industrialization and those connected to forestry, land use and change in land use. Lastly, The activities of man, which either increases the amount of greenhouse gases in the atmosphere that in turn depletes the ozone layer or that causes carbon reduction from the atmosphere is referred to as anthropogenic factors.

Methodology
This article relies solely on data collected from government documents, journals, books and interviews. This method was geared towards gaining perception into the topic of discuss. The empirical data with respect to the information was based on selected communities in Imo State of Nigeria. This is to ascertain the best approach and ways of mitigating climate change, poverty and insecurity. The data collected were qualitatively analyzed.

Theoretical Framework
Most frequently, poverty is defined as a state of being in which we are incapable of meeting up with our needs (Watt, 2000). Nevertheless, poverty, like every other social perception is bedeviled with a surplus of descriptions. Poverty is insufficiency, bereavement, or the state of one who is in lack of certain amount of physical properties or money. In the same vein, World Bank (2001) stated that complete or destitution refers to the deficiency with respect to rudimentary human desires, which commonly includes food, water, sanitation, clothing, shelter, health care and education.
For insecurity to be understood, a comprehensive idea of security is required. According to Mazrui and Mazrui (1997) the delivery of security to the lives and possessions of the societies is the main purpose of the State or nation. Similarly, security is thought-provoking to define appropriately with accuracy. Subsequently, Zebadi (2007) suggests that the perception and notion of security has always been associated with the safety and survival of the state and its people to the state. Consequently, he noted that security is not limited to the readiness of the defence and security forces while incorporating the safety of the citizens to the state. Fayeye (2007) postulated that in many nations of the world the security of such country requires moving away from the local militaristic and state centric definition of security towards human security. He further stated that, security incorporates the personal and collective state of being safe from an extensive range of serious and pervasive threats. Likewise, Nnoli (2006) asserted that national security as a valued worth connected with physical safety of persons, groups and nation states. Finally, the causes of insecurity can be connected the deficiency or poor management of the socio-economic activities of a country, poor implantation of rightful developmental commendations and politics.

Though, climate change is a universal threat, it is also very much a problem for development; hence, poorer countries have the least adaptive capability and the most vulnerable populations. Moreover, the low income countries are expected to feel the greatest adverse effects. This becomes possible because majority of the poor in the world are found in geographically vulnerable regions, and they live under vulnerable environment, socioeconomic, institutional, and political conditions.

Climate Variability
Climate variability can result from both natural and anthropogenic factors. The degree of climate variability can be described by the differences between long-term statistics of meteorological elements calculated for different periods (in this regard, the measure of climate variability is the same as the measure of climate change). Studies have shown that for the past few decades, anthropogenic factors like urbanization, deforestation, population explosion, industrialization and the releases of greenhouse gases are the major contributing factors to the depletion of the ozone layer and its associated global warming and climate change Odjugo (2007). The evolving climate change coupled with increasing temperature had been observed to plunge some localities into experiencing extreme weather conditions (Ayoade, 2004). Available evidences show that climate change will be global, likewise its impacts, but the biting effects will be felt much more by the developing countries especially

those in Africa due to their low level of coping capabilities (Nwafor, 2007). Nigeria is one of such developing countries. Studies have shown that Nigeria is already being plagued with diverse ecological problems that have been linked directly to the on-going climate change (Adefolalu, 2007).

Influences, Threats, Vulnerabilities of Climate Change

According to Fawzy *et al. (*2020) to understand the severe effect of climate change on natural and human systems and the risks associated with its vulnerabilities poses an important starting point in understanding the present state of climate emergency. Furthermore, Fawzy *et al. (*2020) posited that the changes in climate which include temperature, precipitation, sea-level rise, ocean acidification as well as extreme weather conditions have been emphasized in a recent report by the United Nations Climate Change Secretariat (UNCCS). UNCCS (2019) reports show that climate hazards include the following: droughts, floods, hurricanes, severe storms, heat waves, wildfires, cold spells and landslides. In Nigeria, for instance, it has resulted in drought, erosion and flood disasters which have been affecting most part of the country leading to loss of lives and destruction of properties (Aremu and Olatunde, 2012).

Soil Erosion as influenced by climate change

Soil Erosion is the process that erodes, breaks or gradually diminishes things down. The process of erosion usually takes place on the surface of soil, rock, or dissolved material from one location on the Earth's crust and with the help of the wind or water flow, it gets to settle down at another location. Soil Erosion is one form of soil degradation. It occurs in almost all types of lands. Flowing water, rainwater, and the wind are the prime agents which cause a significant amount of soil loss each year. Too much of soil erosion causes serious loss of topsoil and also reduces crop production potential, lower surface water quality, and damaged drainage networks.

Rainfall and Geo-Textural Influences

Rainfall is one prime climatic factor, variable, active, destructive and pivotal to a conglomerate of actions on the environmental soil problems and flooding. Temperature and water affect weathering, consolidated land surfaces under constant raindrops and alternate high temperature undergoing exfoliation and weathering. The causes of climate change can be divided into natural processes and human activities. The natural processes are the astronomical and extraterrestrial factors (Akpodiogaga and Odjugo, 2010). Furthermore, they stated, that the astronomical factors include the changes in the eccentricity of the earth's orbit, changes in the obliquity of the plane of ecliptic and changes in orbital procession while the extraterrestrial factors are the solar radiation quantity and quality.

Procedures to Ensure the Climate Change Impact Reduction/ Mitigation

The consequences of changing natural atmospheric greenhouse are difficult to determine. However, Akintomiwa (2018) noted that in the year 2017 series of climate-related disasters was witnessed in Nigeria and this ranges from the increased health risk, decreasing agricultural productivity, biodiversity loss, drying lakes, famine, conflicts or social unrest, poverty, worsening food insecurity situation, heat stress, deteriorating soil capability for agricultural production, increased natural disaster, as well as extreme weather actions.

One of the most complicated issues facing us in recent time is climate variation or change. It involves several proportions and dimensions which include; science, economics, society, politics plus ethical questions. Carbon dioxide, the heat-trapping greenhouse gas that has driven recent global warming, lingers in the atmosphere for hundreds of years, and the planet takes a while to respond to warming.

Ways to mitigate the impact of climate change and foster poverty, insecurity alleviation.
Many adaptation mechanisms will be strengthened by making progress in areas such as good governance, human resources, institutional structures, public finance, and natural resource management. Such progress builds the resilience of countries, communities, and households to all types of shocks, including climate change impacts. Strategies to cope with current climate variability provide a good starting point for addressing adaptation needs in the context of poverty reduction. Learning from experience will help to prevent the underachievement of sustainable development efforts and avoid maladaptation. The following processes can be utilized to ensure that objective and polices of the government on climate change with respect to alleviating poverty and insecurity is achieved:

1. Reduction of greenhouse gases emissions (GHGs) from transport and industrial sectors.
2. Development of low cost green initiative and technologies for the energy industries and manufacturing companies.
3. Promotion of Forestry and biodiversity, through afforestation and re-afforestation programmes.
4. Facilitating the availability of health facilities, equipment and medicine to assist in early diagnosis and treatment in climate change related disease.
5. Protection of water resources from pollution through necessary institutional and legitimate means and implementation of programmes to sustainably extend and improve water supply.
6. Employment of de-carbonization technologies and methods that reduces CO_2 emissions, such as renewable energy and fuel switching. Most of the De-carbonization technologies are well established and carry an acceptable level of managed risk (Ricke et.al., 2017; Victor et.al., 2018; Bustreo et.al., 2019).
7. Improved governance: This involves an active society, transparent and accountable policies and decision making process.
8. Accessing good quality information about the impacts of climate change. This is the key towards effective poverty reduction strategies. Early information systems and warning that ensures safety help to increase security and prevent disasters.
9. Enhanced livelihoods and infrastructure are methods that can be employed to effectively reduce poverty.
10. Funding adaptation and ensuring synergies with other multilateral agreements.

Conclusion

It will be concluded that climate change has adversely affected the world and more especially the underdeveloped and developing countries. From all indications climate change and mitigation that this study tends to look at, with respect to alleviating poverty and insecurity in Nigeria, has posed a major threat to humanity. It is obvious that it has really affected food production, human health, security and induced communal clashes. Climate change, caused by natural and anthropogenic factors, with the latter as the major causative agent needs mitigation to attenuate vulnerability of our environment. In order to mitigate the challenges and threat posed by climate change, the government has to develop or revamp National climate change policies and response schemes. Other factors, which enhance climate change notwithstanding the effort from the government, include industrialization, deforestation among others, which has led to variation in temperature, flooding, erosion, drought, poverty and insecurity in different parts of the country. We therefore, recommend an all-inclusive reassessment by policy makers in the country and the rest of the world toward climate change, mitigation, insecurity and poverty alleviation. Additionally, individuals should be able to partake in providing solutions by encouraging afforestation, establishment of local

security outfit that will arrest any unlawful fellow who is found wanting. Finally, the heads of local communities should make it a duty to be vigilant and announce regularly the importance of security, afforestation and the need to protect their environment.

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POVERTY ALLEVIATION, INSECURITY AND THE ICT

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Abstract
The paper considered the various aspects of poverty alleviation, insecurity, the Information Communication Technology (ICT) and the relationship between them. It observed that Nigeria as an oil producing nation has currently become the hub of poverty, insecurity and poorly developed in ICTs. The major identified causes of insecurity in Nigeria are poverty and the failure of government to actualize the fundamental objectives and principles as they are contained in the constitution of the federal Republic of Nigeria. The study therefore, concludes that there exists a perfect correlation between poverty and insecurity in the country and that the greed by the insurgent groups; and corruption by most of the public officials which led to deprivation, alienation, conflict, insecurity and poor ICT knowledge in Nigeria. The study recommends enhanced ICTs improvement which will not only empower the citizenry but also sustain poverty alleviation programmes thereby improve self-determination, economic, social, educational and cultural advancement and employment of the people Lastly, improved service quality of governance will reduce the incidence of poverty and insecurity in Nigeria.
Keywords: Poverty Alleviation, Insecurity, the ICT

Introduction

Nigeria is among the largest oil producers in Africa, and the sixth oil producer in the world. In spite of its enormous resources, it has been ranked among the poorest nations in the world today. World Bank (2000) report at a United Nations Summit, it was noted that Nigeria is rated second poorest country in the world with majority of them living below poverty line. However, poverty is not confined to a section of the Nigerian society. As Nigeria Bureau of Statistic (2012) posited that about 60.9% of Nigerians in 2010 were living in outright poverty. In the same vein, in 2011, the figure increased to some extent to 61.9% and Angela ajodo-adebanjoko and Ugwuoke (2014), noted that the number of Nigerians living in poverty was about 61%. Nigeria's poverty and alleviation situation is a very pitiable issue, from North to South, East to West. Many individuals are in yokes and are ravaged by hunger, unemployment, destructively poor electricity supply (where they are available) and frequent grid failures, as well as lack of pure quality drinking water in the midst of plenty. It will be deduced from chapter two of the 1999 constitution of the Federal Republic of Nigeria concerning the fundamental Objectives and Directive Principles of State Policy in Section 2(b) specially provides that 'the security and welfare of the people shall be the primary purpose of the government. Since seventies, successive governments in Nigeria have come up with a lot of commendable initiatives and programmes with an intention to reduce poverty (Idachaba, 2006). Obayelu and Ogunlade (2006) noted that poverty as it were, means different things to different people as it is seen as being conceptualized in various ways in the literatures. On a broad dimension, there is poverty when a family or an individual is unfit to meet what is deliberated as a minimum prerequisite to sustain livelihood in a given society (Ogwumike, 2001). Furthermore, Deepa *et al. (*2000) posited that poverty is agonizing; the poor suffer physically, emotionally and morally.

ICTs are understood as a precarious resource that promotes the socio-economic development, with an effectiveness to alleviate poverty (Gopalakrishna, 2005). Similarly, Obayelu and Ogunlade (2006) noted that an academic study on ICTs and Society indicates that there are

varieties of challenges, which make it clear that the information Society are left with benefits that comes from ICT and its detrimental applications. They stated that a review of these academic studies of the ICT shows that there are no simple and straightforward effects of ICT on society. Hence, most effects are multiple and contradictory (Garson, 2000; Spears and Postmes, 2000; and Rommes, 2002). This paper tends to investigate the poverty alleviation with respect to insecurity and the ICT using Nigeria as a study case. In addition, proffer recommendations and suggestions that will aid the government to subdue its rate in the country. This paper is divided into five sections and begins with an introduction which is accompanied by the theoretical framework; relationships between poverty, insecurity and ICTs; challenges; conclusion and recommendations.

Theoretical Framework

Most commonly, poverty is defined as a state of being, in which we are incapable of meeting up with our needs (Watt, 2000). However, poverty, like every other social perception, is bedeviled with a surplus of descriptions. Poverty is insufficiency, bereavement, or the state of one who is in lack of certain amount of physical properties or money. In the same vein, World Bank (2001) stated that complete or destitution refers to the deficiency with respect to rudimentary human desires, which commonly include food, water, sanitation, clothing, shelter, health care and education. Consequently, Instituto Nacional de Estadistica (2009) noted that absolute poverty is defined contextually as economic variation in a location or a society in which people live. Using the idea of relative scarcity, individuals, families and groups in the population can be said to be in poverty when there is lack of resources to acquire the kinds of diet, as well as participate in the activities and amenities which encourage a good living condition.

Definition of Poverty Alleviation

The word ‘poverty alleviation’ can be defined as the methods, ways and procedures adopted by both government and non-governmental agencies to reduce and eradicate poverty. The best approach to ensure that poverty alleviation is controlled is by raising people’s capacities or enhancing freedoms. The effect of this methodology to progress is empowerment, which is, assisting people in poverty to obtain the tools they need to meet their basic wants as the long-term solution to poverty.

Perception of Insecurity

To understand what insecurity is, a proper knowledge of security will be required. Even though, Mazrui and Mazrui (1997) stated that the provision of security to the lives and property of the people is the major purpose of the State or nation. The term is challenging to define properly with precision. Consequently, Zebadi (2007) posits that the concept and perception of security has always been related with the safety and survival of the state and its people to the state. He further stated that security is not limited to the preparedness of the defense and security forces while incorporating the safety of the citizens to the state. Fayeye (2007) posited that in many nations of the world, security requires moving away from the local militaristic and state centric definition of security towards human security. He further stated that security incorporates the personal and collective state of being safe from an extensive range of serious and pervasive threats. Similarly, Nnoli (2006) asserts that national security as a valued worth connected with physical safety of persons, groups and nation states. Finally, the causes of insecurity can be related to the lack or poor management of the socio-economic activities of a country, poor implantation of rightful developmental recommendations and politics.

Relationship between poverty and insecurity

According to Olufemi *et al. (*2016) Crushing poverty is the proportion of half of the world's population. They further noted that, about 3 billion human beings manage to survive on less than $ 2 per day to $ 730 a year, just an equivalent of seven quality pairs of sneakers in the United Nation's. In the developing countries, the word "poverty" is a sentence of misery; it can regularly be a sentence to death, hunger, malnutrition and some easily preventable diseases like diarrhea, respiratory infections, malaria, and cholera flourish in rotten diets that have no basic sewerage, clean water, or poor electricity supply, while desolate rural areas lack basic health infrastructure to provide prenatal care or lifesaving vaccines or drugs. According to a report stated by Olufemi *et al*, (2016) with respect to UNICEF noted that, 10.5 million children less than five years old die each year from preventable diseases.

The Effect of ICTs in the Development of Economic Lives of the Poor in Nigeria

The ICTs are sometimes regarded as close-mystic solutions to challenges (Obayelu and Ogunlade, 2006). However, they are exceptionally powerful tools that have proven their usefulness over time in Nigeria. The poor in the rural areas and communities are now informed through the new ICTs and the traditional media. Though, little empirical evidences of the benefits of ICTs in Nigeria are found in literatures, there are unlimited potentials of ICTs as tools for improving people's daily lives whether through access to information enhancement with respect to its relevance to their economic lives, better access to other information sources; healthcare, transport, distance learning programs. Most common ICTs related poverty alleviation programs in Nigeria include, the telephone and the radio. other frequent use of traditional media include: Print, video, television, films, slides, pictures, drama, dance, folklore, group discussions, meetings, exhibitions and demonstrations (Munyua, 2000). The usage of computers or the Internet is still limited to very few individuals living in urban centers. According to Norrish (2000) ICTs have the possibility of enlarging and enhancing access to information and communication resources for inaccessible rural areas and poor communities, to reinforce the procedure of democratization and to better the endemic problem of poverty.

Inadequate healthcare services are among the most burdensome aspects of poverty. There has been a noteworthy focus on using ICTs to really provide healthcare plus as a way of educating people on health matters in Nigeria. Conversely, other uses of technology exist, which have the potential for revolutionary enhancements in the distribution of healthcare. In some cases, the technology is being utilized in its simplest forms to support the collection, storing and retrieval of data and information. The ICTs have supported Nigeria in the reduction of joblessness nationwide at both urban and in the rural areas of Nigeria.

Limitations amongst ICTs and Poverty Reduction in Nigeria

Understanding the connection that exists between ICTs and poverty reduction; some researchers have noted that the constraints facing the ICTs in poverty alleviation in Nigeria, are but not limited to lack of access to electricity and inadequate technical support. According to (Melkote and Steeves 2001; and Heeks, 1999) electricity is basic to internet access and ICT usage. Furthermore, they referred to these constraints as technological constraints. Obayelu and Ogunlade (2006) observed that over 75% of rural Nigerians are in the dark without power supply for lighting, let alone for running computers or television sets. Additional restrictions inferred from the study include: evaluating information, constraints in applying/using Information.

Challenges of Poverty Alleviation and Insecurity in Nigeria

The challenges of poverty alleviation and insecurity in Nigeria cannot be over underestimated. This is due to its multidimensional and in-exhaustive factors. However, for the purpose of this article, the following few challenges were knowledge and deliberated:

1. **Corruption**: In Nigeria, public funds that would have been used to positively affect the livelihood of the people are looted by corrupt leaders to develop the other economies of the world at the expense of Nigerians. It was on record that in the 1970s, Nigeria was among the 50 richest countries globally but now, one of the 25 poorest countries in the world due to failure in leadership and massive corruption Oviasuyi (2013)
2. **Bad governance**: Majority of those who took over leadership of the country from 1960s are till date, holding on to power. Some that are retiring are replacing themselves with unskilled and unproductive wards that were poorly groomed of ideas, vision and mission, and therefore lack the capability to execute good governance.
3. **Epileptic Power Supply**: The poor supply of electricity in the country has contributed in no small measure, to insecurity, increased poverty level and reduced ICTs growth in the country. In most cases, electricity is unavailable and the cost of running generating sets to provide personal electricity is very expensive.
4. **Poor education**: Education in Nigeria, over time, has been based purely on theories. Majority of our laboratories and workshops established for practical exercises are poorly equipped or non-existent. It was in acknowledgment of this insufficiency that the National Directorate of Employment (NDE) was established to equip and empower the graduates with the needed skills to alleviate poverty and survive in life.
5. **Mono-economy**: Nigeria as a country relies majorly on its one track economic status with oil accounting for almost 90% of the income. Oil has shattered the creativity of Nigerian leaders and has likewise reduced other sectors of the economy to the background. Consequently, efforts made to alleviate poverty, insecurity and employ ICT have not yielded concrete results.
6. **Government Policies:** Government's pitiable policy implementation is a contributory factor to the high rate of poverty, poverty alleviation and insecurity particularly in the rural areas in Nigeria
7. **Finance:** In developed countries, their success towards the ICT, poverty alleviation and insecurity was achieved through proper financing. However, it was not so in Nigeria as finance militates against the actualization of the set objectives of rural development.

Conclusion

Poverty and insecurity are co-related as it subjects man to untold hardship, and in some occasions dehumanizes the victim. This paper looked at poverty alleviation, insecurity and the ICTs in Nigeria. Firstly, it sees poverty as a condition where a person or an organization experiences lack, a situation with little or no means to obtain the basic necessities of life. In this paper has established a strong linkage between poverty alleviation, insecurity and the ICT in Nigeria. Similarly, most of the conflicts and insecurity experienced in Nigeria were prompted by poverty. The paper concludes that urgent actions should be taken by the relevant authorities in the country, more especially the government to address the issues of poverty in Nigeria in order to circumvent an impending disastrous situation which is on the increase.

Recommendations

In order to put the nation on the path of prosperity, growth and sustainable development, government must play the role of midwifing the economy. The following recommendations are proffered in order to actualize a profitable resolution:

1. Anticorruption organizations/ agencies in the country should be independent enough to perform their tasks of combating and reducing corruption to the lowest.
2. Oil theft; the current position where the oil revenue to the nation is always unknown, and powerful Nigerians and their cohorts in other foreign nations have turned themselves into oil thieves should be speedily addressed by the government.
3. Government ought to provide the essential and obligatory infrastructure such as power supply, water, road, health care services, housing, food and shelter, jobs and exhaust all for her citizens in order to alleviate poverty and insecurity in Nigeria.
4. Government should institute commerce and cottage industries, in addition to creation of enabling environment for the private sector to thrive so as to provide profitable employment to the populace of the rural areas, thereby eliminating poverty and insecurity.
5. There should communication that is effective and efficient between government and the policy makers as well as the community leaders and followers in project planning, implementation, monitoring and evaluation, particularly in the rural areas as this will stimulate growth and sustainable development that will eradicate poverty and insecurity.
6. Government, as a matter of urgency should make ICT the hub of the policy wheel, to link the various parts and absorb the cost at the initial stage of implementing the Policy.
7. The dilapidated rural telephony schemes should be revived and relentlessly implemented to bring about the desired ICT revolution and its capabilities to rural zones where the majority of Nigerians reside since access to information is part of empowerment and it reduces insecurity.

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THE ENGLISH LANGUAGE AS A RESOURCE FOR ALLEVIATING POVERTY IN NIGERIA

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Abstract
Every responsive and responsible Government, throughout the World, is expected to ensure that her citizens are not only well-protected from both the internal and external aggressions and attacks; but also have basic necessities of life. No doubt, the minimum basic necessity is food. As it is often said that a hungry man is an angry man, a man in need of food; clothing and shelter can do anything to survive, even if it means jeopardizing the peace and security of his environment. In the light of the above, every country, especially in the West Africa, is striving to fight poverty. They put up different measures to combat poverty, and even the United Nations Organization enlists Poverty Alleviation as one of the Cardinal goals to attain in the Millennium Development Goals. The thrust of this paper is to show the indispensable role the English Language and Literacy can play in making a reality Government's different poverty reduction measures in Nigeria. Our submission is that vibrant, realistic, functional literacy and language policy is imperative for sustainable and effective poverty alleviation measures and policies in Nigeria.
Keywords: Poverty Alleviation; Language Policy; Literacy; Millennium Development; Aggression; Sustainable.

Introduction

It is evident that no society can completely eradicate poverty. There shall always be class distinctions- The Rich; The Poor; and The Average. It can only be alleviated.

Poverty, according to Raji, (2016) can be explained as a condition of being poor or lacking something that ought to be within reach. He emphasized it that the lack could be material, physical, moral, spiritual etc. if most of the people, as it is the present situation in Nigeria, lack any of these basics, it means there is poverty in such land.

Herbert, (2014) observes that in spite of being home to many treasured raw materials and natural resources, West Africa, among which is Nigeria, harbours some of the poorest countries in the World.

Corroborating Herbert, Raji (2016) recalled that Nigeria that was always referred to as a Rich and Giant Country, is in reality full of poor people- a people suffering in the midst of plenty. He observed that the current situation in Nigeria reveals that the current situation in Nigeria reveals that poverty has permeated all aspects of lives of Nigerians. To him, poverty has perverted the ways of thinking of the masses who are left at the mercies and dictates of the rich who in turn use them for their own selfish interests.

As it is the case of Nigeria, most West African Countries also swim in poverty, hunger, disease and illiteracy. Hence, they keep embracing the several economic intervention schemes by the international institutions such as the World Bank, IMF, ADB etc. Hence, poverty reduction, Herbert, (2014) submits, becomes one of the areas of focus of many governments.

Disheartening however, poverty continues to sting a lot of Nigerians, as the efforts of the Successive Governments to alleviate these sufferings have not yielded the desired positive results.

The authors here therefore wish to examine how language education; and especially the English Language Policy, can contribute to poverty alleviation through the development of the language capital.
It is observed that although indigenous Nigerian languages have been germane to the processes of production and distribution in the informal sector, aimed at poverty alleviation, they are not relevant in the formal, international economy. The continued use of the indigenous languages to the detriment of our lingua franca (English Language) does not promote formal businesses.

Concept of poverty
Poverty is a condition of being poor or unproductive. It can also be referred to as a condition in which a person or group of persons are unable to satisfy their most basic and elementary requirements for human survival in terms of good nutrition, clothing, shelter, health, education, recreation and others.
To the layman, it simply refers to the members of the society who cannot afford their three square meals a day.

James (2023) refers to poverty as the state or condition in which people or communities lack the financial resources and essentials for a minimum standard of living. He submits that poverty is a socio-economic situation that is the result of multiple factors- not just income. These factors include race, sexual identity, sexual orientation and little or no access to education, among others.

Reliefweb (2020) identifies some causes of poverty. First is Inequality and Marginalization, which is described as the systematic barriers leaving groups of people without a voice or representation within their community. It advised that for a population to escape poverty, all groups must be involved in the decision-making process, especially when it comes to having a say in the things that determine their place in the society.
Hunger, malnutrition and stunting are also a cause of poverty. If a person doesn't get enough food, they will lack the strength and energy needed to work. Also, if a mother is malnourished during pregnancy, it can be passed on to her children, leading to wasting (low weight for height or stunting (low height for age).

Poor Health care Systems- Especially for mothers and children is another cause of poverty in Nigeria. Reliefweb observed that extreme poverty and poor health often go hand in hand. In countries, like Nigeria, where health systems are weak, easily preventable and treatable illnesses like malaria, diarrhea and respiratory infections can be fatal. When people must travel far distances to clinics or pay for medicine, it drains the already vulnerable households of money and assets, and can tip a family from poverty into extreme poverty.
Another cause of poverty, as Herbert (2014) noted, is little and no access to clean water, sanitation and hygiene. He noted that a lot of Nigerians don't have access to clean water at home. They walk very long distances, spending hours, to fetch water. That's the precious time that could be used working, or getting an education to help secure a job later in life. Contaminated water can also lead to a host of waterborne diseases, ranging from the chronic to the life-threatening. Poor water infrastructure such as sanitation and hygiene facilities can compound this, or create other barriers to escaping poverty.

Herbert, (2014) also identified climate change as a potent cause of poverty among the Nigerians. He observed that many of the World's developing nations, including Nigeria rely, to a substantial percentage, on farming. If therefore, climate change affects Cultivation or harvest, there shall not be enough food and assets to last through the next season, and not

enough reserves to fall back on in the event of a poor harvest. So, when climate change or natural disasters occur, it results in drought, leaving millions of people without food, it pushes them further into poverty, and can make recovery even more difficult.

Reliefweb, (2020) adds that Lack of Education as a cause of poverty. It submitted that although, not every person without an education is living in extreme poverty, most of the extremely poor don't have an education. There are many barriers to education, including a lack of money for uniforms and books, a bias against girl's education, and the others. As the great equalizer, education can open the door to jobs and other resources and skills that a family needs to not just survive but thrive. It concluded that poverty truly threatens education, but education can also help end poverty.

Poor Public Works and Infrastructure is also a potent cause of poverty. Reliefweb (2020) identified poor road network and lack of infrastructure of roads, bridges, wells, cables for light, cell phones and internet, can isolate communities living in rural areas. Living off the grid often means living without the ability to go to school, work or the market to buy and sell goods. Isolation limits opportunity, Without opportunity, many find it difficult, if not impossible; to escape extreme poverty.

Human rights careers (2000), identified the following among the others causes of poverty;

First, lack of good jobs /job growth. It noted that this is the first reason a lot of people think about. When one doesn't have a good job, one won't get a good income. And at times, when one has a job; but the income is static; one shall still live from hand-to-mouth, below poverty line.

Quoting the Economic Policy Institute, large groups of workers with full-time, year-round employment are still below federal poverty guidelines.

In addition, it identified social injustices, submitting that people who are victims of social injustice struggle with getting a good education, the right job opportunities, and access to resources that can lift them out of poverty.

Another cause of poverty identified is Lack of Government Support. Here, it explained that to combat many of the issues that causes poverty, the government needs to be involved. However, many governments are either unable or unwilling to serve the poor. Hence, such governments fail to provide social welfare programs, redirecting funds away from those who need it, failing to build good infrastructure, or actively persecuting the population.

The Last root of poverty, according to Human rights Career (2000) is High Costs. Stuff Costs too much. In Nigeria, most households spend 60-80% of their incomes on food. Food prices are also very unpredictable in certain areas. So, when they rise, the poor have to keep cutting out their essentials. Housing is another essential that is rising. Global house markets have been climbing, according to the International Monetary Fund. Income growth, however, has not.

In his write-up, Adesuwa, (2017) identifies Government Corruption as one of the main causes of poverty in Nigeria. It observed that since its founding, government corruption has plagued Nigeria. He observed that certain Government Officials often take bribes from oil companies that are supposed to go into public trusts. When government officials engage in the kind of Corruption, the poor and underserved populations within Nigeria are inevitably hurt. If these large sums of money stopped going into government officials' pockets, the Nigerian Government could use that money to build up the country's infrastructure- electricity, roads, running water and more. This shall identify alleviate poverty among Nigerians.

Insecurity is a cause of poverty in Nigeria, where there is insecurity, every citizen lives like a slave; as all socio-economic activities shall come to a standstill. No one shall go to work, thereby affecting all facets of life. Basic necessities cannot be provided. There shall be no food, clothing or shelter. Farmlands are destroyed; workplaces are destroyed.

Language, Poverty Alleviation and National Development

It is evident that no society can completely eradicate poverty. There shall always be class distinctions- The Rich; The Poor and The Average. It can only be alleviated. Poverty reduction, according to Raji, (2016) in his write-up title "Language, poverty Alleviation and National Development" in the 21st Century, sees poverty alleviation as the process which seeks to diminish the level of poverty in a community or among a group of people or countries and this can be overcome through education, economic development and income distribution. It involves a deliberate goal setting especially by Government, Individuals and Corporate bodies geared towards minimizing the harsh effects of the conditions of poverty.

Just as in the several countries of the World, the Nigerian Governments, past and present, have tackled poverty in various ways. They have always embarked on different Poverty Alleviation Programmes, including the Youth Employment Scheme (YES); Rural Infrastructure Development Scheme (RIDS); Social Welfare Services (SOWESS), among the others.

Despite all these schemes and efforts, poverty is far from being alleviated; let alone eradicated.

This paper aims at examining the inevitable role languages, especially the English Language, can play in alleviating poverty in Nigeria.

State of Language Education in Nigeria

Language is indeed the Engine of Education in Nigeria. Mathew, (2021) noted that Language has been variously defined by its functions as a systematic and conventional use of sounds, signs and symbols in a human society for Communication and self-expression. He further views language as the people's property which enables speakers to communicate with one another and with others at both the local and international levels. In other words, language plays a vital communicate role in the development of every Country; especially in the Educational, Scientific, Cultural, Social and Economic Sectors.

Language education therefore refers to the use of language as a medium for teaching and learning various subjects, an on the other hand, being primarily a branch of applied linguistics involving teaching and learning of a language with a view to improving the listening, speaking, reading and writing skills of pupils/students.

English Language, The Nigerian Education System and Human Development

The Role English Language plays in human development in Nigeria cannot be underestimated. Julian, (2017) observed that through language, people interact, share ideas and express their feelings. Without language, man would be incapable of a sustained and result-oriented thinking.

The issue of education cannot be discussed successfully without the language which serves as the medium of instruction. The skills and knowledge, which education provides for human development will not be possible without the language through which the concepts are expressed. In this wise, the English Language is supreme. It is the language of Education through which the learning experiences are relayed; and English, being the language of Education in Nigeria, one can therefore state categorically that it is a primary tool for human development in Nigeria.

Ukaegbu (2021) observed that language and poverty have a close relationship because no poverty alleviation measures can be successful if not poverty communicated to the masses.

Alexander (2016) submits that as a global language of communication, Nigeria also places English above all other five hundred and fifteen (515) local languages. English is the only official language of communication in government, educational, institutions, commerce, industries, politics, social interactions, law, judiciary, economics and many other issues.

Hence, the teaching and learning of the language is a sine-qua-non to improving the economy and alleviating poverty in Nigeria. It is the language spoken as the first language by many technologically-advanced countries in the World.

The English Language, no doubt, is an effective mechanism for technological acquisition, growth and productivity in Nigeria.

Although, English is a good language in Nigeria, it is a basic tool for National growth and productivity because it enhances the acquisition of knowledge, transcends various ethnic and linguistic barriers, professions, economics, political and social spheres. The knowledge obtained from formal education in Nigeria is through English Language. So, there cannot be any national growth or productivity without proper teaching and learning of English Language. It is a global language, quite developed and standardized over the years to accommodate new technological development. The modern Information Communication System (ICS) like computers, internet and multimedia Systems make use of English Language extensively. Even though other developed nations like Russia, Franca, Germany and Italy make use of their local languages in the development of their computers and other technologies, they still rely on English as the basis of their communication of technological development.

Corroborating the importance of the English Language to poverty alleviation, Umo (2008) noted that it is the means for effective expression of scientific applications in order to make them unique and generally acceptable. The eradication of poverty by the use of language can be enhanced solely through communication. Man interacts with another culture by understanding the language of such interest.

Nigeria is a nation with different ethnic groups having different cultures, languages and reasoning. This situation places Nigeria below poverty level. The unique and common language, which would make Nigeria to share the same species of reasoning is English Language, which is not generally appreciated and accepted in every part of the country, people still believe that their nature language is superior to English and this makes socio-economic interaction difficult.

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Conclusion

This work has examined the role of language especially the English Language and Literacy in Poverty Alleviation in Nigeria and how the duo could help make the Poverty Alleviation measures established by different regimes in Nigeria a success. Different regimes have made continuous efforts towards reducing the level of Poverty in Nigeria. First, though the activities of Ministries and Agencies; and second, by collaboration with the international Agencies. Third, and most importantly, through the establishment of agencies equipped solely to fight rising Poverty in Nigeria. These include, but not limited to: The National Directorate of Employment (NDE); People's Bank of Nigeria (PBN); Nigeria Agricultural Insurance Corporation (NAIC); Industrial Development Centre (IDC); Directorate of Food, Roads and Rural Infrastructure (DFRRI); Family Support Trust Fund (FSTF); Nigeria Industrial Development Bank (NIDB); Operation Feed The Nation (OFN) among the others (Godwin, C.S. and Eunice K.U ( )

The success of these programmes involves, among other things, an enlightenment of the target population through information dissemination and instruction. The aim is to enable them to acquire new skills and improve upon archaic, old and inefficient methods of carrying out their occupations. Such steps will bring about a higher output leading to improved living standards for the people.

The big question is how can any of these programmes of enlightenment and instruction be carried out among Nigerians who cannot understand the official English Language, in the Nigeria of Multi-Linguistics Status. The answer is 'NO'. The much –talked about technology

can only be successfully impacted and transferred through the universal English Language. Inability to understand and communicate in the English Language, however little, therefore be an impediment to Poverty eradication through Technology Transfer. In different occupations, the approaches, techniques and methods most engagers/professionals use in their trade of goods and services are obsolete requiring improvements to achieve a better and higher output, to record more profits. You want, as an instance, to introduce improvements in the methods of farming, fishing, knitting, carpentry, feeding the livestock; milking the cattle e.t.c. unless indigenous instructors are available, instructions in these areas shall not be of use to those who do not understand the English Language.

This paper then concludes that effective use, teaching and learning of the English Language is indispensable to alleviating poverty in Nigeria.

Recommendations

1. By implication, provides tools for scientific investigations. It means that without Language, science cannot function and without science, language cannot be studied as it is today. In the case of Nigeria, it is the unifying English Language that can conveniently perform the task. The Nigerian Government and its agencies should therefore do everything to improve its teaching and learning in schools.
2. It is evident that the world's poorest countries are those that have the highest population of illiterate citizens as part of the Millennium Development Goals (MDG) , the Government should free education in at least the Primary and Secondary School in Nigeria; and subsidize School fees for the tertiary institution students. More priorities should be given the teaching and learning of the General Studies (English Language) courses. The English Language Teachers and authors be encouraged with more incentives to be more hardworking and dedicated to work; and churn out relevant English Language Textbooks.

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GODFATHERISM AND SECURITY OF POLITICAL PARTY INTERESTS IN NIGERIA

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Abstract
This work was set to exposit godfatherism in security of political party interests in Nigeria. Snowball sampling technique was adopted in the selection of 80 executive-members of dominant political parties (APC, LP, PDP) among the 18 political parties registered by INEC in Nigeria. Data collected through questionnaire were analyzed using descriptive statistics of frequency count, percentage and bar chart. Result revealed both roles and problems posed by godfatherism in the security of political party interests in Nigeria. Among established roles of godfatherism in the security of political party interests in Nigeria is that godfathers secure party against factional crisis among party leadership, secure party interests with ruling government, and unifying strength security of the party against elements of internal and external acrimony division. In line with the findings above the study recommended that a law be enacted to accord godfathers official status in security of political party interests and to tenure activities of godfatherism in security of political party interests, politics and public administration.
Keywords. Administration, Godfatherism, Government, Political Security, Political Leadership.

Introduction

Political evolution of any state is predicated on the activism of political gladiators, Alabi and Tunde (2013). Political gladiators, from time immemorial, were noted to influence the structure of the state from the basic anarchic, to theocratic and up to monarchy, and the gradually-extinct totalitarian system as well as the representative and the contemporary complex democratic system. (Ali and Isah, 2018). While the concept of godfatherism was not particularly emphasized in the evolution of state and public administration in the pre-colonial and colonial Nigeria, its practice was not entirely unheard of and it, in fact, had increased prominence since the country's independence of 1960 with continuous relevance even during the military regime. Prominent godfathers during these eras were Nnamdi Azikiwe, H.O Davis, Obafemi Awolowo, Ahmadu Bello, Meredith Adisa Akinloye and the then Ooni of Ife; Oba Okunade Sijuade Olubuse, the second. Among the personalities who passed through the political tutelage of the aforementioned and in successions were Adegoke Adelabu popularly known as *Penkelemesi*, whose grandson – Adebayo Adelabu contested but lost the Oyo State gubernatorial elections in 2019 and in 2023. Others included Umar Yar'adua who served as minister in the first republic and whose nephew was later elected executive President of Federal Republic of Nigeria in 2007.

This political epoch was succeeded by that of Saka Eruobodo who trained the enigmatic Lamidi Adedibu, whose son – Kamoru – later became Senator of Oyo Central Senatorial District in 2007 and was allegedly ordained by his father to succeed the then incumbent Governor Adebayo Alao-Akala before the sudden death of Lamidi Adedibu. Another godfather of repute was Senator Olusola Saraki whose son governed Kwara State for 2 consecutive tenures of eight years. Other important godfathers who had played decisive roles in the Nigerian political history in different political parties were Chris Uba, Rabiu Musa

Kwakanso, Olusegun Obasanjo, Goodluck Ebele Jonathan, Late Abba Khiyari and the emerging Akeredolu, Governor Seyi Makinde, Nasiru El-Rufai, Ayodele Fayose, Atiku Abubakar, Rotimi Amechi and the national leader and godfather of All Progressives Congress – Bola Ahmed Tinubu, who in 2023 general elections, won a landmark election and became the 16th Commander-in-Chief and President of Nigeria.

The concept of "Godfather" is rooted in certain traditions in many parts of Europe and America, especially in the Catholic Church, where it is originally associated with a new man who provides inspiration, advice or support to a younger one for his overall betterment (Albert, 2005). Godfathers plan, organize, finance, co-ordinate and decide virtually all resources necessary for the attainment of the objectives of the group but with particular interest which may sometimes be exclusively or partially selfish. Political discussions in Nigeria, however, emphasized selfish and even destructive roles being played by godfathers to establish their hegemony on both the party and the state resources. There have been reported cases of godfathers who publicly confessed to siphoning, misappropriation or personalization of public treasury. A typical example is that of Lamidi Adedibu who publicly bragged that his political might installed Rashidi Ladoja as governor of Oyo State in 2003 and that prior to election victory, the governor agreed to gratify his effort with payment of certain percentage from the governor's security vote. As this agreement seemed to be falling apart, Adedibu was known to influenced the State House of Assembly to impeach Ladoja (Human Right, 2007). In this case, all the activities of the godsons are expected to be in line with the interest of godfathers. This is to sustain the dominance of the godfathers on administration and political activities of the godsons.

Corroborating the above, a study by Chukwuma, (2008) disclosed that the politics of godfatherism has negative implication on the political arrangement of Nigeria and the citizens. Certainly, the right to select an aspirant of their choice to rule them has run down, given the conditions in which godfathers are the deciders of who are to contest or they impose candidates of their desire on the society. This is, the faith of democratic rule. Politics of godfathers in the Nigerian states is not whose influence stems not just from wealth but from their capacity to organize violence and corruption to manipulate the central, state and local political schemes in support of the candidates they champion. Olunloyo, (2014) also observed that godfathers request a considerable grade of control over the government not in order to support or form government policies, but to extract direct financial returns in the form of government resources stolen by their politicians or gave to them as further opportunities for the implant. The over-concentration of influence, wealth and power of politicians describes the ascent for the regulation of the political structures and institutions by the ruling class in the society. However, the struggle and the resulting standards have impacted significantly on the society in various ways. In the present emerging democratic practice, the power struggles among the members of the ruling class have given rise to violence in different forms and degrees. In a related opinion, study by Ohiole and Ojo (2016:10), revealed that the Nigerian politics has been characterized by godfatherism and party politics, Ohiole and Ojo (2016), added that political godfatherism is based on political substitution relating to financial and moral aid where the godfather is the main donor and the godsons are the primary receivers, as a result, the common people are being destabilized with the dividends of democracy.

Here are some of the activities associated with godfatherism in Nigeria which have resulted in a wide range variety of problems, having serious negative impacts on the Nigerian elections, politics, administration.

For the purpose of brevity and contextual relevance, let us look at some inherent problems brought about by the activities of godfatherism leading to Economic and Political insecurity.

- Godfatherism is the collaborating relationship and tendencies of both the godfathers and the godsons in looting and siphoning resources met for the development of the state into their private pockets. Oviasuyi (2009).
- Godfatherism has led to placing people in various governmental positions whom themes do not have the required leadership qualities to bring about good governance and development. As a result, the godfather sits at home dictating the pace of development and influencing decisions of Governments on who gets what, when and how (Oviasuyi, 2009).
- Many of our unemployed youths are being lured through the activities of godfatherism into committing acts of political violence and thuggery through promises of employment and or other forms of illegal government patronage that never come to reality at the end (Oviasuyi, 2009).
- Godfatherism, in all ramifications over the years has resulted in the disenfranchisement of eligible voters through the use of thugs. It has also been instrumental in the final determination of most of our public policies, thereby challenging our idea of "one citizen" "one vote" (Oviasuyi 2009).
- Godfatherism in Nigerian politics determines in all elections who competes, who wins, who get nominated to positions or who get appointments. Godfatherism has also resulted in the turning around of our national priorities to favor their own personal interest and thereby making the national assembly less representative and less responsive to the yearnings of the citizens (Oviasuyi, 2009).
- Nigeria today has the worst unemployment problem, deplorable roads and transportation problem, miserable infrastructures, medical services, educational system and standards, epileptic power outage, the living standard of the average Nigerians does not reflect the oil wealth of the nation. All these are as a result of the activities of godfathers who collaborate with their godsons to siphon resources met for the overall infrastructural development of the country (Oviasuyi, 2009).
- The study also discovered that the unholy alliance of godfathers and godsons has brought untold hardship on the totality of the Nigerian populace (Oviasuyi P.O. 2009).
- Rate of unemployment in the country has resulted in the youth taking to violence with or without any monetary rewards, especially when there are flamboyant promises by the godfathers (Oviasuyi 2009).

While other ominous reports of activism of godfathers are unestablished, the fact that people hold low opinion of godfatherism in politics offers a critical gap in knowledge of politics and public administration and this requires scientific investigation to establish factual knowledge of these unverified reports. In view of this, the research sought to:

i. Identify the roles of godfatherism in security of political party interests in nigeria
ii. Identify the problems being posed by godfatherism in security of political party interests

Methodology

The design for this study was the survey design. Study population includes card carrying executive members of any of the 18 INEC registered political parties in Nigeria. This is because the population could be trusted to be conversant with political events vis-à-vis godfatherism in the security of political party interests as it unfolds in Nigeria. Snowball sampling technique was adopted in the selection of 80 executive members of dominant political parties in Oyo State – these are All Progressive Congress, People's Democratic Party

and Labour Party – as participants in the study. Questionnaire data collected were analyzed using descriptive method such as bar chart, frequency count, percentage and histogram.

Data Analyses and Presentation

Table 1: Distribution of Responses on the Roles of Godfatherism in Security of Political Party Interests (n=80)

Variables	Frequency	Percentage
Godfathers secure party against factional crises among party leadership		
Agree	68	85
Disagree	12	15
Godfatherism secures party interests with ruling government		
Agree	64	80
Disagree	16	20
Godfatherism secures public trust in the political party		
Agree	48	60
Disagree	32	40
Godfathers secure party against internal and external acrimony division		
Agree	44	55
Disagree	36	45
Godfatherism mainly works to fulfill the party interest sometime against personal interest		
Agree	72	90
Disagree	08	10
Political party cannot function without godfathers		
Agree	24	30
Disagree	56	70
Total	80	100

Source: Researchers' Survey, 2022

Table 1 presents the distribution of responses on the roles of godfatherism in the security of political party interests. It is seen that 85% of the respondents agreed that godfathers secure party against factional crises among party leadership while 15% disagreed. This implies that godfathers can be a binding force especially during intraparty rivalry and disagreement. This finding affirmed that of Odivwri (2003) that godfathers are noted to be powerful figures respected for their conciliatory abilities among party members and sometimes in interparty negotiations.

Also, from the table, it is seen that 80% of the respondents agreed that godfatherism secures party interests with the ruling government in which 20% disagreed on this point. This means that godfathers serve as informants that give the party information about the government. In consonance with the findings of Onwuzuruigbo (undated) which indicates that godfatherism can give individuals established links with a given institutional hierarchy in the expectation of favoured treatment such as political appointees.

Moreover, the table indicates that 60% of the respondents agreed to the fact that godfatherism secures public trusts in the political party while 40% disagreed. This implies that some godfathers are close to the masses and therefore can mobilize for political actions including elections, boycotts, and protests among the others. Just as it's been affirmed by Abdullah and

Tunde (2013) that Godfathers reign across all spheres of the society: internally and externally, even in academics, legal and religious professions.

Moreover, the table reveals that 55% of the respondents agreed that godfathers secure the party against internal and external acrimony division while 45% disagreed on this point. This implies that godfathers secure the party and its people to be free from eavesdropping, interception and even financial loss at times.

In addition, the table has shown us that 90% of the respondents agreed that godfatherism mainly works to fulfill the party interest sometimes against their personal interest while 10% disagreed. This finding is quite unexpected and it's interesting because the priori expectation is that godfathers are known to be selfish and administer the party for personal interest. This however, is not the case with the findings as almost all of the respondents, based on their political experience, did not see godfathers as selfish but rather, as selfless, patriotic and amiable. This is affirmed by Ali and Isah (2018) that godfatherism contributes to the development of any interest group and successfully contributed crucially in determining candidates rather than their personal interest, all for the party.

In conclusion and as indicated by the table, 30% of the respondents agreed that political party cannot function without godfathers while 70% disagreed. This implies that political parties can function in the absence of godfathers, as seen in the zero-party system. However, this finding contradicted that of Ali and Isah (2018) that candidate who want to get the nod of their parties for whatever office, even those vying to the office of the president, must be identified with one prominent godfather.

Table 2: Distribution of responses on the problems of godfatherism in security of political party interests (n=80)

Variables	Frequency	Percentage
Behavior of godfathers often create factions / divisions in the party		
Agree	68	85
Disagree	12	15
Godfatherism often practices selfish favoritism at the detriment of the party objectives		
Agree	68	85
Disagree	12	15
Attitude of godfathers often drives some members out of the party to other political party		
Agree	72	90
Disagree	08	10
Godfathers are often dictators with insensitivity to members' reactions		
Agree	52	65
Disagree	28	35
Existence of godfatherism has more disadvantages than advantages		
Agree	60	75
Disagree	20	25
Godfathers will not usually has political/ legally establish position in the party		
Agree	60	75
Disagree	20	25

Godfatherism mainly works to fulfill personal interest of godfathers sometimes against party interest		
Agree	56	70
Disagree	24	30
Total	80	100

Source: Researchers' Survey, 2022

Table 2 above presents the distribution of responses on the disadvantages of godfatherism in politics and public administration. It indicates that 85% of the respondents agreed that behavior of godfathers often create factions/ divisions in the party while 15% disagreed on this point. This implies that the faction in the behavior of godfathers as concerned with the party, a case of Adedibu as Peoples Democratic Party (PDP) godfather during the period of Senator Rasheed Ladoja as governor of Oyo State, created factions such that some people supported Adedibu while the others supported Ladoja in the same party; also, Ambode versus Tinubu in All Progressive Congress (APC) in Lagos State and Tinubu versus Aregbesola 2021 in Osun State among others.

Also, the table indicates that 85% of the respondents agreed that godfatherism often practices selfish favoritism at the detriment of the party objectives, 15% of the respondents disagreed over this point. The implication of this is that godfathers' self-favoritism harms the party objectives, which should not be. However, there is comparison between the findings of this research and Edigin (2010) that political position holders become a stooge to his godfather because he that pays the piper dictates the tune. By the time the godsons refuse to meet their godfathers demands, they eventually get impeached from office. And also, the case between Alhaji Lamidi Adedibu (godfather) and Ladoja (protégé) battled for the soul of Oyo State in 2003 (Okafor, 2006).

More Also, the table reveals that 90% of the respondents agreed that the attitude of the godfathers often drives some members out of the party to other political parties while 10% disagreed. This implies that if godfathers are too selfish and insensitive, many of the people will cross carpet because politics is much more about personal interests.

More Again, from the table, it is seen that 65% of the respondents agreed that godfathers are often dictators with insensitivity to members reactions while 35% of the respondents disagreed to this point. This implies that godfathers use absolute power of sovereignty over political members: meaning godfathers are autocratic in their power. This was affirmed by Ali and Isah (2018) that godfathers are regarded as strong elites and their authoritative decisions were respected.

Also, this table has shown us that 75% of the respondents agreed that the existence of godfatherism has more disadvantages in which 25% disagreed on this point. This implies that once the negative side of godfatherism supersedes its positive side, it should be shoved.

In addition, the table indicates that 75% of the respondents agreed that godfathers do not usually have political/ legally established positions in the party while 25% disagreed that godfathers do not usually have political / legally established positions in the party. This implies that godfathers only plan, organize, finance, coordinate and decide virtually all resources necessary for the attainment of the objectives of the party.

Lastly, the table reveals that 70% of the respondents agreed that godfatherism mainly works to fulfill personal interest of the godfathers sometimes against party interest while 30% disagreed on this point. This implies that godfathers are to favour their mindsets over any other party interests sometimes.

Discussion of Findings, Conclusion and Recommendations

The research investigated godfatherism and security of political party interest. Based on the objectives of the study, the following findings were made:

- Roles of godfatherism includes: Securing the party against factional party crises, secures party interests with the ruling government, and instrumental to the achievement of party interests sometimes against their personal interests.
- Problems posed by godfatherism include: Creation of intra-party favoritism in favour of loyal' subjects, elevation of self-interest above the party interest and consequently driving some dissatisfied members out of the party.

While problems posed by godfatherism in security of political party interests seem to outweigh its roles, godfatherism is found to be inevitable and performs important roles to achieve electoral victory and secure the interests of political party.

Recommendation

As the concept of godfatherism cannot be jettisoned in the security of political party interests despite its shortcomings, it is recommended that the position of godfathers should be legalized and tenured that, the activities of the godfathers could be brought to evaluation and legal questioning by party members and the public especially at the expiration of their tenure.

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COVID-19 AND LIVELIHOOD ACTIVITIES OF WOMEN: DURING AND AFTER THE PANDEMIC IN IBARAPA CENTRAL LOCAL GOVERNMENT AREA OF OYO STATE

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Abstract
The study examined the livelihood activities of women during and after Covid 19 pandemic in Ibarapa Central Local Government Area of Oyo State, Nigeria. The specific objectives of the study are to identify the livelihood activities among the women, to examine the effect of Covid 19 on the livelihood activities of women and to identify the constraints faced by women during and after the pandemic. The study examined how women affected by the crisis struggled to recover from the economic shock of Covid-19 and secure resilient futures. 120 respondents were sampled purposively while descriptive statistics and probit regression were used for the analysis. The mean age of the respondents was 42 years old, the main source of livelihood (occupation) of the respondents revealed that Artisans had the highest number of respondents (33.33%). Educational status of the respondents revealed that 45% had no formal education while 61.67% were married. The secondary livelihood activities revealed that 60% of the respondents were traders while the mean total income during and after pandemic per monthly were #11,541.67 and #21, 333.33 respectively. Effect of covid-19 on livelihood activities among women revealed that age of the respondents is positively significant at 1%, increase in age increase covid- 19. Also, income from livelihood activities is negatively significant at 1% and it implies that increase in covid 19 decreases the income generated from livelihood activities of the women. The constraints faced by the respondents in the study area during and after the pandemic revealed that business activities during the pandemic were low (60%) while business activities after the pandemic were high (75%). the profit made on their business was very low (75%) during the pandemic while the profit was on the average (57.5%) after the pandemic. The profit was on the average after the pandemic because they didn't recovered on time from the pandemic shock in their livelihood activities. Majority of the respondents were not affected health wise except few aged but affected financially due to total lock down which caused a lot of set back on their businesses/ livelihood activities and after the pandemic, the recovery was gradual but slow. Women in rural areas should be trained on e-marketing, e- business, expand access to information, so that if there is pandemic and total lock down, their livelihood activities can still strive. Restoring resilient futures for women in such crisis relies on multi-stakeholder action and inclusive economies to women's economic empowerment, rebuilding economies by prioritizing the right to safe and decent economic opportunities, financial services, social networks, social protection, redistributed unpaid work/ care and gender equality.
Keywords: Covid 19**,** Livelihood**,** Pandemic and Women

Introduction

The impact of Covid -19 is still felt in the economy especially in rural areas of developing economy. Livelihoods have been disrupted by both production systems and households in most regions remain fragile to external shocks (FAO 2020). According to Asegie *et al.* (2021)**,** the World Bank estimated that the world economy will shrink by five percent in year

2020. The COVID-19 pandemic compounded challenges of food security and sustainable livelihoods in developing countries (Rasul, 2021). The agricultural supply chain is disrupted by the pandemic (Pu and Zhong, 2020; Rasul, 2021). Its containment measures diminished the livelihoods of vulnerable people (Gerard *et al.*, 2020; Kassegn and Endris, 2021; Ouko *et al.*, 2020) with multifaceted impacts (Alvi *et al.,* 2021). The COVID-19 has a mixed effect on the economies of developing countries (Swinnen and McDermott, 2020,).

WCOZ, 2020 admitted that COVID-19 has evolved from merely being a health crisis, but socio-economic crisis, with the hardest impacts being taken by women. The Covid-19 pandemic has had a devastating impact on the lives and livelihoods of women globally. This research clearly demonstrates that women affected by this crisis and displacement have been hit by a 'triple disadvantage' of Covid-19, displacement and gender discrimination. Findings from research in Jordan, Greece and Nigeria evidence clear gender differences in the ability to earn an income, be employed in salaried formal work and take on responsibility for unpaid care work throughout the pandemic, with women hit hardest (Clingain *et al.*, 2021). Key barriers to economic opportunities during and after the pandemic include restrictions on freedom of movement, access to financial services, formal employment and social protection.

Clingain *et al. (*2021) admitted that without dedicated action by host nations, donors and multilaterals, women affected by crisis and displacement will struggle to recover from the economic shock of Covid-19 and secure resilient futures. This will set back progress on the gender equality and decent work commitments within the Sustainable Development Goals (SDGs 5 and 8), the refugee self-reliance objectives of the Global Compact on Refugees, and Economic Justice action commitments included in the recent Generation Equality Global Acceleration Plan.

Empirical evidence shows that women are over-represented in informal and vulnerable employment, with statistics showing that women constitute at least 65% of the informal sector. According to the latest data by ILO, the share of women in informal employment in developing countries was 4.6 percentage points higher than that of men. The informal sector has not recovered from the negative economic consequences of the lockdown, which the country has been facing since March 2020, which placed a ban on all informal activities. The majority of women in the informal sector rely on cross-border business, selling of clothes, domestic piece jobs, processing of Agricultural produce as well as marketing the produce. A larger portion of this sector has not been in operation since year 2020. This has presented a negative impact on the income generating capacity of most women, hence resulting in impoverishment. This has meant that more women in the informal sector have had to grapple with the reality of COVID-19 and challenges of income loss, food security, water and livelihood support. Women-led households have been amongst the group of the most vulnerable population taking the hardest hit on the economic front, both in the rural and urban settings.

According to the research undertaken by Plan International in 2020, at least 83.4% of respondents were women and their households could not sufficiently meet their families' basic needs during the COVID-19 lockdown. (Plan International, 2020b) The pandemic has not only exposed and exacerbated, in the most devastating ways, the socio-economic vulnerabilities of women, but rather the glaring weaknesses in the State's governance and social protection mechanisms such as the poorly funded, National Social Protection Policy Framework (NSPF). An Analysis commissioned by UN Women and UNDP in 2020, estimated that by 2021 around 435 million women and girls will be living on less than $1.90

a day - including 47 million pushed into poverty as a result of COVID-19. Loss of livelihoods and hunger has also been noted as key drivers for the rise of GBV during the lockdown.

Restoring resilient futures for women in crisis and displacement settings relies on multi-stakeholder action and inclusive economies. The Covid-19 global recovery presents an opportunity for renewed attention to a comprehensive and inclusive approach to women's economic empowerment, rebuilding economies by prioritizing the right to safe and decent economic opportunities, financial services, social networks, social protection, redistributed unpaid work/ care and gender equality.

The broad objective of this study is to know the effect of COVID 19 on livelihood activities of women during and after the pandemic in Ibarapa Central Local government area of Oyo state. The specific objectives are to describe the socio- economic characteristics of the respondents in the study area, to identify the livelihood activities among the women, to examine the effect of Covid 19 on the livelihood activities of women and to identify the constraints faced by women during and after the pandemic.

Methodology

The study area

The study was carried out in Ibarapa Central Local Government area of Oyo state. Ibarapa Central consists of two major towns; Igboora and Idere which consist of 10 political wards made up of 7 wards in Igboora and 3 wards in Idere. The study area shares boundary with Ayete (Ibarapa North), Abeokuta (Ogun state) in South, Ibarapa East and Republic of Benin in the West. The pattern in the area follows a tropical type with an average annual rainfall pattern of 300mm and high temperature.

The study area has an area of 440 km^2 and a population of 116,809 according to the 2006 census. The vegetation of the area is largely rain forest and Savannah. This makes it possible to cultivate crops ranging from tree crops and arable crops. The early season planting usually begin from March and ends towards the end of June, and the late season planting ends around December. The common tree/ cash crops grown in the area include Cocoa, oil palm and cashew while the arable crops include maize, cassava, yam, water melon and other vegetables.

Population of the study

The target populations of this study were women of different livelihood activities in Ibarapa Central Local Government area.

Sampling Techniques and Sample Size

Multi- stage random sampling technique was used in selecting the respondents from the study area. The first stage was random selection of 5 wards from the 10 political wards in Ibarapa Central Local Government Area. The second stage was random selection of 25 households from each of the selected wards. The third stage was purposive selection of women in each household either the female head or the mother of the house. 5 respondents were unable to complete the interview; therefore, 120 respondents were fit for the study/analysis.

Data Collection

Interview schedule was used to collect data from the respondents and this serves as primary source of data.

Data Analysis

Objective 1, 2 and 4 were analyzed using descriptive statistics such as Frequency, mean, standard deviation, percentages and likert scale while objective 3 was analyzed using inferential statistics i.e. Probit Regression Model.

Objective 3: Probit Regression Model

Probit analysis was developed from the need to analyze dichotomous dependent variables within the regression framework. Many response variables are binary by nature (yes/no), while others are measured ordinally rather than continuously (degree of severity). Ordinary least squares (OLS) regression has been shown to be inadequate when the dependent variable is discrete (Collett, 1991 and Agresti, 1990). Probit or logit analyses are more appropriate in this case.

The probit procedure computes maximum likelihood estimates of the parameters β and C of the probit equation using a modified Newton-Raphson algorithm. When the response Y is binary, with values 0 and 1, the probit equation is:

$p = \Pr(Y = 0) = C + (1 - C) F(x'\beta)$

Where: β is a vector of parameter estimates, F is a cumulative distribution function (the normal, logistic, or extreme value), x is a vector of explanatory variables, p is the probability of a response, C is the natural (threshold) response rate.

Y = 0: Not ffected by Covid- 19, Y= 1: Affected by Covid- 19

While; X_1 = Age (years), X_2 = Occupation: (Trading = 1, Artisan= 2, Farming = 3, Civil servant = 4), X_3 = Secondary Occupation (Trading=1, 0 otherwise), X_4 = Education: (No schooling = 1, primary =2, secondary =3 and tertiary = 4), X_5 = Household size: (number), X_6 =Number of Children (number), X_7 = Age of spouse (years), X_8 = Types of Family (Monogamy = 1, Polygamy = 2), X_9 =Religion (Christianity = 1, Islam= 2, Others= 3), X_{10}= Marital status (Single = 1, Married = 2, Divorce/ Separated =3, Widow= 4

Result and discussion

Socio-economic Characteristics of the Respondents

Table 1 below shows the socio-economic characteristics of the respondents in the study area. The age of the respondents revealed that 37.5% of them were less than 30 years of age, 10.83% of the respondents were between 31-40 years old, 44.17% of the respondents were 41-50 years old, 4.98% of the respondents were between 51-60 years old while 2.49% were above 60 years old. The mean age of the respondents was 42years old and it implies that they are in their economic active age. The occupation i.e main source of livelihood of the respondents revealed that Artisans had the highest number of respondent's i.e 33.33%, traders were 21.67%, farmers were 20.83% while 24.17% were civil servants. The educational status of the respondents revealed that 23.33% had primary school education, 13.33% of the had secondary school education, 18.33% had tertiary education while 45% had no formal education which implies that many of them didn't experience formal education but adult education while most of the respondents were married (61.67). The mean total income during pandemic was #11,541.67 while the mean total income after lockdown and pandemic was #21, 333.33.

Table 1

Variables	Frequency	Percentage	Mean	Std dev.
Age				
Less than 30	45	37.50		
31- 40	13	10.83		
41-50	53	44.17		
51-60	6	4.98	42	6.621
Above 60	3	2.49		
Occupation				
Trading	26	21.67		
Artisan	40	33.33		

Farming	25	20.83	
Civil servant	29	24.17	
Educational Status			
Primary	28	23.33	
Secondary	16	13.33	
Tertiary	22	18.33	
Non formal	54	45.00	
Marital Status			
Single	19	15.83	
Married	74	61.67	
Widow	22	18.33	
Divorce	5	4.17	
Household Size			
1-2	11	9.1	
3-4	70	58.33	3
2.214			
5-6	38	31.67	
>6	1	0.83	
Number of children			
0	19	15.83	
1-2	21	17.50	
3-4	41	34.17	
5-6	24	20.00	3
1.038			
Above 6	15	12.50	
Type of family			
Monogamy	86	71.67	
Polygamy	34	28.33	
Total Income (#)/Month (Duringr/After Covid 19)			
<10,000	68(20)	56.67(1.67)	
11,541.67(21,333.33)			
10,000-20,000	27(52)	22.5(43.33)	
20,001-30,000	10(15)	8.33(12.5)	
30,001-40,000	8(18)	6.67(15)	
>40,000	7(15)	5.83(12.5)	

Source: Field Survey, 2021. ***Note: Total Income after pandemic in Parenthesis***

Identification of Primary and Secondary livelihood activities among women in Ibarapa Central Local Government Area of Oyo State.

Table 2 below revealed the respondents' primary and secondary livelihood activities in the study area. The main livelihood activities revealed that, 21.67% of the respondents were traders, 33.33% of the respondents were artisans, farmers were 20.83%, while 24.17% were civil servants/public servants both in private and government sector. The secondary livelihood activities revealed that 60% of the respondents were traders, 10% of them were into Patent Medicine, 14.17% were Artisans while 15.83% were farmers. It implies that greater percentage of them were into trading as a support to their major means of livelihood.

Table 2

Main Livelihood Activities	Frequency	Percentage (%)
Trading	26	21.67
Artisan	40	33.33
Farming	25	20.83
Civil servant	29	24.17
Secondary Livelihood Activities		
Trading	72	60.00
Patent Medicine	12	10.00
Artisan	17	14.17
Farming	19	15.83
Total	120	100

Source: Field Survey 2021

4.3 Examine the Effect of Covid-19 on Livelihood Activities Among Women

Table 3 below showed the probit regression result of the effect of covid-19 on livelihood activities among women in Ibarapa Central Local Government Area of Oyo State. The age of the respondents is positively significant at 1% i.e increase in age of the respondents increase covid- 19 which implies that the older people are more affected by covid-19 pandemic. Also, income from livelihood activities is negatively significant at 1% and it implies that increase in covid 19 decreases the income generated from livelihood activities of the women because there was movement restriction to go about daily business activities which reduced their income.

Table 3 Probit Regression Result.

Number of obs = 120 LR chi2(8) = 3.13
Prob > chi2 = 0.9256 Log likelihood = -62.412383
Pseudo R2 = 0.6245

eftotal	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Age	.1268121*	.3759198	2.34	0.001	-.609977	.8636013
Household size	.1691462	.3221568	0.53	0.600	-.4622695	.8005619
Number of children	.0388532	.1601009	0.24	0.808	-.2749388	.3526452
Type of family	-.0308962	.0424994	-0.73	0.467	-.1141935	.0524012
Secondary occupation	-.2849248	.4160357	-0.68	0.493	-1.10034	.5304903
Income livelihood activities	-.1341212*	.2018729	-3.66	0.000	-.5297847	.2615424
Educational level	.0407358	.1577645	0.26	0.796	-.268477	.3499485
Marital status	.1099585	.2418496	0.45	0.649	-.3640579	.583975
_cons	1.777747	1.061097	1.68	0.094	-.3019659	3.857459

*=sig at 1%, **= sig at 5% ***=sig at 10% **Source: Field Survey 2021.**

Constraints faced by women on livelihood activities during and after Covid 19 pandemic in Ibarapa Central Local Government Area of Oyo State.

Table 4 revealed the constraints faced by the respondents in the study area during and after the pandemic. The case of covid 19 in the study area was low (98.33%) during the pandemic, there was no total lockdown (98.33%) in the study area but there was movement within the neighborhood while there was restriction to their major markets and other places. This is similar to the study by Clingain *et al. (*2021) who admitted that there were movement restrictions, curfews and limits to hours of operation or in-person operation of business (Greece: 75%;

Jordan: 28%; Nigeria: 15%). The business activities during the pandemic were low (60%), some even closed down their businesses during the pandemic, this is similar to the study by Clingain *et al. (*2021) that 80% of women had had to close down their business at least temporarily. Business activities after the pandemic were high (75%). The reason is that during the pandemic, many of them couldn't go to their major markets as often and work (civil servants), most of them were transacting their businesses in the neighborhood. Lastly, according to the women, the profit made on their business was very low (75%) during the pandemic while the profit was on the average (57.5%) after the pandemic. The profit was on the average after the pandemic because they didn't get over the pandemic set back on time in terms of their livelihood activities.

Table 4

Constraints	Remark	Frequency	Percentage%
Case of covid19 during/after	A	2(0)	.67(0)
	L	118(0)	98.33(0)
Total lockdown during pandemic	A	2	1.67
	L	118	98.33
Business activities during/after pandemic	H	5(90)	4.17(75)
	A	44(14)	36.67 (11.67)
	L	71(16)	59.17 (13.33)
Level of production during/after lockdown	H	13(25)	10.83(20.83)
	A	34 (64)	28.33 (53.33)
	L	73 (31)	60.83 (25.83)
Profit on business during/after lockdown	H	2 (35)	1.67(29.17)
	A	28(69)	23.33 (57.5)
	L	90 (16)	75 (13.33)
Additional occupation during/after lockdown	H	Nil (21)	Nil (17.5)
	A	57 (69)	47.50 (57.5)
	L	63 (30)	52.50 (25)
Total		**120**	**100**

Source: Field Survey 2021 (H= high, A= average, L= low), **Constraints after covid- 19 in Parenthesis ( )**

Conclusion

Based on the study, majority of the respondents were not affected with covid- 19 health wise except a minute of aged people while majority were affected financially due to total lock down which caused a lot of set back on their businesses/ livelihood activities. After the pandemic, the recovery was gradual and slow.

The situation therefore dictates deliberate synchronized efforts by Government and Stakeholders to mitigate the gendered impacts of COVID-19. Such coordinated efforts are primarily hinged on a gender lens COVID-19 response and Recovery Plan. Empowering economic measures targeting women should therefore be in place to address and mitigate the loss of income and livelihoods for millions of women. The rationale for this, is the growing body of evidence that access to secure and productive livelihoods not only improves women's practical capacity to look after themselves and their families, but can also provide a strategic pathway for gender equality and meaningful change in other spheres of their lives.

Recommendation

- The government and NGOS should create more awareness on the importance of covid - 19 vaccines and the vaccine should be more accessible to the people in rural areas.

- The citizens should be encouraged to use face mask, wash their hands regularly and use hand sanitizer as preventive measures even after covid 19 pandemic
- Provision should be made by Government and NGOs to subsidize medical treatment especially for the aged because their immunity is generally low
- Women in rural areas should be trained to diversify on livelihood activities through e-marketing, e- business, expand access to information etc so that if there is total lock down, they can still transact and make their money despite restriction in movement.

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EPISTEMIC STANCE AND FUNCTIONS IN OPINION ARTICLES ON BOKO HARAM INSURGENCY

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Abstract
This paper explores the discourse functions of epistemic stance in opinion articles on Boko Haram insurgency, drawing examples from three randomly selected Nigerian Newspapers, based on contextual variables with a view to knowing the attitude and stance of the writers. Four types of opinions feature prominently in the articles, namely criticism, rejection, acceptance and belief while four discourse functions of the categories are identified such as positive, negative, sentimental and biased, reflecting the attitudes and the stance of the writers. The paper therefore, concludes that the writers' deployment of epistemic stance in opinion articles portrays their attitude and stance on the Boko Haram crisis. Hence readers are expected to be able to deduce the implicit and explicit intentions of the writers on the insurgency.
Key words: Epistemic stance, discourse functions, Boko Haram insurgency, opinion articles, Nigerian national newspaper.

Introduction

This paper examines the epistemic stance as deployed by writers of opinion articles on the Boko Haram insurgency in selected Nigerian national newspapers in order to discover stance and attitudinal meanings underlying what is written. In 2009, many groups of Islamic fundamentalists in Nigeria came together and formed a complicated insurgent group called Boko Haram. The name Boko Haram, which means 'western education is sin', was adopted by the sect and subsequently announced its intention to islamise Nigeria with the soul aim of imposing strict Sharia law. Among these groups are Hisbah, Al-Suuna Wal Jamma and Shura Council of Jama'atu. After their coming together, Yusuf Mohammed became their leader and the group started killing and maiming many people in the northeastern states of Borno, Yobe and Adamawa.

Since 2009, Boko Haram related attacks have occurred in almost all of the Northern states and in the Federal Capital Territory. The leader of the sect, Yusuf Mohammed was arrested in 2009, and in a circumstance shrouded in secrecy, he was killed in police detention. A protégé of Yusuf called Abubakar Shekau, took over the control of the Boko Haram and in order to avenge the death of Yusuf Mohammed, massive attacks are launched in many places since then.

The foregoing has necessitated many news reporting and comments as well as opinions in the various media in Nigeria and beyond, signifying the intentions of the commentators and the writers of the opinions. This is possible as there are many media houses in Nigeria. Getting insight from the above, our study spans through the year 2014, a time of intense attacks by the Boko Haram sect in Nigeria. Many military formations were established to quell the menace but the more all these actions were taken and the members of the sect were being arrested or killed, the more their number increased. Thus Boko Haram crisis, as discussed by various writers of public opinions in Nigerian newspapers, became an aspect of interest to researchers and the core of this paper.

Existing studies and the problem statement

Many linguists have worked on media discourse as it has to do with the Boko Haram insurgency in Nigeria. Though, they are so virile, most of the studies have been approached

from the perspectives of pragmatics (Chiluwa and Oyegoke, 2013; Odebunmi and Oloyede, 2016), aspects of sociolinguistics (Aghedo, 2012), grammar and discourse analysis (Osisanwo, 2016 a and b; Amao, 2018), critical discourse analysis (Chiluwa and Ajiboye 2014), rhetorical analysis (Konje 2013; Oparinde *et al.,* 2021), lexis (Ogungbe and Alo 2014) and so on.

This paper examines the epistemic stance and its discourse functions as deployed by the writers of opinion articles with a view to investigating the attitudes and stance of the writers on Boko Haram insurgency. The paper answers the following questions: what are the opinions expressed in selected opinion articles? What is the stance type chosen by the writers of opinion in the study and its discourse functions? How do situational contexts necessitate the use of the linguistic device found in the study by the writers and its discourse functions?

Methodology

For the purpose of this paper, therefore, the opinion articles of the Nigerian national dailies would be sampled through purposive sampling. The national dailies are *The Punch*, *The Nigerian Tribune* and *The Guardian*. These national dailies were selected for the wide coverage of Boko Haram crisis and their expansive readership.

Theoretical orientation

According to Alo (2007), it is believed that if any media house will be efficient and effective in the dissemination of information, such will have to consider information credibility, information content and cultural realities. Here, the media houses will use the language that is easily decoded and not fail to employ a common cultural frame of reference between the discourse agents (sender and receiver). In the light of the foregoing, this paper is interested in the various writer's opinion articles in the selected national newspapers with a view to finding out their attitudes and stance. To realise this, the epistemic stance is deployed in the analysis. This gives a vivid explanation of the intention of the writers on the activities of the Boko Haram.

Du Bois, (2007) defines stance as "a public act by a social actor, achieved dialogically through over communicative means of of simultaneously evaluating objects, positioning objects (self and others), and aligning with the subjects, with respect to any salient dimension of sociocultural field". Through stance, participants in interactions "commonly express personal feelings, attitudes, value judgement, or assessments" (Biber *et al.,* 1996:996) cited in Odebomi (2016:3). Stance, according to Chindamo *et al. (*2012:1), is the expression of a proposed information. Thus, one can posit that stance can be referred to as the position taken in relation to oneself, to what is said, and to other people or objects. One can therefore conclude that all the definitions given by scholars on stance focus on expression of individual speaker or writer and not on interactive relation. Three components are always found in stance statement: the person expressing the stance or better known as stance-taker or person taking a position, the topic being discussed or the stance object in which the stance is related to; and the resources being drawn upon which deal with a particular word choice and style by which the stance is expressed (Barton and Lee, 2013:87).

Biber in Myers (2003: 254) divides stance into three categories: epistemic, attitudinal, and stylistic stances. Epistemic stance concerns the marking certainty and uncertainty about the factual basis for statements. It signals the speaker's knowledge and belief towards his/her statement. Thus, epistemic stance deals with stating of facts, knowledge, or beliefs towards certain stance objects. The second stance is attitudinal stance which refers to the personal aesthetic preference, moral judgement or emotional response. Attitudinal stance is used in signalling speaker's feelings. Some markers of attitudinal stance convey an emotional response, rather than an aesthetic preference or moral norm. By using the stance, people

prefer to talk about their feeling rather than about rights and wrongs. Attitudinal stance can be expressed by delivering aesthetic appreciation, moral judgement, and emotional affect. Then, the third type is stylistic stance that deals with the way of expressing an idea. The examples of stylistic markers are adverbs like *seriously, honestly, frankly, etc* which relate to the tone of the speakers.

Epistemic stance, therefore, is chosen as a model for this study to show the linguistic variations in the public opinion section of the newspapers under study. These are not just functions of syntactic forms but also the representation of the writers' perception of events that concern the Nigerian security situations.

Analyses and Findings

Our findings regarding the data collected on epistemic stance and its discourse functions as deployed by writers of opinion articles on Boko Haram crisis in selected Nigerian newspapers show that four discourse functions are identified in the study: positive, negative, sentimental and biased discourse functions and the types of opinion expressed are criticism, rejection, acceptance and belief. The analysis shows the classification of opinions as expressed by the various writers of the articles under investigation which includes instances, sources, texts and the grounds of their arguments.

In the opinion articles under investigation in this study, the writers' intentions and attitudes vary from statement of fact and assertions on the certainty of their statements, acceptance and rejection of various security issues. These characterise their stance on several issues on security situations in Nigeria, most especially on Boko Haram crisis. They are epistemic stance with negative, positive, sentimental and biased opinions. We shall take these in turn.

Epistemic stance and negative opinion

Epistemic stance with negative opinions were found to be prominent in opinion articles on Boko Haram crisis. This implies that many of the writers are pessimistic about the readiness of the military, and most especially the government, to bring the unbearable insecurity situation in the country to an end, as found in the following texts:

Text 1

> We know that Boko Haram **will** not let go of the girls- Boko Haram has proved to not be the sort of terrorist organization that is open to negotiation… The group (groups, more like) **will** only "listen" to the consistent demonstration of superior intelligence and military force. No appealing to conscience, or social media campaigns, or threats, **will** work. That should be clear by now.
>
> **The Punch, Monday, May 12, 2014 page 25**

The use of **will** above indicates insistence and future occurrence. The insistence is on the part of Boko Haram sect which is not ready to release the girls abducted in 2014. Future occurrence is seen in respect of the fact that the terror group is not ready for negotiations now or in future. The above text is an example of negative opinions as aired by the writer. He believes that the Boko Haram sect is so hardened that there is no much of appeal that can make it negotiate or cease from its murderous acts, meaning that any hope of ceasing from their action is a mirage. He even states that the sect will never release the recently abducted school girls. The only solution that can stop the insurgents, according to the writer, is by engaging it in what he terms "the consistent demonstration of superior intelligence and military force."

Text 2

> Gathering at the Unity Square in Abuja and holding press conferences **will** not bring back the girls. It may help mount

pressure on the government, but it doesn't lend any practical help to the cause.

The Guardian, Wednesday, August 6, 2014 page 17

The modal **will** used in the above text is predictive of future occurrence. It signifies that the efforts of the protesters who daily gather at the Unit Square to pressure the government to rescue some abducted girls will yield nothing. The recent happenings in Nigeria where the insurgents have taken over some towns and abducted school girls have made some concerned Nigerians to form a group called "Bring Back Our Girls". The writer is not comfortable with this and expresses his negative attitude to the incessant gatherings to address press conferences on daily basis. His belief is that the gathering will never culminate in bringing back the girls. The thrust of his argument is that there is no practical help that the daily noise will offer but it can only help in mounting pressure on the government which can take actions or not bothered to think of taking any steps.

Epistemic stance and positive opinions

This paper also revealed that some of the data on epistemic stance were on positive opinions where the writers of opinion articles expressed conclusions obtained from the actual evidence about the class of possibilities that the security situations in Nigeria will be better as explicated below:

Text 3

The daunting task of rebuilding Nigeria will depend, above all, on Nigerian authorities putting aside political rivalries, tackling corruption and pursuing the public interest. Even if all these steps are duly applied, however, Boko Haram **will** not disappear overnight. Patience and dedication **will** be critical.

The Punch, Thursday, April 17, 2014, page 22

An instance of possibility is found in our data with the use of **will** which is anchored on prediction. That is, there is a predictable tendency that the Boko Haram menace will end but with "patience and dedication". Therefore, the writer is optimistic about the eventual stoppage of killings and destruction of properties by the Boko Haram sect. He believes that the future is bright for Nigeria if all political gladiators will put aside their differences as displayed through rivalries, tackle corruption in the country and pursue the public interest. His argument is hinged on the fact that if "patience and dedication" are embraced by the politicians in particular and the Nigerians in general, the Boko Haram will soon be a forgotten menace.

Text 4

The media and the public **should** continue to encourage and support our security in their war on terror by promoting peace, national security and political stability.

Nigerian Tribune, Wednesday, 1 January 14 page 20

The modal **should** in the above express assurance of confidence in the media and the public to bring an end to the terror being unleashed by the Boko Haram sect. The writer is expressing a positive opinion by tasking the media and the public that one of their duties is to continue to encourage and support the security men to crush terrorism in Nigeria. His opinion is premised on the fact that the only tool that Nigeria needs to win the war against terror and terrorism is the promotion of "peace, national security and political stability". This implies that if every man takes the war against terror as a responsibility, the Boko Haram sect will cease to exist.

Epistemic stance and sentimental opinions

Epistemic stance with sentimental opinions is also found in our data. This shows that the writers in expressing conclusions on the class of possibilities of improved security situations

in Nigeria are easily moved by emotion rather than reason in their opinions. This is evident in the following analysis.

Text 5

> I have a clenched fist here while writing this and if I were to be standing before the president today, I can't assure what exactly I **would** be banging between his desk and his……..
>
> **Nigerian Tribune, 4 May, 14 Page 16**

The modal **would** in the above text expresses a condition that the writer will take to express his grievances against the President. It means that it is a probability that the writer can ever be at the desk of the President let alone banging it or whatever. A sentimental opinion is expressed in text as the writer is full of emotional outburst because, according to him, the Nigerian President is not living up to his responsibilities. The writer opines that the President knows those that are sponsoring the Boko Haram sect but is deliberately shielding them from justice. He therefore concludes that if he were to be before the President, only God knows how he could behave and he might even be banging the President's face.

Epistemic stance and biased opinions

The writers of public opinion, in employing an epistemic stance, also engage in expressing biased opinions whereby their judgment on security issues are not fair either in favour or against the Nigerian government and some opinions being aired by certain people in the society.

Text 6

> Having failed in the first round, the expectation was that everything **would** be done by the authorities to rescue the girls. The days of branding Boko Haram as ghosts are over, for ghosts don't abduct human beings.
>
> **The Guardian, Monday, May 19, 2014 page 15**

An instance of the use of modal **would** is also found in our data signifying the failure of the government to rescue the girls abducted by the terrorists. That has damaged people's expectation. The above is an expression of a biased opinion by the writer where he considers the government a failure because it has not done enough to rescue some abducted school girls. His argument is bothered on the fact that some prominent Nigerians have been telling the government that the Boko Haram sect does not exist, claiming that it is some people's way of distracting the government from performing its duties. As a result of yielding to this counsel, the writer terms the acceptance by the government a failure.

Conclusion

The paper contributes to the existing knowledge in many ways. Notably, the work applies the epistemic stance. Thus, this reveals that the use of language in opinion articles requires writers to possess certain linguistic skills, such as stance to effectively employ different discourse strategies such as criticism, rejection, acceptance and belief in interacting with the readers. The paper also locates the stance and views of writers such as negative, positive, sentimental and biased from both contextual and linguistic perspectives by locating the contexts of security situation in relation to Boko Haram insurgency and exploring both the discourse forms and functions of the opinions. Lastly, the deployment of epistemic stance by writers of opinion articles portrays their attitude and stance on the Boko Haram crisis. Hence, readers will know the implicit and explicit intentions of the writers on the crisis.

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ENTREPRENEURSHIP EDUCATION AS A PANACEA TO POVERTY ALLEVIATION AND INSECURITY AMONGST YOUTH: A STUDY OF AKINYELE LOCAL GOVERNMENT, MONIYA, IBADAN, OYO STATE, NIGERIA

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Abstract
The study investigated the effect of entrepreneurship education on poverty alleviation and insecurity amongst youths. The study used structured questionnaire to a sample size of 100 drawn through a random sampling from different area in Akinyele Local Government. The distributed questionnaires were retrieved and analyzed using frequency and percentage for demographic characteristics of respondents while Mean and Standard deviation were used to achieve the research objectives. The result obtained revealed that majority of the respondents were of the opinion that the prevailing cause of poverty and insecurity is unemployment. It was also realized that all the skills outlined were accepted by the respondents as available in recent times as means of survival; it was also deduced that the majority of the respondents believed that all the skills and entrepreneurial activities outlined have significant effect on youth poverty and insecurity; and finally, most of the respondents accepted to the suggested solutions capable of reducing poverty and insecurity amongst the youth. Based on the above findings, the study recommends that government should embrace entrepreneurship trainings, skills acquisition, job creation and innovation to poverty reduction by providing the enabling environment for the youths to be gainfully empowered. Entrepreneurship education should be integrated into the primary schools curricula, curricula of secondary schools and tertiary institutions as this will help shift the youth from being job seekers to job creators; and that government should concentrate on the rural area to discourage rural-urban migration among the youths.
Keywords: Demography, Entrepreneurship, Poverty; Insecurity

Introduction

The world`s greatest problem and the most addressed issue is growth and development in a given economy. It has attained such a global dimension because of the interrelationship of all the economic systems. The basic duty of any responsive government is to satisfy the basic needs of the majority of its people especially, the provision of security, poverty alleviation programmes, road network, and communication. They should improve the accessibility of people to cheap and affordable food, consumable commodities which improve the living standard of the people as well as the economic development (George, 2000). In Nigeria, poverty has become a major problem provoking the lives of the Nigerian youths, as reported by National Bureau of statistics (NBS) that 83 million Nigerians wallowing in extreme poverty, survive below $1.90 per day, while 133 million(63%) of the country`s population are multidimensionally poor. Moreover, it was made known (NBS report) that multidimensional poverty is higher in the rural areas, where 72% of people are poor compared with the 42% of people in urban areas. Thus, this study intends to examine the effect of entrepreneurship education on poverty alleviation and insecurity amongst the youth in Akinyele Local government Moniya, Ibadan, Oyo State.

Entrepreneurship, is a process through which individuals identify opportunities, allocate resources, create values and opportunities. Entrepreneurship as reported by Allen (2006) is the mindset or a way of thinking that is opportunity focussed and growth-oriented. It was

defined by Drucker as the only one who always searches for change, acts on it and utilizes it as an opportunity. Entrepreneurship education is a practical task of transforming an idea into reality and then really try to do it. Entrepreneurship education seeks to provide students with the knowledge, skills, and motivation to encourage entrepreneurial success in a variety of settings (Wikipedia, 2013). It is when dependable and practical entrepreneurship education is inculcated that poverty and insecurity amongst the youths will be alleviated and later on/ eradicated in our country.

According to World Bank (2000) poverty was described in terms of material deprivation, low standard of education and health, exposure to danger and risk, and 'noiselessness and 'powerlessness'. Gordon *et al. (*2000) consider people as poor when they have both a low standard of living and a low income.' this submission was echoed by Sumption, (1979) who noted that 'A family is poor when it cannot afford to eat three times in a day.' European Commissions (2004) in its Joint Report on Social Inclusion reported that: "People are said to be living in poverty if their income and resources are so inadequate as to preclude them from having a standard of living considered acceptable in the society in which they live. Poverty and insecurity are twin problems of development in Nigeria. It was generally observed that high level of poverty induced youths to commits social vices like stealing, kidnapping, robbery etc.

The circulating menace of insecurity in Nigeria constitutes a leading challenge confronting Nigeria. The hazard and precariousness connected with the level of insecurity has affected negatively the inflow of Foreign Direct Investments (FDI) to Nigeria while many foreign investors were also demoralized to invest in the Nigerian Economy. Chuku, (2019) opined that the worrisome level of insecurity in Nigeria has made the economy unattractive to the citizens and the investors from another countries who have become afraid of investing and putting their hard-earned resources in profitable investments in Nigeria.

The considerable efforts made by the Government at all levels to alleviate poverty and security in Nigeria have been embedded in entrepreneurship training. Part of the schemes introduced by government are Youth Empowerment Scheme (YES), Rural Infrastructural Development Scheme (RIDS), National Poverty Alleviation Programme (NAPEP), and Natural Resources Development. In Oyo state, training canters such as technical and vocational schools, and apprenticeship canters for all were established as strategies to reduce poverty and insecurities amongst the Youths. The Oyo State government developed Vocational and Acquisition Training Centres in all the 33 Local Governments in the state.

Materials and Methods

Research design

The study adopted the descriptive research design. The descriptive research design is a design used to examine the impact of entrepreneurship on poverty alleviation and Insecurity Amongst the Youth in Akinyele local Government, Moniya Ibadan. The sample comprises 100 youths selected randomly from four cities in Akinyele local Government, Moniya Ibadan. Data for the study was collected through the questionnaire designed to reflect five (5) point Likert scale. The questionnaires were administered to 100 respondents made up of Youths in Akinyele Local Government area of Oyo State. Out of the distributed questionnaires, 98 of them were properly filled and returned representing a response rate of 98%. The questionnaires used was divided into two sections A and B. Section A dealt with personal data of the respondents while section B address the causes of poverty, insecurity and the entrepreneurial skills available to mitigate the negative effect of poverty and insecurity in the study area.

The data were analysed by the use of frequency count and percentage for demographic variables of the respondents. Mean and Standard deviation was used to answer research questions raised in the study. For opinion purposes, any item mean 250 and above was accepted while any item mean below 2.50 was rejected.

Area of study

The study was carried out in Akinyele Local Government Area of Oyo State, Nigeria. Akinyele Local Government is the largest local government in present day Oyo State. It was formed in 1976 out of Ido Local Government.

Population of the Study

The total population size of Akinyele local Government was 211,811 people (2006 National census). it is 222 square kilometres in area. The target population for this study comprises of all the youth from four select cities (Ojoo, Shasha, Moniya, and Orogun) whose age group falls between 18years and 35years.

Table 1: Mean responses and Standard Deviation that indicate the causes of insecurity amongst youths in Akinyele local Government Area of Ibadan, Oyo State Nigeria.

S/N	Variables	N	Mean	Standard Deviation	Remarks
1.	Bad governance	98	2.66	0.511	Accepted
2.	poverty	98	2.80	0.687	Accepted
3	Fax Machine	98	3.23	0.516	Accepted
4.	Weak judicial system	98	3.09	0.539	Accepted
5.		98	2.71	0.721	Accepted
	Corruption				
	Unemployment	98	2.50	0.562	Accepted
7.	Poor security system	98	3.90	0.675	Accepted
8.	Porous border security	98	2.54	0.570	Accepted

Source: Field Survey, 2023

Table 1: above shows the causes of insecurity amongst the youths in Akinyele local Government Area of Ibadan, Oyo State, Nigeria. The table revealed that all the nine (9) items are accepted signifying with the mean scores of 2.50 and above. The standard deviation of 0.511 to 0.687 all indicated that the respondents were close in their responses.

Table 2: Mean responses and Standard Deviation that indicate the causes of poverty amongst youths in Akinyele local Government Moniya Area of Ibadan, Oyo State Nigeria.

S/N	Item Statement	N	Mean	Standard Deviation	Remarks
1	Poor government policies	98	2.94	0.511	Accepted
2.	Laziness	98	3.05	0.637	Accepted
3.	Poor employment	98	2.60	0.526	Accepted

	opportunity				
4.	Corruption among political office holders	98	2.95	0.514	Accepted
5.	Poor education system	98	3.07	0.502	Accepted
6	Poor saving culture	98	2.60	0.345	Accepted
7	Non diversification of the economy	98	2.72	0.516	Accepted
8	Poor investment knowledge	98	2.09	0.670	Rejected
9	Insecurity	98	3.11	0.426	Accepted

Source: Field Survey, 2023

Table 2 above shows the causes of poverty amongst youths in Akinyele local Government Area of Ibadan, Oyo State Nigeria. The table revealed that eight (8) out of listed items were accepted which shows that the mean scores were all above the cut-off point of 2.50 and above, this implies that the respondents acknowledged that all points raised are factors that are responsible for the prevalence of poverty in the study area except poor investment knowledge that was rejected. The standard deviation of 0.502 to 0.637 all indicated that the respondents were close in their responses.

Table 3: Mean responses and standard deviation that show the entrepreneurial activities and skills available in recent time as survival strategies.

S/N	Item Statement	N	Mean	Standard Deviation	Remarks
1.	Computer and GSM repairs have increased the level of employment opportunity for youths	98	2.79	0.674	Accepted
2.	Bead making has enhanced the economic	98	3.20	0.512	Accepted
3.	Involvement of youths in shoe and bag making have contributed to job creation in Akinyele LG.	98	3.85	0.599	Accepted
4.	Fashion and designing has created more job opportunities	98	2.73	0.601	Accepted
5.	Catering and interior decoration are good skills	98	3.11	0.594	Accepted
6	Engagement of youths in fast food business increases make them to be self-reliance.	98	2.89	0.461	Accepted
7	Engagement of youths in Hair dressing business helps them to be independent	98	3.50	0.613	Accepted
8	Decoration and painting have reduced unemployment	98	2.77	0.506	Accepted

Source: Field Survey, 2023

Table 3 above shows the entrepreneurial activities and skills available in recent times as survival strategies. The table revealed that all the eight (8) items are accepted indicating with the mean scores were above the cut off of 2.50 which indicated that all the respondents believed that there are entrepreneurial activities and skills available in recent times as survival strategies to create employment for the youths.

Table 4: Mean responses and standard deviation that show the solutions to poverty and insecurity amongst youths in Akinyele local Government Area of Oyo state, Nigeria.

S/N	Item Statement	N	Mean	Standard Deviation	Remarks
1.	Creation of employment through startup of new entrepreneurship	98	2.79	0.674	Accepted
2.	Development of the rural area will stop the migration of people	98	3.20	0.512	Accepted
3.	Rapid industrialization should be created	98	3.85	0.599	Accepted
4.	Initiation of quarterly skill acquisition programs in villages and the L.G.A levels	98	2.73	0.601	Accepted
5.	Inclusion of entrepreneurial activities in academic curricula	98	3.11	0.594	Accepted
6	Government should encourage skills acquisition in the rural area	98	2.89	0.461	Accepted
7	Financial empowerments of the youth	98	3.50	0.613	Accepted
8	Small and medium enterprises in rural areas	98	2.77	0.506	Accepted
9	Regular seminars and teachings on entrepreneurship	98	3.88	0.401	Accepted

Source: Field Survey, 2023

Table 4 above shows the possible solutions to poverty and insecurity amongst the youths in Akinyele local Government, Moniya area of Oyo state. The table revealed that all the nine (9) items were accepted indicating that the mean scores were above the cut off of 2.50 which shows that all the respondents accepted that the items listed in the table are solutions to poverty and insecurity amongst youths in Akinyele local Government , Moniya.

Discussion

The Human Capital Theory, as reported by Robert (1991) in his study, advocates education as a tool for improving human capital, stimulating labour productivity and boosting the levels of technology across the globe. This study examines the effect of entrepreneurship education on poverty alleviation and insecurity in Akinyele Local Government, Moniya.

The causes of insecurity amongst youths in Akinyele local Government, Moniya area of Oyo state Nigeria.

The findings from table 4 on the causes of insecurity amongst youths in Akinyele local Government, Moniya area of Oyo state revealed that all the factors mentioned in the study are factors that promote incidences of crime and insecurity in the study area as suggested by the mean scores that were above the cut off points of 2.5 which indicated that all the respondents believed and agreed that those factors are responsible for the prevalence of insecurity in the study area. Ranking the outcome from the table it was revealed that employment and extreme poverty lead the causes of insecurity among the others. This result corroborated the submission of Nwagbosa (2012) that past governments have failed to put in place actions that will reduce unemployment and poverty rates, which have been the major causes of insecurity in Nigeria.

The causes of poverty amongst the youths in Akinyele local Government Moniya , Oyo state.

The findings from table 5 on the Causes of poverty amongst youths in Akinyele local Government, Moniya area of Oyo state disclosed that all the factors mentioned in the study are factors that advance frequency of poverty in the study area. The mean scores that were above the cut off points of 2.5 indicated that all the respondents believed and agreed that those factors responsible for extreme poverty in the study area. The standard deviation of 0.502 to 0.637 all indicated that the respondents were close in their responses.

Entrepreneurial activities and skills available in the recent time as survival strategies.

Table 6 demonstrated the reports on some entrepreneurial activities and skills available in recent times as means of survival. The findings depict that all the skills outlined were strongly agreed to by the respondents' as skills that are available in recent times as means of survival. The mean scores that were above the cut off points of 2.5 indicated that all the respondents believed and agreed that those factors are key entrepreneurial activities that are available as a survival strategy. This submission is in tandem with the report of Adejumo (2000) which stated that entrepreneurial development has been found to be capable of making positive impacts on the economy of a nation and the quality of life of the people. This implies that entrepreneurial activities should be buckled up for the improvement of lives and economy.

Solutions to poverty and insecurity amongst youths in Akinyele local Government Area of Oyo state, Nigeria.

Table 8 revealed the reports on solutions to poverty and insecurity amongst youths in Akinyele local Government Area of Oyo state, Nigeria. The result established that the majority of the respondents' agreed and accepted that all the solutions outlined were key areas to be focused on the solutions to poverty and insecurity amongst youth in Akinyele L.G.A. The findings show that poverty and insecurity in Akinyele L.G.A. can be solved if the Government encourages skills acquisition in rural areas. This was followed by gainful employment after school (ranked 2nd) and the initiation of quarterly skill acquisition in the villages and the Local government levels. The findings of this study echoed the report of Duru (2011) who recommended entrepreneurial skills as indispensable for rapid economic growth and development.

It was equally established by the respondents that provision of financial empowerment to youths will help in solving poverty and insecurity.

Conclusion

Based on the findings, it was established that entrepreneurship has an effect on poverty and insecurity among youths in Akinyele L.G.A. of Oyo State. The study further discovered that poverty and insecurity are a social menace in Akinyele Local Government and constitutes a threat to political, social, and economic development. Nevertheless, the integration of entrepreneurship education can help to bring employment opportunities and reduce both poverty and insecurity. In spite of all benefits embedded, in entrepreneurship development in Akinyele L.G.A. There are a lot of challenges facing entrepreneurship among which are lack of training on entrepreneurship, lack of entrepreneurship skills in rural areas and financial empowerments to start up skills acquired. Entrepreneurial skill acquisition therefore becomes a essential panacea that should be promoted by the government of Oyo State and embraced by youths to reduce poverty as well as insecurity in Akinyele Local Government Area.

Recommendations

Based on the findings of the study, the study therefore recommended, among the others, that

i. Government at all levels should embrace entrepreneurship training, skill acquisition job creation and innovation to poverty reduction by providing the enabling environment for the youths to be gainfully empowered.

ii. Entrepreneurship education should be integrated into the curricula of the primary schools, the secondary schools and the tertiary institutions as this will prepare the youth to be job creators and not job seekers.

iii. In promoting youth entrepreneurship, government should concentrate on the rural area to discourage rural urban migration among the youths.

iv. The Oyo State government should look into and embrace how the ICT industries can provide new jobs and entrepreneurial opportunities for the youth in Akinyele Local Government.

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MANAGING INNOVATIVE GOALS IN TERTIARY INSTITUTION FOR THE ATTAINMENT OF SUSTAINABLE DEVELOPMENT GOALS IN NIGERIA.

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Abstract
Sustainable development goals (SDGs) have become wide spread as several countries have embraced it. This paper examines how innovative Nigerian tertiary education can be achieved for sustainable development. Thus, the paper focuses on SDG 9 which is the goal of industry, innovation, and infrastructure. The world today is a digitalized world characterized by digital technology and infrastructure and necessary for 21st century students to keep up modern-day digital practices. SDGs have been set up by the United Nations to improve the living standards of the people in the world despite differences in class, religion, economy, race, and other factors that usually cause division between people. These sustainable development goals can be achieved through tertiary education known for imparting knowledge, values and discipline to students and shaping them to become future leaders. The roles of Nigerian tertiary institutions in achieving innovative university education for sustainable development as well as the challenges impeding the advancement of innovative university education in Nigerian tertiary institutions, were examined to include inadequate technological knowledge, funding, inadequate e-learning, and ICT facilities, amongst others. It can be concluded that there is a need for Nigerian universities to develop innovative infrastructure so as to achieve sustainable development in Nigerian tertiary institutions, so as to enable students to compete with their peers globally. The way forward would be adequate funding, provision and proper maintenance of e-learning and internet facilities, and proper management of resources, amongst others.
Keywords: Managing, Innovative, Education, Sustainable Development

Introduction

Managing innovative university education to attain sustainable development is very vital to society and the nation. Change is inevitable in every society has a dynamic and tertiary education is inclusive of such dynamism. The world is currently faced with a digital age where one who lacks digital skills cannot keep up with his peers who are digitally and technologically inclined. The administrators of Nigerian tertiary institutions must thus adapt the current trend of innovation in society and the world to be up to date in knowledge and skills to achieve the goals and objectives of tertiary education and sustainable development. For the administrators to achieve these goals and objectives effectively, they must adapt to the current changes in society and the world globally so that the students can be self-reliant, independent and be able to contribute to their National Gross Domestic Product (GDPs). The adaptation of current global trends so that the students can be marketable locally and internationally in the labour market. As a result of the innovative and competitive nature of the world, there is the need to give students good and qualitative education to variation in curriculum and trends in society to prepare students for new and future jobs without compromise. The tertiary institution administrators must also prepare students for novel ideas where they can think creatively, collaborate and partner with other universities that are conversant with innovative technology so that they can be relevant in the labour market.

The objective of this paper is to examine some modern-day innovative tertiary institutions initiatives and see how they can be applied to the Nigerian tertiary institutions system to promote innovative tertiary education in Nigeria. The aim of this paper is to identify

contributions tertiary institutions can make them to adequately manage innovation within their system and encourage the accomplishment, spread, and implementation of the innovative in other Nigerian tertiary institutions so as to achieve sustainable development in Nigeria. The Sustainable Development Goals have been set up by the United Nations to improve the living situation of the people in the world despite the differences in class, religion, economic situation, race, and gender. The main SDG of this paper is SDG 9, which promotes innovation. The 9th sustainable development goal can be achieved with the help of a university education which is known for imparting knowledge, values, and discipline to students and shaping them to become future leaders. The SDGs are very necessary for the growth and development of the countries of the world.

Education is very vital for the mental, social, political, and economic development of an individual. It is a formidable tool necessary for the development of a competent workforce in any society. (Umeozor and Eziuzo 2020). Anisiudo (2013) asserts that "it is better to be unborn than untaught; for ignorance is the root of misfortune". Education is undoubtedly the foundation upon which the future of any society is built and the best investment any government can make for its citizenry which will basically resulted in the attainment of economic prosperity (wealth creation, scientific and technological advancement, and political stability of a nation). This gives an arrangement of the level of innovation in education in the university and its effects at large. Innovation in education makes working together and teamwork easier. Students, parents, and lecturers can communicate easily and more effectively. Innovation allows easier, faster, and more efficient delivery of lectures in the classroom as lesson materials are digital and can be accessed using digital devices. There is advancement in technology, allowing students to adapt to the changing technology every day. Students should have a change in their perspective on innovation in education, new ideas, and advancements in technologies that can cause an increase in academic progress and output. Innovation in education pushes lecturers and students to discover something new through research and experimentation. Innovation helps students in problem-solving.

Sustainable development has been described as development that meets the needs of the present generation without compromising the needs of future generations to come. To achieve sustainable development, the United Nations set out sustainable development goals (SDGs). This paper focuses on the attainment of sustainable development goals by regulating innovative university education to achieve them. Sustainable development goals are guidelines which the world must follow to maintain world order in all aspects of society. As earlier stated, this paper concentrates on the 9th SDG which pertains to industry, innovation, and infrastructure as it relates to the development of innovative tertiary education in Nigeria.

Management

In any working society, there must be a person or a group of persons to pilot the affairs of the organisation through planning, organising, controlling, and coordinating human activities towards goal attainment. These people are called managers, administrators, leaders, or supervisors. Therefore, the effectiveness of an organisation depends greatly on management (Akpan, 2011). Okwori (2011) asserted that management is the coordination of all the processes of planning, organising, directing, and controlling in order to achieve the organisation's objectives. Igbinedion (2016) referred to management as a dynamic process of mobilising both human and non-human resources towards the attainment of the goals and objectives of an institution. Okunamiri (2008), cited in Eze *et al. (*2018a), rightly stated that the job of an effective educational manager is to plan, design, and implement an efficient and effective learning system responsive to the needs of the learners and society. In a university system, the management of affairs is handled by the university administration, which manages decisions on the implementation of policies and programmes within the university.

Education

Education is a vital instrument of change within a society and is no doubt an important tool required for the development of a society, community, or country. Osuji and Koko (2019) agreed with this when they asserted that education plays a key role in the development of human capital and subsequently brings about the establishment of sound economics and harmonious communities where there is peace and national unity. Education may either be formal when it takes place in a classroom/school or informal when it takes place outside school. Education is a continuous process of life that stops only when a person dies. Educated individuals stand a greater chance of being able to make positive contributions that will ehance the development of themselves and the society in which they live (Uyanga and Emana, 2016).

Education in Nigeria has often been seen as more theoretical than practical. Education should be more holistic and practical; the purpose is to prepare the youths to meet not only the challenges of their academic life but life as well. They will thus have the opportunity to learn about themselves, their social development, emotional development, and much more. At the end, they will have a positive impact on their immediate communities and on the nation at large (Kumar 2011).

Innovation

This can be defined as the process of transforming an old idea into an improved version by introducing change to its regular characteristics. Innovation entails the use of knowledge, reasoning and creativity to acquire a new version of the previous situation. Apebende (2013) opined that innovation is the introduction of new things or a new way of doing things. Also, Mykhailyshyn *et al. (*2018) submitted that innovation in the educational context includes educational, technological, scientific, legal, administrative, infrastructural, and other. Innovation in education represents a deliberate activity aiming to introduce novelty into a certain context; it is pedagogical because it aims for sustainability and improves student's preparation by means of interaction and interactivity (Bechard, 2007). Agommuoh (2013) reasoned that innovation is a tool intentionally used to bring into existence and practice something new to enhance performance and growth through improvement in efficiency and effectiveness. Ogakwu and Isefe (2012) averred that innovation is a process whereby a new product is made available, spread through the system, and infused into other operating practices. In the same vein, Olugboyega (2017) maintained that innovation is the implantation of creative inspiration. To Olugboyega (2017) innovation can take several forms, such as:

• Innovation process, including changes and improvement to methods: These contributes to an increase in productivity, lowers cost and help to increase demand. There are 17 sustainable development goals; these are;

1. No Poverty,
2. Zero Hunger,
3. Good Health and well-being,
4. Quality Education
5. Gender Equality,
6. Clean Water and Sanitation,
7. Affordable and Clean Energy,
8. Decent Work and Economic Growth,
9. Industry, Innovation, and Infrastructure)
10. Reduced Inequalities,
11. Sustainable cities and Communities,
12. Responsible Consumption and Production,
13. Climate Action,

14. Life Below Water,
15. Life on Land,
16. Peace, Justice, and Strong Institutions,
17. Partnerships for the Goals.

Problems of Innovative in Tertiary Institution in Nigeria

There are certain problems encountered in the attainment of innovative university education for sustainable development in Nigeria. These problems include:

Low Adaptation Rate in University Curriculum

The curriculum in most Nigerian universities cannot meet up to modern-day innovative teaching and learning standards because it is outdated and relies on the old teaching method of using a board and a marker to teach the students, the use of notebooks to take lesson notes, submission of assignments manually, amongst others. The Lagos Business School (2022), opined that the fact that the academic program in Nigerian educational institutions is older than the nation itself is no longer a surprise. This is due to the unwillingness of some administrative heads in these educational institutions to follow the current 21st-century practice of e-learning. An educational environment that is not encouraging, open to new ideas and flexible would be limited when trying to promote innovation. This will build a gap between them and the rest, who are ready to adapt to changes in education. Therefore, the implementation of an e-learning-based curriculum is a necessity in Nigerian universities.

The Issue of Funding

The absence of funds to carry out research, projects, or seminars that focus on sustainable development would be detrimental to the management of innovative university education for sustainable development in Nigeria. Chijioke *et al. (*2017) noted that funding is an essential ingredient that contributes to the success of any university education all over the world. The level of funds available in the university system can determine the quality and quantity of resources that will be available for teaching, research, and community development. There are issues of funding from Federal to States Universities across the board. No wonder Chukwurah, (2011) categorically stated that Nigerian tertiary institutions are being funded below the minimum standard of 26% recommended by the United Nations Education Scientific and Cultural Organization (UNESCO). Also, Ogbogu (2011) submitted that the academic staff did not attend workshops and conferences regularly and that there was a drastic reduction in the awards of

Conclusion

The importance of innovations in tertiary institutions for sustainable development in Nigeria has been emphasized in this paper, and for every member of a nation and citizens to contribute human and material resources to achieve them. It must be understood that the world is dynamic, and Nigerian tertiary institutions education must follow new trends that are springing up in the innovation of education. Therefore, tertiary institutions administrators must put in effort to ensure that innovation are seen in their educational policies to promote SDG 9. The paper discussed various challenges facing the effective management of innovative university education for sustainable development in Nigeria, some of which included a poor adaptation of e-learning practices in curriculums, inadequate funding, computer illiteracy, and low energy needs, amongst others. These challenges may be resolved with the following suggestions;

- Efficient and open-minded leaders should head various positions in higher institutions thereby creating a trend of innovation in the school system. A new curriculum which

conforms to 21st-century innovative educational practices should also be adopted in Nigerian tertiary institutions.

- ❖ A mixture of digital and non-digital methods in learning should be adopted to improve the learning environment. This can be achieved through the introduction of e-learning in Nigerian tertiary institutions.
- ❖ The training and restraining of teachers /lecturers through workshops and seminars to keep up with the changing technologies in learning**.**
- ❖ The Federal Government should provide for the electricity needs of the tertiary institutions in order to enhance the use of e-learning facilities.

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SOCIAL MEDIA AND PERFORMANCE OF MANAGEMENT STUDENTS IN OYO STATE COLLEGE OF AGRICULTURE AND TECHNOLOGY, IGBOORA

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Abstract
The study investigated relationship between social media and performance of management students in Oyo State College of Agriculture and Technology, Igboora using a survey research design. The study utilized primary data obtained through administration of structured questionnaire administered to 81respondents, using convenience random sampling. The study found that the use of smart phone, social media accounts, number of social media accounts and time spent on social media were positively and statistically significant to influence students' academic performance. Based on the findings, it was recommended that the students should be adequately trained on proper use of the smart phones for academic learning not just for social networking. In the same vein, the management of the institution is further advised to avail opportunity to learn adequately intricacies that would benefit from the utilization of social media platform for quality and enhanced networking.
Keywords: Performance, Social Media, Smart Phone; Networking.

Introduction

Social media has rapidly become international trend with spread of tentacles to almost every corner of the world, cutting across all ages and social strata. The world today celebrates improvements in communication technology which has broadened the scope of communication through Information and Communication Technologies (ICTs). Social networking sites have become popular among students (Hasnain, Nasreen, and Ijaz, 2015).

Asemah and Edegoh (2012) assert that the social networking sites including the Twitter, Yahoo Messenger, Facebook Messenger, Blackberry Messenger (BBM), Whatsapp Messenger, 2go messenger, Skype, Google talk, Google Messenger are used by most people to interact with old and new friends. Internet based technology uses both web and mobile technology and allows every user to manipulate a complete communication through their digital gadgets (El Khatib, and Khan, 2017). Social networking sites (SNSs) are online communities of internet users who want to communicate with other users about areas of mutual interest, from a personal, business or academic purpose (William, Boyd, Densten, Chin, Diamond and Morgenthaler 2009). They further asserted that the evolution of internet technology has turned it as the best medium for communication as about two-third of the world's internet user's population visits social networking or blogging sites, thus serving as a communication and connection tool. According to Talaue, AlSaad, AlRushaidan, AlHugail, and AlFahhad (2018), social media are online technology platforms that allow interactions with people within, near or far.

Academic achievement plays an important role in an individual placement-be it academic institutions or job placement; its role as one of the predictors of one's life success is

inevitable (Kyoshaba, 2009). There are, however, concerns about the declining quality of education in Nigeria which could be linked to the usage of social media, among other factors. In classrooms and lecture theaters, it has been observed that some students are always busy pinging, shuffle the internet, chat or browse on facebook, Instagram, Tiktok and the likes while lectures are on-going and with the times ought to be channeled towards learning about academic research and innovation. The platforms are being misused by the passion for meeting new friends online and most times busy discussing trivial issues. Hence, most students' academics suffer setback as a result of distraction from the social media. Diligent students tend to allot their free time to doing research, assignments and other school work. From the theoretical perspectives, diffusion of innovations theory captures a process by which new ideas, practices and the like are communicated through certain channels over a period of time among identified members of a social system. Morah, (2012) argues that diffusion of innovations consists of four stages: invention, diffusion (or communication) through the social system, time and consequences. Technological Acceptance Model (TAM explains how users accept and use a technology. The model suggests that when users are presented with a new technology, a number of factors influence their decisions about how and when they will use it.

On the empirical front, Adebiyi, Akinbode, Okuboyejo,Agboola and Oni (2015) researched the role of attention deficit, predictors of behaviour and academic competence in understanding the relationship between online social networking and students' academic performance among the Covenant University undergraduates students. It was discovered that the prevalence and continuous engagement of online social networking services by the students' population group continued to be on the increase, thereby impacting negatively on their academic performance. Ezeah, Asogwa and Edogor (2013) sampled 300 students from selected Universities in South-East Nigeria and found that students in South-East Nigeria use the social media partly because of the pleasure and fun they derive from the pornographic contents and watching movies using the social media. In another survey of 93 students in University of Benin, Aghaunor and Ekuobase (2015) found that over 75% of activities carried out with the aid of ICT tools (social media) do not have any direct link to students curricular thereby implying that students use social media in pursuing activities that do not have bearing with their academics.

Researchers like Mehmood and Taswir (2013) believed that the use of technology such as social media is one of the most important factors that can influence educational performance of students positively or adversely. Regardless of this, whether the student is a teen, young adult, or old, social media users the all over the world use them for different reasons.

The results of previous research is not conclusive with some studies suggesting a negative impact for social media and others suggesting promising opportunities for engagement (Buhari and Ashara, 2014). In the light of the above, this study broadly examined the effect of social media on performance of management students in Oyo State College of Agriculture and Technology, Igboora. It specifically sought: (i) to identify the type(s) of social media network that is/are mostly used by the students; (ii) to determine the level of student addictiveness to social media and the influence on their performance; and (iii) to examine the relationship between student usage of social media and their academic performance.

Materials and methods

This study, linking diffusion of innovation and technological adoption model, examined the relationship between social media and performance of management students in Oyo State College of Agriculture and Technology, Igboora, Nigeria. It adopted a survey research design with the primary data obtained using a well-structured questionnaires administered to a randomly selected 100 students, by convenience sampling across departments in Faculty of

Management and Communication Studies of the institution. A total of eighty-one (81) questionnaires were duly filled and returned. The study adopted both descriptive and inferential analyses while the research instrument was subjected to content and face validity.

Results and Discussion

Table 1: Socioeconomic Characteristics of the Students

Variable	Frequency	Percentage
Gender		
Female	47	58.02
Male	34	41.98
Age		
16 21	27	33.33
22 – 27	45	55.56
Above 27	9	11.11
Marital status		
Single	73	90.12
Married	8	9.88
Programme		
ND 1	24	29.63
ND 2	20	24.69
HND 1	19	23.22
HND 2	18	22.22
Department		
Accountancy	16	19.75
Business Administration and Management	21	25.93
Public Administration	16	19.75
Library and Information science	16	19.75
Office Technology Management	12	14.81
Total	**81**	**100.0**

Source: Researcher's Field Work 2023

Table 1 reveals the distribution of the respondents in respect of socio-economic variables of the students to whom questionnaires were administered. Of 81 respondents, 47 (58.02%) are females while 34 (41.98%) of the respondents are males. From this, it can be seen that most of the respondents were female employees. Also, the table shows that 27 (33.3%) of the participants are within the age category of 16 years -21years, 45 (55.6%) of them were within the age category of 22 years – 27years, 9 (11.1%) of the respondents were above 27 years. This shows that most of the students were within the age range of 22years – 27years. In addition, 73 (90.12) of the respondents were single while 8 (9.9%) were married. This suggests that most students of the Faculty were single. Of the total respondents, 24 (29.63%) of the students were in ND I, 20 (24.69%) were in ND II, 19 (23.22%) were in HND I, while 18 (22.2%) were in HND II. This implied that ND I students constituted the highest percentage of the respondents. Again, of the total respondents, 16 (19.8%) were in Accountancy department, 21 (25.93%) were in Business Administration and Management, 16 (19.8%) were in Public Administration Department, 16 (19.75%) were in Library and Information Science Department, and 12 (14.8%) were in the department of Office

Technology Management. This implied that the majority of the respondents were in the department of Business Administration and Management.

Effect of Social Media on Performance

Table 2 below revealed the effect of social media on academic performance on students of management department in Oyo State College of Agriculture and Technology, Igboora. The Adjusted R Square of 0.814 revealed that about 81% variation in the academic performance of the students were been accounted for by the independent variables (such as age, sex, course of study, departments and information of social media accounts) while the 19% are due to random error of research. Out of 8 variables are hypothetical to influence management students' performance, 4 variables (using of smart phone, using social media account, number of social media accounts and time spent on social media) were negatively and statistically significant to influence students' academic performance. The result implies that the higher these variables, the lower their academic performance.

Table 2: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.760[a]	.722	.814	.197

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	T	Sig.
(Constant)	1.968	.493		3.992	.000
AGE	.004	.032	.005	.129	.898
SEX	.072	.046	.053	1.586	.116
PROGRAMME	-.047	.036	-.048	-1.285	.202
DEPARTMENT	.035	.120	.058	0.724	.388
USING SMART PHONE	-2.064	.155	-.431	-13.345	.000
USING SOCIAL MEDIA	-1.075	.053	-.675	-20.248	.000
NUMBERS OF ACCOUNTS	-.967	.069	-.430	-14.021	.000
TYPE OF SM ACCOUNTS	.032	.123	.008	.264	.792
TIME SPENT ON SOCIAL MEDIA	-.910	.153	-.190	-5.954	.000

a. Dependent Variable: PERFORMANCE

Conclusion

This study basically establishes the impact of social media on performance of management students in Oyo State College of Agriculture and Technology, Igboora. Four variables are hypothetically used to influence management students' performance (using of smart phone, using social media account, number of social media accounts and time spent on social media) and they were found negatively and statistically significant to influence the students' academic performance. The result implies that the higher these variables the lower their

academic performance. Based on the foregoing, it was recommended that the students be trained on proper use of the smart phones for academic learning not just for social networking; the school avail them of the opportunity on the use of social media platform for quality and enhanced networking.

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EFFECT OF WORKPLACE TOXICITY ON EMPLOYEE PERFORMANCE: A STUDY OF ZARTECH LIMITED IBADAN, OYO STATE, NIGERIA

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Abstract
There is intuitive sense that toxic work environment is harmful to workers' psychological and emotional health. This study investigated the effect of work toxicity on employee performance in Zartech Nigeria Limited. It adopted survey research design with the use of primary data obtained using a well-structured questionnaire administered to randomly select 255 staff of the company. Data were processed and analyzed using descriptive and inferential analyses. The hypotheses tested indicated that workplace toxicity have significant effect on employee performances. It was also revealed that workplace toxicity impacted significantly on employee's wellbeing and job security. It was therefore recommended that the company put in place mechanisms and host of packages that would ensure proper management of the workplace toxicity.
Keywords: Toxic Workplace; Employee Welfare; Job Security; Organisation Performance; Productivity.

Introduction

In recent times, there has been growing concern about the negative effects of work toxicity on employee well-being, job satisfaction, and overall productivity. The word toxic refers to "containing or being poisonous material especially when capable of causing death or serious debilitation" and also means "extremely harsh, malicious, or harmful" (Toxic, 2016). Walton (2008) defined a toxic organization as one within which there exists noxious behavior that are disruptive, destructive, exploitive and dysfunctional while abuses are pervasive and tolerated. Shain (2009) described a poisoned work environment as characterized by persistent and repetitious pattern of abuse, harassment or discrimination over time; the same is ignored, allowed to exist and/or supported by the employer with no adequate steps taken to remedy the situation.

Consistent with the above, workplace toxicity researchers have noted that the mere presence of stressors like high workload, destructive behaviour in the work environment does not necessarily imply toxicity (Padilla, Hogan, and Kaiser, 2007; Reed, 2004). Indeed, a number of researchers point to the importance of the persistence and dosage of stressors, as well as organizational members' responses to them (see, for example, Lawrence, 2008; Maitlis and Ozcelik, 2004). Opperman (2002) viewed work environment as processes, systems, structures, tools or conditions in the workplace that impact favorable or unfavorable for individual performance. The success of an organization is highly dependent on the performance of its employees (Arubayi, Eromafuru and Egbule, 2020). The work environment also includes policies, rules, culture, resources, work relationships, work location, internal and external environmental factors all which influence the ways that employees perform their functions.

Most workplace toxicity researchers have discussed toxic and their effects on workers (see, for example, Goldman, 2006; Pelletier, 2010; Reed and Olsen, 2010; Steele, 2011); fewer, however, have viewed the phenomenon more broadly and considered contributors beyond

leaders, such as co-worker interactions (Chamberlain and Hodson, 2010; Frost,2003), work-related processes (Frost, 2003, Maitlis and Ozcelik, 2004), and organizational culture (Hartel, 2008; Shain, 2009; Walton, 2008). Seeking to gain a better understanding of the phenomenon from this broader perspective, the current research explores the notion of a toxic work environment as a systemic issue, where system means a group of related parts that move or work together (System, 2016).

According to Maslow's theory of needs, security remains an important concern for people. A toxic workplace is seen as an indispensable factor that demolishes a person's sense of security, and thus, is bound to have a negative impact on well-being and performances. The effort-reward imbalance model advances that when employees perceive that their effort exceeds the receipt of rewards, such as pay, recognition, and job security, they experience high levels of stress and burnout. This leads to reduced job satisfaction, poor work performance, increased absenteeism and turnover. The social support theory emphasizes the role of social relationships in work toxicity and employee performance. It lends credence to the fact that social support from colleagues and supervisors can act as a buffer against the negative effects of job stressors. Employees who receive support from their colleagues and supervisors are more likely to have better mental health outcomes, job satisfaction, and work performance.

On the empirical front, Rasool, Wang, Tang Saeed and Igbal (2021) explored the effect of toxic workplace environments on employee engagement. They used quantitative research approach with data obtained from 301 workers in the small and medium-size enterprises in China. The researchers employed partial least squares structural equation modelling. The results of the study confirmed that a toxic workplace environment has a negative impact on employee engagement. It further confirmed that organization support and employee well-being significantly mediate a toxic workplace environment and employee engagement.

Arubayi (2023) researched workplace toxicity and employee performance of manufacturing firms in Nigeria. He used narcissistic behaviour, harassment, offensive/aggressive leadership, bullying and ostracism as proxies for the independent variable while administering questionnaire to one hundred and thirty-two sampled employees of water production companies. It was found that there was positive and significant relationship between all the variables of workplace toxicity and employee performance. Ali, Abdiaziz and Abdiqani (2013) investigated the relationship between work environment and employee productivity. They found out that working conditions were significantly related to employee productivities in manufacturing sectors. With particular focus on such variables as comfort level and temperature in the office work, the study of Junaida, Muhadir, Siti and Afida (2010) investigated the physical work environment on staff productivity. With 150 participants among civil servants in the Ministry of Youth and Sports in Malaysia, the study established a significant relationship between workplace environment and employee productivity. A study by Maslach, Schaufeli, and Leiter (2001) found that work toxicity, in the form of emotional exhaustion, depersonalization, and reduced personal accomplishment, is associated with lower job satisfaction, reduced organizational commitment, and increased turnover intentions. Onyishi, Ekechukwu, and Ibebuike (2019) found that work toxicity, in the form of job stress, work overload, and poor work-life balance, significantly reduces employee productivity and effectiveness.

Employees, being vital and direct stakeholders in ensuring survival of an organization and or institutions, interact with the clients, suppliers and or intermediaries in providing products and or services. From the foregoing, literatures indicated that some employees experience very difficult conditions such as toxic leadership, colleagues and customers, work processes and organizational culture. With dearth of literature on work toxicity and employees' performance in Nigeria, this study was conducted to empirically examine the effect of

workplace toxicity on employees' performance in Zartech Limited Ibadan Oyo State Nigeria. It specifically sought: (i) to determine the relationship between workplace toxicity and employee's productivity; and (ii) to investigate the effects of job toxicity on employee's wellbeing and security.

Materials and Methods

This study sought to investigate the relationship between workplace toxicity and employee performance in Zartech Limited Ibadan Oyo State Nigeria. It has a theoretical linkage with Maslow's theory of needs that security is the main concern for people as well as the social support theory that emphasizes social relationships in work toxicity and employee performances, among others. The study adopted a survey research design, using primary data obtained using a well-structured questionnaires administered to a randomly selected 255 staff across relevant units and staff cadres of the Zartech limited. The research instrument was validated using content and face validity while the data were processed using both descriptive and inferential analyses.

Results and Discussion

Table 1 revealed the socio-demographic characteristics of 255 sampled respondents. The distribution by gender indicated that 198 (78%) were male while 57 (22%) were females, indicating the majority were male. The distribution of respondents by age indicated that 89 (35%) of the participants were in the range of 18 - 25years, 127 (50%) were within the age category of 25 – 40years, 39 (15%) of the respondents were 40 years above. This shows that most of the staff members of Zartech Limited, Ibadan Oyo State were within the age range of 25years – 40 years. The proportion of respondents with GCE/SSCE qualifications were 55 (21%), 101 (40%) were NCE/OND holders, while 99 (39%) were HND/BSC holders. This implies that majority of the respondents had qualifications above NCE/OND level. Similarly, 78 (31%) of the respondents were single, 121 (47%) of the respondents were married, 35 (14%) of the respondents were widowed while 21 (8%) of them were separated. This implies that majority of the respondents were married. Based on work experience, 46 (18%) of the participants had between 0 and 2 years, 62 (24%) had 3 to 5 years, 83 (33%) had 6 to 11 years, while 64 (25%) of them had above 11 years' work experience. By this, majority of the respondents had 6 to 11 years' work experience.

Table 1: Socio-Demographic Characteristics of Respondents

Characteristics	Category	Frequency (*n*)	Percentage (%)
Gender	Male	198	78
	Female	57	22
Age (Years)	18 – 25	89	35
	25 – 40	127	50
	Above 40	39	15
Education	GCE/SSCE	55	21
	NCE/OND	101	40
	HND/BSc	99	39
Marital Status	Single	78	31
	Married	121	127
	Widowed	35	14
	Separated	21	8
Work Experience	0 – 2 years	46	18
	3 – 5 years	62	24
	6 – 11 years	83	33

Above 11 years	64	25

Researchers' Computation, 2023

Test of Hypotheses

The hypotheses formulated were tested for validation. The simple linear regression was used to ascertain the effect of independent variable on the dependent variable.

Hypothesis One (H_{O1}): Workplace toxicity does not significantly affect employee productivity.

Table 2: Summary of Linear Regression Test of Significant Relationship between Workplace Toxicity and Employee's Productivity

Variables	Co-efficient	Standard Error	t-statistics	P-value
Constant	4.418	3.086	9.214	0.000
Workplace toxicity	3.233	3.042	7.012	0.000

R square: 0.647 No. of Observation: 255
Adjusted R square: 0.802 R: 0.791
F-statistics: 72.149

Source: SPSS computation 20.0

Table 2 presents the linear regression model of significant relationship between workplace toxicity and employee's productivity with F (1, 253) = 72.149, $p < 0.05$ implying the significance values reported is less than 0.05 ($p = .000 < 0.05$). Thus, we reject the null hypothesis (H_{o1}) that workplace toxicity does not have significant relationship with employee productivity and accept the alternative hypothesis that workplace toxicity does have significant effect on employee productivity.

Hypothesis Two (H_{O2}): Workplace toxicity has no significant effect on employee's wellbeing.

Table 3: Summary of Correlation Test of significant effect of workplace toxicity and employee's wellbeing

	Variable	Mean	SD	N	1	2	P
1	Workplace toxicity	4.214	1.574	255	1		0.000
2	Employee's wellbeing	4.010	0.792		0.789*	1	

*P<0.05

Source: SPSS computation 20.0

Table 3 shows correlation test of significant relationship between workplace toxicity and employee's wellbeing. The correlation value of *rho* = 0.789 indicates a positive correlation between workplace toxicity and employee's wellbeing. Also, the p-value 0.000 is less than 0.05 (significant level); thus, the null hypothesis which that workplace toxicity has no significant effect on employee's wellbeing is rejected while the alternative hypothesis is accepted. It implies that to a large extent workplace toxicity has significant effect on employee's wellbeing.

Conclusion

The results of this study basically establish the effect of workplace toxicity on employee performance in an organization, using a study of Zartech Limited, Ibadan Oyo State. It, no doubt aligned with the theoretical proposition that workplace toxicity impacts on employee well-being, productivity, and job security. Findings from the study corroborated and aligned with empirical outcomes in the studies of Tio (2014) and Rasool, Wang, Tang Saeed and Igbal (2021) in different study locations.

Recommendations

It is recommended that the management should adopt both preventive and remedial measures to curtail toxins at the workplace environment for enhanced productivity and staff wellbeing. Management may adopt periodic meetings with employees to receive their grievances for effective management.

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OYSCATECH GLOBAL CONSULT

IMPACT OF EMPLOYEE SATISFACTION ON CUSTOMER SATISFACTION: A STUDY OF UNITED BANK FOR AFRICA (UBA) PLC, LAGOS, NIGERIA

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Abstract
The knowledge, skill and abilities remain germane to instil key competencies in employees. This study investigated the effect of employee satisfaction on customer satisfaction, with particular reference to United Bank for Africa (UBA) Plc Headquarter, Marina, Lagos, using survey research design. Primary data were obtained using a well-structured questionnaire administered to randomly select 51 staff of the company at the main secretariat. The data were processed and analyzed using descriptive and inferential analyses. It was found that employee satisfaction significantly impacted on customer satisfaction. The findings indicated that employee motivation, training and reward packages were statistically significant to influence customer satisfaction, hence, customer patronages. It was therefore recommended that the company adopt engagement strategies to bring about successful bonding and employees' loyalty with a view to igniting positive energy to satisfy the customers.

Keywords: Employee Satisfaction; Loyalty; Reward System; Customer Service; Motivation

Introduction

Organization requires a crop of technically, socially and numerically adequate staff to manage diverse customer needs, competently. Customer satisfaction is important for service businesses for it is a prerequisite for loyalty and word-of-mouth behaviour (Spinelli and Canavos, 2000). The continual process of staff development and motivation as a means to establish link between employee satisfaction and customer satisfaction has generated research interest, in the recent times. Gursoy and Swanger (2007) suggest that in hospitality and tourism industry, attention to service and customer satisfaction is considered to be a given factor which is an expected and a natural part of day-to-day operations. According to Massad, Heckman and Crowston (2004), the service provided by employees help to build a good relationship with customers and in some cases, increases their loyalty. A satisfied customer may result in a positive word of mouth recommendation and loyalty (Torres and Kline, 2006). Satisfied employees are expected to be more inclined to share same positive feelings with customers due to the emotional contagion effect, which explains how satisfied employees spread their satisfaction to other people around them (Jeon and Choi, 2012). Organizational profit shows the level of satisfaction of employees, who are more satisfied and are less satisfied (Brown and Lam, 2008).

Hung, Huang and Chen (2003) stated that the big challenge for today's service lies in the excellent service quality and high customer satisfaction. Customer satisfaction is a mediating factor between the employees' satisfaction and organizational performance (Chi and Gursoy, 2009). Total quality management considers the employees as internal customers based on the idea that an organization that does not take into consideration the needs of employees cannot

meet the customer expectations and that it is necessary to satisfy the employees in order to achieve customer satisfaction first. While the satisfaction of the internal customers is important for the healthy functioning of the process and the motivation of the employees, the satisfaction of the external customers is necessary for the existence of the organization (Uryan, 2002).

Theoretical literature establishes the linkage between employee satisfaction and customer satisfaction. According to the balance theory, a system of triadic relationships between two persons (employee and customer) and an object (organization) can be either balanced or unbalanced. A relationship system is balanced if two people have the same attitude toward the object. A relationship system is unbalanced if two people involved in a relationship with each other differ in their attitudes toward the object. This results in cognitive tension that ultimately leads to activities to balance the system. In the context of social exchange theory, the employer is devoted to building a relationship of long-term employment with his employees by fulfilling their needs through offering them favourable working conditions, growth opportunities, organizational support etc; in return, employees will be committed to their employer. Such a willingness to build a long term relationship between the employer and employees is one of the key characteristics of a social exchange theory. In the like manner, the emotional contagion framework explains how the emotions of two people (e.g., salesperson and customer) during a conversation are transmitted from one to the other via facial cues, and that these emotions affect the outcome of that interaction. The emotional contagion framework specifically suggests that some psychophysiological processes cause facial reactions. These facial reactions can transmit the emotions of a person to other people.

Researchers like Colombo and Stanca (2008), Sepulveda (2005) and Konings and Vanormelingen (2009) showed that employee satisfaction is a fundamental and effectual instrument in successful accomplishment of firm's goals and objectives and in attaining higher productivity. Business success is the ultimate result of the employee satisfaction but it is reflected in customer satisfaction (Xu and Goedegeburre, 2005). Quality and profit life cycle is an impact of employee satisfaction (Yee, Yeung and Cheng, 2008). Several studies suggest a positive relationship between employee satisfaction and customer satisfaction (Bernhardt, Donthu and Kennett, 2000; Harter, Schmidt and 2002; Koys, 2003; Wangenheim, Evanschitzky and Wunderlich, 2007; Turkyilmaz, Akman, Ozkan, and Pastuszak, 2011; .Ammari, Al kurdi, Alshurideh. and Alrowwad, 2017; Obeidat, Alshurideh, Al Dweeri., and Masa'deh, 2019; Aburayya, Alshurideh, Albqaeen, Alawadhi and Ayadeh, 2020).

In the business environment, banking companies cannot survive without satisfied customers because they operate in a very competitive market. In order to succeed, a company has to do a better job in creating satisfactory experiences for both employees and customers. The relationship between customer satisfaction and employee satisfaction are two important factors for a service industry but has not received much attention in banking industry; hence the present study. The broad objective was to analyse the impact of employee satisfaction on customer satisfaction with particular reference to United Bank for Africa (UBA) plc. Headquarter, Marina, Lagos State. The specific objectives are to: (i) assess the impact of employee motivation, training, reward on customer satisfaction; (ii) find out the perception of customer on service delivery and customer service of United Bank for Africa (UBA) plc.

Materials and Methods

The study examined relationship employee satisfaction and customer satisfaction, a study of the United Bank for Africa (UBA) Plc. Headquarter, Marina, Lagos State, Nigeria. The study adopted the survey research design to empirically establish the theoretical linkage between employee satisfaction and customer satisfaction. The study's population of sixty-five (65)

was sampled using probability random sampling using the sample size of fifty-six (56) as the estimate arrived through Taro Yamani formula at 5% significance level. Questionnaires were administered to obtain primary data with a response rate of 91% from the respondents.

Results and Discussion

Table 1: Socio-demographic Characteristics of Respondents

Characteristics	**Category**	**Frequency *(n)***	**Percentage *(%)***
Gender	Male	21	41
	Female	30	59
Age (Years)	20 – 30	23	45
	31 – 40	19	37
	41 - 50	4	08
	51 – 60	3	6
	Above 60	2	4
Marital Status	Single	17	33
	Married	21	41
	Divorced	13	26
Education	GCE/SSCE	2	4
	ND	4	8
	HND/BSc	36	71
	Postgraduate	9	17
Department	Marketing	9	18
	Teller	14	27
	Auditing	3	6
	Customer Service	21	41
	Accounting	4	8

Source: Researchers' Computation, 2023

Table 1 revealed the socio-demographic characteristics of 51 respondents. The distribution by gender indicated that 21 (41%) were male while 30 (59%) were females; thus the majority were female. The distribution of respondents by age indicated that 23 (45%) of the participants were in the range of 20 - 30years, 19 (37%) were within the age range 31 – 40years, 4 (8%) of the respondents were in the age range 41 - 50 years, 3 (6) were in the age range 51 – 60 years while those older than 60 years represented 2 (4%). This shows that most staff at the UBA Plc headquarter were within the age range of 20years – 30 years. The marital status of the respondents indicated 17 (33%) were single, 21 (41%) were married while 13 (26%) were separated; this implied that the majority were married. Based on the education level, the proportion of respondents with GCE/SSCE qualifications were 2 (4%), 4 (8%) were ND holders, 36 (71%) were HND/BSC holders and 9 (17%) held postgraduate degrees. It implies that majority of the respondents held HND/BSc qualifications. On the distribution by departments, 9 (18%) were in Marketing, 14 (27%) were in Teller Unit, 3 (6%) were in Auditing, 21 (41%) were in Customer Service, and 4 (8%) were in Accounting. The spread by function indicated the highest number of staff in the customer service department.

Test of Hypotheses

This section reveals the findings following the test of hypotheses formulated to validate this work.

Hypothesis One (H_O): Employee motivation, training and reward has no significant impact on customer satisfaction.

Table 2: Test of Multiple linear regression of significant impact of employee motivation, training, reward on customer satisfaction.

Variables	Co-efficient	Standard Error	t-statistics	P-value
Constant	2.423	1.157	5.991	.000
Employee Motivation and Reward	1.511	1.065	3.515	.000

R^2: 0.879 No. of Observation: 51

Adjusted R square: 0.801 R: 0.745

F-statistics: 189.872
Dependent variable: customer satisfaction

Source: SPSS computation 21.0

Table 2 shows the multiple linear regression of significant impact of employee motivation, reward and training, on customer satisfaction; virtually all the variables significantly have effect on the organization performance as the model shows F (1, 49) = 189.872, $p < 0.05$. The table reveals that the organization reward system have significant effect on customer because significant value reported is less than 0.05 ($p = .000 < 0.05$). Thus, we accept the alternate hypothesis which implies that there is significant impact of employee motivation, training, reward on customer satisfaction.

Conclusion

The study investigated the impact of employee satisfaction on customer satisfaction at the United Bank for Africa Plc. Lagos, Nigeria. It was found that employee satisfaction impacted significantly on customer satisfaction. The theoretical proposition, like the empirical findings by Colombo and Stanca (2008), Sepulveda (2005) and Konings and Vanormelingen (2009) corroborated same. Thus, it was recommended that the organization should adopt more strategies and commit more resources to satisfying employees with a view to translating to customer satisfaction, loyalty and continued patronage.

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PERFORMANCE BENCHMARKING AS A WINNING STRATEGY FOR ENHANCING SUPPLY CHAIN COMPETITIVENESS

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Abstract
Competiveness is the order of the day and benchmarking as a tool helps companies to position themselves in the market place. Decision makers are persistently on the lookout for techniques to facilitate quality enhancement. The study reviewed literature on the practice of benchmarking in supply chain management, to come up with a better understanding of the subject and to use it to efficiently improve supply chain performance in any business organization. The study outcome reveals that benchmarking is not just a measurement process that results in a comparative performance measurement, but also describes how remarkable performance is achieved. Moreover, benchmarking helps organization to identify the gaps in its performance when compared with another organization. The concept of change is an integral part of benchmarking. However, while every improvement means a change, not every change means improvement. It was deduced that benchmarking is not just seeking to make changes, but its main objective is to add value to the organization.
Keywords: Performance Benchmarking, Supply Chain Competitiveness

Introduction

The term 'benchmarking' was introduced by Frederick Taylor in his scientific management practices and a benchmark turn into the fitness criterion by which a task could be executed. Owing to overall fast changes and cut-throat competition, organizations have been constrained to think through and implement ideas and techniques. Benchmarking is a technique of identifying new philosophies and new methods of refining process that meets the expectation of customers in a better way.

Benchmarking has spread fast and become one of most used competitive techniques (Chen, 2002). It is widely used as a tool to improve performance (Yasin, 2002), eliminate the process of trial and error, enhance efficiency of developing a new products (Hong et al, 2014), and improve customer satisfaction (Brah and Madhu, 2000). Several organizations have adopted benchmarking as a part of TQM approach (Wym-Williams, 2005) and one of significant continuous process tools. Rohlfer (2004) viewed benchmarking as a search of best practices and applying them in order to cover identified gaps and to accomplish continuous process improvement in an organization for the purpose of enhancing its competitiveness.

This article is an attempt to review published studies on the concept of benchmarking and to pave the road for future empirical studies in different contexts.

Methodology

This study reviewed relevant literature on benchmarking to elicit more information on the subject and how it is being practiced in different organizations. The study carried out a critical analysis of opinions of different authors on benchmarking to have a better view of the subject and how it can be effectively carried out to yield positive result.

Benchmarking: A general overview

Benchmarking is broadly used as a tool to enhance performance (Yasin, 2002), remove the process of trial and error, increase productivity by growing new products (Hong, Peterson, Mumovic, and Steadman, 2014), and develop customer gratification.

Benchmarking has been defined in literature differently. A very prevalent definition given by Camp, (1989) is to look for the cream industry practices that will direct to excellent performance because of the execution of the cream practices.

Kumar, Anthony, and Dhakar (2006) indicated that benchmarking seeks to develop the performance of a workplace by recognizing, comprehending, and attaining decent practices of other workplaces. According to Joo, Nixon, and Stoebert (2011), benchmarking signifies a style of management tactics described by executing the cream practices discovered in the same industries or even in different industries to enhance the performance of a workplace.

Benchmarking is not just seeking to make changes, but its main objective is to add value to the organization. In other words, if the benchmarking activities do not add any value to the organization, they should be discontinued (Mollace, Rahimi and Tarassoli, 2009). Furthermore, comparing data and copying the best practices from other organizations are not considered as benchmarking. Instead, benchmarking is a broad process that seeks to know the strength and the weakness of an organization so as to apply best practices that are learned from other organizations (Camp, 1989).

As one of the total quality management results, benchmarking seeks to achieve many benefits (Blackiston, 1996). Elmuti and Kathawala (1997) argued that benchmarking as a strategic tool aims to increase productivity and individual design, enhancing learning, changing the culture of an organization and growth potential, tool for performance assessment, tool for continuous improvement, and tool for improving performance. In addition, Mollace and Rahimi (2009) argued that benchmarking aim to achieve continuous improvement through applying five steps which are: deciding what to benchmark by making priorities and determining a certain process; analyzing the starting position and the aim by identifying measurement tools that enable to determine the improvement that occured; selecting a suitable partner; getting the required information from the partner; and applying the lessons learned and taking action to improve.

In his study, Wynn-Willams (2005) opined that some companies implemented benchmarking as a significant role in Total Quality Management (TQM) approach. Benchmarking receives from TQM an obligatory assurance to endless expansion and supervision (Wynn-Willams, 2005). It must be modified to reveal internal alterations and the altering competitive topography (Mcgauchy, Puleo and Casey, 2005). As Boxwell (1994) has mentioned that in Japan, benchmarking is the role of job descriptions of a manager. This may be one of the reasons why Japanese products surpass others in industries like electronics, automobiles, etc.

However, some individuals comprehend benchmarking as copycatting. That is, they perceive that those who benchmark never develop their views. And as such, it tends to lessen imagination and deceased opinions. Benchmarking requires constant learning to achieve the maximum advantages of its practice (Rohlfer, 2004).

The basic concept of benchmarking and its processes can be framed from three known theories namely; The Resources Based View of the form (RBV); Market-Based Orientation and Organisational Learning Theory (OLT). According to Rothaermel (2012), these source-based views of the form encompass the resources, whether tangible or intangible, as key to obtaining superior performance. The theory was first developed by Williamson (1991), who postulated that the effectiveness and efficiency of firms are practically based on efficiency approach. Also, Bridoux (2004) strongly argued that the RBV has a strong impact on attaining sustainable competitive advantage. Makadok (2001) and Peteraf (1993) pointed out that resources are a source of competitive advantage that should be given special attention in a way that competitors find difficult to imitate and follow..Benchmarking, in this case, is largely confined with resources as the basis for competitive advantage.

On the other hand, another theory underlying the concept of benchmarking is the Market-Based Learning, where Dickson (1992) stressed the importance of this model in achieving

sustained competitive advantage, with timely and organized market assessment of a firm in comparison with its rivals. It emphasized the need to understand and assess the market needs over competitors, and linking capabilities towards the external environment particularly establishing and maintaining relationships with different stakeholders. Moreover, Market-Based Learning enables the organizations to enhance motivation and obtain the opportunities of market scanning and evaluation that are essential to benchmarking. This model has been proven to enhance benchmarking in relation to organizational performance.

Third theory that enhances benchmarking is Organizational Learning. It presupposes the capability of benchmarking firm to provide research and knowledge channels (Celuch, Kasorf and Peruvemba, 2002) . In other words the use of benchmarking is primarily focused on increasing the organization's awareness to attain improvement or better performance (Camp, 1995).

The payback of benchmarking

Benchmarking as the process through which enterprises concentrate on the 'top' in the industry and attempt to copy their models and practices assists organizations to decide what may improve their performance. According to Allan (1997), benchmarking assists in the following areas:

Competitive Analysis: This refers to evaluating and examining the relative strengths, as well as weaknesses of competitors, to know its stand and position in the competition within the industry. Through benchmarking, the relative advantage of the competitors in the industry can be assessed and the organization's performance compared to that of the competitors (Min and Gale, 1996).

Monitoring of performance: Benchmarking plays a vital role in enhancing organizational best practices, and overall organizational strategy performance. Furthermore, it helps to assess efficient utilization of resources and improve any section of the business that needs improvement. Good performance of an organization depends on continuous improvement. Therefore, Benchmarking establishes methods of measuring each area in terms of units of output as well as cost. Benchmarking evaluates performance and wishes to improve it by assisting in setting attainable goals that have already been proven effective (Fuller, 2020).

Planning and Goal setting. As benchmarking is approved, goals and performance metrics are set to improve performance. Besides, benchmarking has a crucial role in supporting the process of budgeting, strategic planning, as well as capital planning (Lyonnais, 2020).

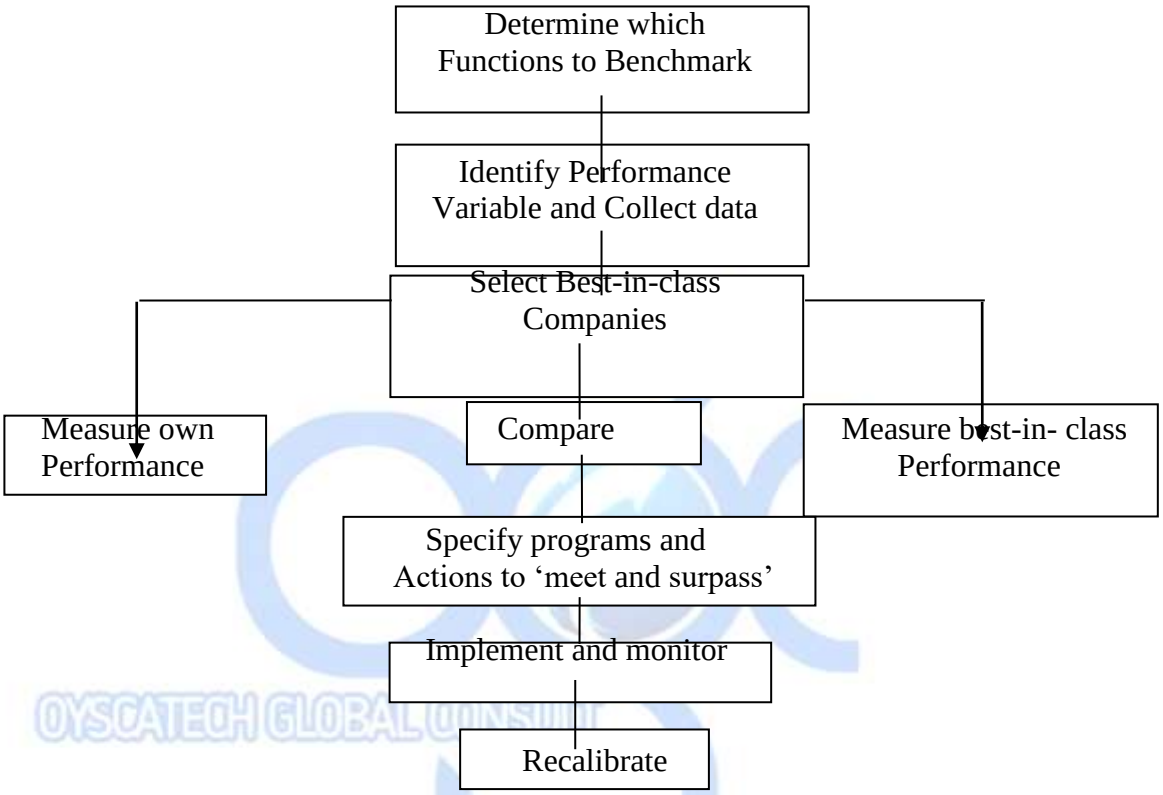
Techniques of benchmarking

There are many forms of benchmarking. Gaughey (2002) classified benchmarking into three, such as internal, external and best practice. Behara and Lemmink (2007) on the other hand classed benchmark based on what takes place: benchmarked as functional, performance, generic, process and strategic or who take place benchmarked as internal competitive or non-competitive. Fong, Cheng and Ho(2008) classed benchmarking based on what takes place benchmark as internal, as competitor, industry, generic global, content of benchmarking as process, functional, performance, strategic next aim of the relationship as: competitive and collaborative.

There is a need to evaluate by every organization carefully, in its view point, that what benchmarking is and how they need to utilize this process. The organization needs to determine whether their focus is only on financial outcomes or on just meeting customer needs. This is the only effective and best way to initiate the benchmarking process.

Process of benchmarking

Benchmarking methods vary from company to company, and as such, which method is best is difficult to decide. Thus, the key steps involved are: firstly, to measure the performance of the best-in-class comparative to significant performance variables as cost, quality, and productivity. Secondly, determine in what way the level of performance are attained, and thirdly, utilize the information to improve and complement a plan for development. Benchmarking process is comparatively simple. Specific knowledge along with a practical indentation is everything that is required to make such a process an achievement



Source: *Adapted from Bateman (1989, P.6)*

Enhancing supply chain performance through benchmarking

Benchmarking aims at improving performance by learning from the best performers in the class (Fong, Cheng, etal.1998). Benchmarking is most commonly used at the organizational or business unit level and is based on the assumption that it is important to learn from organisations that are perceived as the best. Excellence can be related to products services or processes (Dean and Yunus 1997). In practice, benchmarking starts from the best practices search and identification (Fong, Cheng et al 1998).However, there is an issue in that, in many cases, 'best practices are postulated by their authors, without confirmation of how the practices presented actually improve performance in the organisations involved (Laugen, et at 2005).

A major criticism of benchmarking and best practice approach is that it often ignores contextual aspects such as: industry (Davies and Kochlar 2002; Laugen, *et al.*, 2005); supporting infrastructure (Davies and Kochlar 2002); company size (Laughen, *et al.*, 2005); processes and products (Laugen, *et al.*, 2005); and national and regional economic policies (Delbridge, et al 1995).

However, despite such criticism, research suggests that companies that use benchmarking tend to improve their operational and business performance (Voss, *et al.*, 1997). In the area

of strategic purchasing, survey result indication reveals that the use of benchmarking usually have positive impact on organisational performance (Carr and Smelt. 1999).
Kyro (2003), citing Wats On (1993), identified phases of benchmarking, showing six different areas of the business that can be benchmarked. These include reverse benchmarking –comparing product and service offerings; competitive benchmarking process comparison with competitors; process benchmarking comparing processes outside the relevant industry; Strategic benchmarking – understanding and adoption of successful strategies from other organisations; global benchmarking – comparisons across different geographies; and competence benchmarking (how to develop skills, competences and organisational learning).
Benchmarking has been used in many operational areas or fields, including supply chain management. Gunasekaran (2001) proposed using benchmarking for various aspects of supply chain management including the following. Such as benchmarking supply chain operation: process, technology and organisation capabilities; analysing supply chain performance; benchmark internal supply chain performance; and measuring supply chain collaboration at the inter-organizational level.
Benchmarking is also a common subject of academic research that has resulted in hundreds of publications, which are summarised in the literature review by Yaran (2002) and Dattakumar and Jagadecsh (2003).

Measuring and improving supply chain performance through benchmarking.
Identification of the key performance metrics is a major objective of benchmarking process. Performance measurement and the selection of suitable metrics and measurement dimensions are key stages in benchmarking process (Delbridge, *et al.*, 1995; Shah and Singh 2001), and are also the first step in supply chain benchmarking (Gordon 1995), along with the search for the companies or processes that can be classified as the 'best practices' (Davies and Kochlar 2000).
Performance measurement gives an opportunity to identify key areas of a supply chain, while benchmarking helps to assess performance based on selected metrics (Shah and Singh 2001). Anderson and Mc Adam (2004) analyzed various performance measurement approaches that are used in benchmarking, such as the performance measurement matrix, the balanced supply chain scorecard, results and determinants model, measure for time-based competition performance pyramid, Scandia navigator and performance prism. The use of benchmarking and best practices without linking them with performance measures can result in misunderstanding any cause and effect relationship, as improved performance in one area might result in lowering it in another (Davies and Kochlar 2002).

Conclusion and recommendations
The study shows that benchmarking is not just a measurement process that results in a comparative performance measurement, but also describes how remarkable performance is achieved. Moreover, benchmarking helps organization to identify the gaps in its performance when compared with another organization. The concept of change is an integral part of benchmarking. However, while every improvement means a change, not every change means improvement. Benchmarking is not just seeking to make changes, but its main objective is to add value to the organization, so as to enhance its competitiveness in the industry. Its relevance in improving supply chain agility and responsiveness cannot be overemphasized if it is properly carried out.

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MITIGATING SUPPLY CHAIN DISRUPTION AS A POST COVID 19 STRATEGY FOR BETTER SUPPLY CHAIN PERFORMANCE

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Abstract
The emergence of COVID 19 created great challenge for supply chain globally, its impact was felt in many establishments affecting all aspects of supply chain from procurement of raw materials to manufacturing and to distribution.
This study shows how the disruption caused by COVID'19 has revealed the vulnerability of supply chain locally/ globally especially in terms of logistics, manufacturing, distribution and demand. The pandemic caused disruptions to manufacturing operations globally, In Asia, factories were shut down temporarily, China went on complete close due to lockdown measures. Owing to this , there were hitches leading to shortages of essential components & materials, delay in production, and disappointment in deliveries. No sector of economy was left out from the effect of the Pandemic ranging from Healthcare, to Automobile sector, Agriculture, and technological. Logistics was another area affected by COVID, limitations were placed on traveling and movement leading to cancellation of shipment and local movement of goods. These disruptions lead to significant supply chain bottlenecks.
It objective is not only to reflect on impact of COVID on global supply chain but to also provide recommendations to overcoming pandemic effects and suggest possible strategies for better chains performance.
Keywords*: Supply chain, disruption, Global supply and logistics, COVID 19, Lead time*

PURPOSE: Supply chains encountered serious bottlenecks during COVID 19 periods which brought about dangerous setbacks in both local and global supply chain management processes. This study examines strategies that could be employed to combat disruptions in the entire supply chain processes and ensure efficiency in the whole system.

Introduction

Supply chain management (SCM) is the management of the flow of goods and services from the procurement of raw materials, to the processes that transform raw materials into final products and the delivery of the products to final destination. It involves the active streamlining of a business's supply-side activities to maximize customer value and gain a competitive advantage in the market. It covers everything from before production to product development and also to the information systems needed to direct all undertakings. SCM is based on the idea that nearly every product that comes to market results from the efforts of various organizations that make up a supply chain.
By managing the supply chain, companies would achieve their business objectives such as ability to cut excess costs and deliver products to the consumer faster and in a more efficient way, improvement of product quality, reductions of risk recalls and lawsuit, building of strong consumer brand, having reasonable controls of shipping procedures of inventory supply and improving profit margin.

However, there are typical factors that are capable of creating interruptions to the good intentions of supply chain management (SCM) the which pose problems to SCM system, such factors are: Pandemics, Natural disasters, Logistics delays and failures, price fluctuations cyber attacks, Product Problems and more. This work would be focusing majorly on COVID 19 as a factor.

The COVID-19, which is one of the crucial pandemics, did not only affect the local supply chain but worldwide.

It has had severe and far-reaching repercussions on health systems, economies and societies, large and small businesses globally suffered the effects of COVID-19 pandemic as it threatened human life, lead to job losses, reduction in incomes, massive decline in business activities, establishment winded off, and finally put businesses around the world in total disarray, leaving great negative impacts on both present and future supply chain performance and plans.

This study considers the possible disruption of COVID on supply chain management (SCM) and provides recommendations of how all bottlenecks could be mitigated for proper and better efficiency in the supply chain system.

Methodology

This study reviews some existing literature on mitigation of supply chain distribution. It did some critical analysis of various ideas on the Supply Chain Management (SCM) to coming up with more effective strategies for combating bottlenecks of whatever form that may face Supply Chain now and in the future..

An overview of supply chain management

Supply Chain Management (SCM) incorporates the range of activities coordinated by an organization to procure and manage supplies (Oliver and Webber, 1982). SCM is an "umbrella construct that incorporates suppliers and network sourcing and demand and value chain and integration logistics management (Croom *et al.,* 2000; Romano and Vinelli, 2001; Kotzab and Otto, 2004, Fonseca and Lima, 2015). A supply chain involves all parties that directly or indirectly fulfill a customer request(Chopra and Me into, 2007).

The modern approaches of SCM focus on the interdependence of organizations working in a collaborative way to improve the efficiency of global logistics channel (Shin *et al.,* 2000; Nasarimand Kim, 2002). This encourages synergism and collaboration among concerned partners to achieving an effective supply, integrate customers, suppliers, producers and other supply chain players through the firm functions. Following this conceptions, Chopra and Meindl (2007) stated that "A supply chain management consist of all parties involved, directly or indirectly, in fulfilling a customer request. The selection of suppliers should consider that a relationship between customers and suppliers does not depend only on cost but also on product quality, delivery, and flexibility (Fonseca and Lima, 2015). Low-cost supply chain are often unable to respond to unexpected changes in demand or supply or provide a higher amount of defective generation internal and external failure costs(Lee, 2004; Fonseca and Loma, 2015)

Strategic supply chain management (SSM) should be regarded as strategic long-term planned effort to create a capable supplier base and leverage the benefit of supply management (Carr and Pearson, 1999; Shin *et al.,* 2000; Chen *et al.,* 2004). Knowing the critical dimensions that affect performance is pivotal in a highly complex operations environment (Barbosa and Azevedo, 2019). Make-to-order (MTO) supply chains are vulnerable to demand uncertainty, disruptions in material supplies, long product lead times, and large order backlogs (Sahin, 2005). Managing inventories in MTO environments often encompasses keeping high inventory levels to minimize delays (Stavrulaki and Davis 2010). According to Barbosa and

Azevedo (2019), the main performance of Supply Chain (SC) performance are complexity, workload, design reuse, project type, outsourcing, and experience/knowledge of technology, while customers, manufacturers, and suppliers are the primary sources of uncertainty.
The COVID-19 crisis has revealed the fragilbleness and exposed the global supply chains' vulnerability Knowing the critical dimensions that affect performance is pivotal in a highly complex operations environment (Barbosa and Azevedo, 2019). Make-to-order (MTO) supply chains are vulnerable and resilience demand uncertainty, disruptions in material supplies, long product lead times, and large order backlogs (Sahin, 2005). Managing inventories in MTO environments often encompasses keeping high inventory levels to minimize delays (Stavrulaki and Davis 2010). According to Barbosa and Azevedo (2019), the main performance determinants of Supply Chain (SC) performance are complexity, workload, design reuse, project type, outsourcing, and experience/knowledge of technology, while customers, manufacturers, and suppliers are the primary sources of uncertainty. Moreover, the pandemic posed a problem that affected both supply and demand, making it more challenging to respond successfully. Firstly, there was a supply-side shock. Then there was a significant escalation on the demand side with the implementation of containment policies. The first concern of Governments was obviously to address the COVID-19 health issues by imposing social distance constraints on the population, ramping up hospital capacity, and gathering medical supplies, tests, and equipment (e.g., ventilators). However, selecting, and qualified new suppliers to make up for missing deliveries is not an easy task, especially in long global supply chains, that have proven to be the most vulnerable. As the distance and the number of players increase, so does the overall probability of disruption.

Evolution of supplychain management

While yesterday's supply chains were focused on the availability, movement and cost of physical assets, today's supply chains are about the management of data, services and products bundled into solutions. Modern supply chain management systems are about much more than just where and when. Supply chain management affects product and service quality, delivery, costs, customers experience and ultimately profitability.
As recently as 2017, a typical supply chain accessed 50 times more data than just five years earlier. However, less than a quarter of this data is being analyzed. That means the value of critical, time-sensitive data, such as information about weather, sudden labour shortages, political unrest and microbursts in demand, can be lost.
Modern supply chain stake advantage of massive amounts of data generated by the chain process and are curated by analytical experts and data scientists. Future supply chain leaders and the Enterprise Resource Planning (ERP) systems they manage will likely focus on optimizing the usefulness of this data analyzing it in real time with minimal latency.

How supply chain works

How does supply chain management work? According to CIO, there are five components of traditional supply chain management systems:

- Planning - Plan and manage all resources required to meet customer demand for a company's product or service. When the supply chain is established, determine metrics to measure whether the supply chain is efficient, effective, delivers value to customers and meets company goals.
- Sourcing - Choose suppliers to provide the goods and services needed to create the product. Then, establish processes to monitor and manage supplier relationships. Key processes include: ordering, receiving, managing inventory and authorizing supplier payments.

- Manufacturing - Organize the activities required to accept raw materials, manufacture the product, test for quality, package for shipping and schedule for delivery.
- Delivery and Logistics - Coordinate customer orders, schedule deliveries, dispatch loads, invoice customers and receive payments.
- Returning - Create a network or process to take back defective, excess or unwanted products.

The figure below is a typical example of how supply chain works:

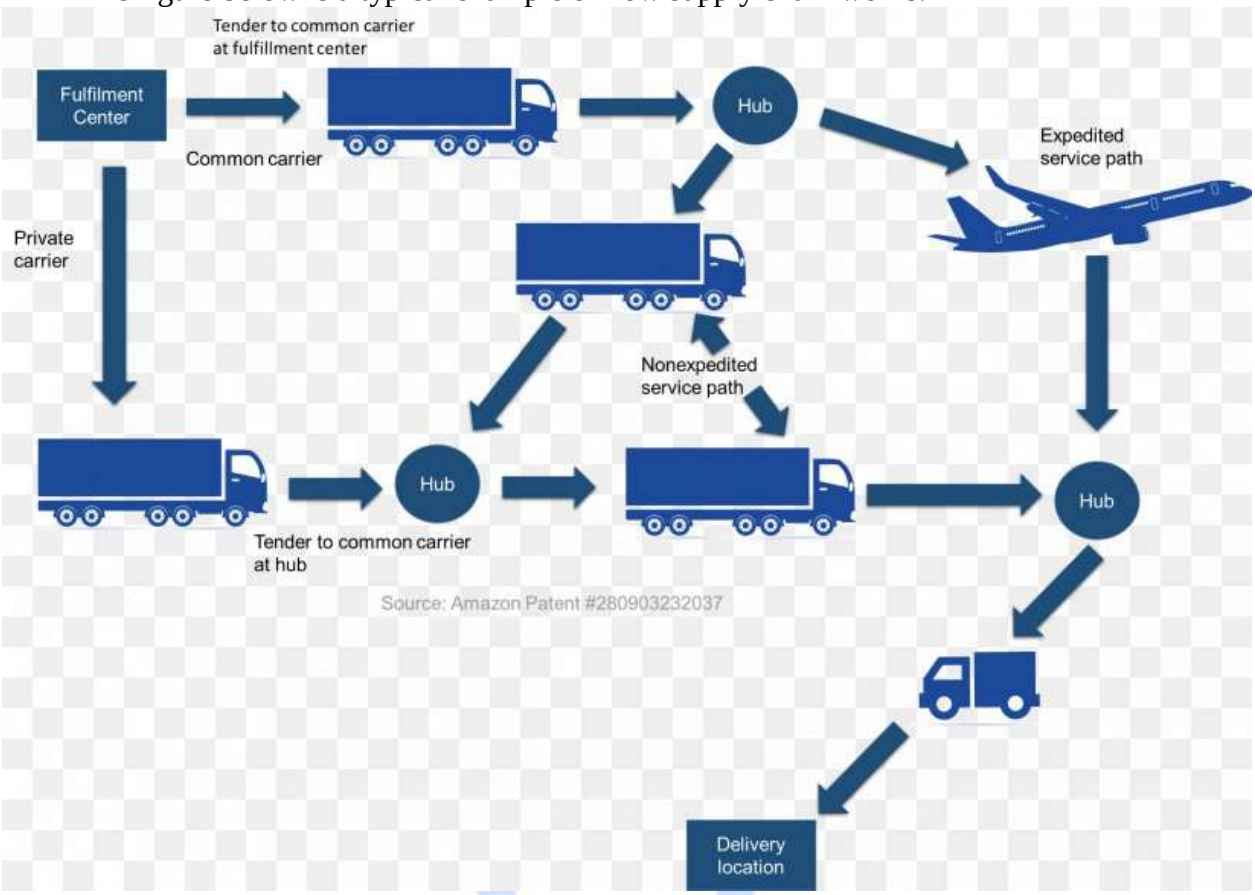

Figure 1 A Supply Chain Network
Source: Amazon.com Logistics & Supply Chain Management PNG

Just-in-time inventry management (jit) and supply chain

The just-in-time (JIT) inventory system is a management strategy that aligns raw-material orders from suppliers directly with production schedules. Companies employ this inventory strategy to increase efficiency and decrease waste by receiving goods only as they need them for the production process, which reduces inventory costs. This method requires producers to forecast demand accurately. Whenever the principle of lead time is applied, efficiency is recorded .Reducing or eradicating waste while making the right product available to the end customer at the right time and place.

Just in Time (JIT) aims to get rid of non-valuable added activities, helping companies to cut costs and improve general operational performance, as was presented in works by Clutterbuck (1978), Schonberger (1982), and Shingo (1989), amongst others.

The figure below shows a JIT supply chain:

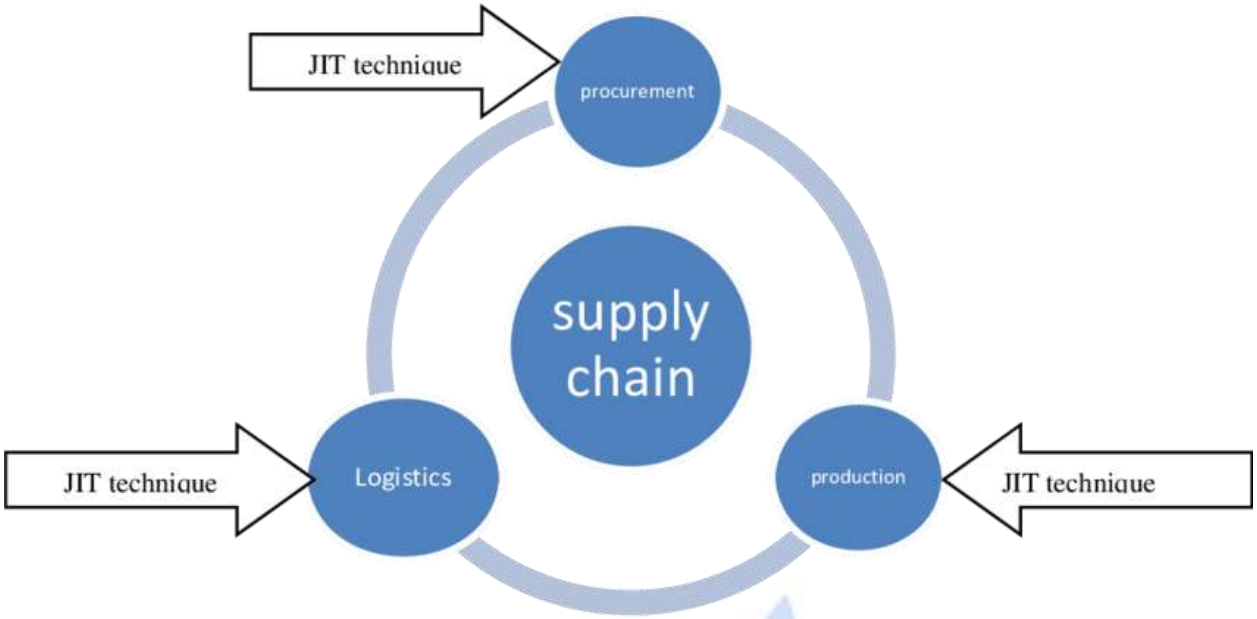

Figure 2 JIT Supply Chain
Source: Mishraa O .P, Vikas k and Dixit G. **(2013).**

An effective supply chain

Effective Supply chain is the efficiently handling of the entire production flow of goods or services from the raw components through to delivering of the final product to the consumer. A company creates a network, that is, "links" in the chain that would aid the movement of product from the suppliers of raw materials to organizations that deal directly with users and these should be done without any hitch.

Below are some elements of supply chain
▪Inventory management and planning
▪Prioritising and planning
▪Finding/sourcing and examining suppliers
▪Supplier relations and supply chain management
Just like the larger companies, a small company can have good chain structure within its business operations. Because, gaining visibility into supply chain and operations, is critical and important, there should be frequent communicating with suppliers and customers as lead times becomes unstable and the purpose of SCM is bridged. Tools that will help manage, plan and aid effective Supply Chain include, Supply chain self-examination, Forecast accuracy, Inventory sectionalization or segmentation, Healthy supplier relations

A disruptive supply chain

A disruptive supply chain suggests a chain of supply where the purpose of SCM is hindered, and free flow of materials is affected. Generally, supply chain bottlenecks become exasperated and really prominent during the COVID 19 lockdown, which brought about a great shift in demand, shortages of labour and structural factors. Globally, ports became congested as there was limitations in airfreight. Lock down in China and some other renowned countries reduced manufacturing processes to a very dangerous extents, shortages of truck drivers hindered movements, disruption in workforce, logistics, and price affected supply chain, not a little. The disruption caused by COVID-19 Pandemic propagated through multiple stages, known as a ripple effect (Ivanov and Dolgui, 2020)

Post covid'19 supply chain

Obviously, COVID 19 has come and gone but due to his serious impact the world looks very different now, meaning that the effects of COVID 19 are still lingering. The shutdown was able to reveal the vulnerability in the production strategies and supply chain of firms all over the place (Christopher and Peck, 2004, Pettit et al., 2010), This, coupled with the U.S.-China trade war, has triggered a rise in economic nationalism. As a result, manufacturers worldwide are going to be under greater political and competitive pressures to effect a change in their domestic production, grow employment in their home countries, reduce or even eliminate their dependence on sources that are perceived to be risky, and restructure their use of lean manufacturing strategies that involve minimizing the amount of stores held in their global supply chains.

Strategies for better supply chain performance

One of the massive issues when the COVID-19 pandemic began was that companies did not know what was going on with their suppliers because of poor technology. For instance, prior to the pandemic, a large number of companies did not communicate with or know the locations of all their suppliers, making it difficult to anticipate shortages.

Companies have since then learned, by experience that being able to be in the know of what is happening along their supply chains is critical to avoiding disruption. And new age digital technologies are key to making this happen. The following are suggested supply strategies to enhance supply chain performance:

•Concentration on Home Supply Chain.

One of the main negative aspect of having supply chains that cut across the globe is that they are more susceptible to externalities that are beyond company's control, such as an earthquake, war, can strikes a key supplier or a lockdown that shuts down factories.

Companies in every industry have been working to relocate suppliers and production facilities closer to home or geographically spreading them out so that they're not so dependent on one country or region. The goal is to ensure they can withstand disruptions and maintain business continuity.

•Increasing resilience in supply chains- That is, making supply chain proactive, rather than being reactive to environmental changes

•Create transparency on multitier supply chains, establishing a list of critical components, determining the origin of supply, and identifying alternative sources.

•Estimate available inventory along the value chain—including spare parts and after-sales stock—for use as a bridge to keep production running and enable delivery to customers.

•Assess realistic final-customer demand and respond to (or, where possible, contain) shortage-buying behavior of customers.

•Optimize production and distribution capacity to ensure employee safety, such as by supplying personal protective equipment (PPE) and engaging with communication teams to share infection-risk levels and work-from-home options. These steps will enable leaders to understand current and projected capacity levels in both workforce and materials.

•Identify and secure logistics capacity, estimating capacity and accelerating, where possible, and being flexible on transportation mode, when required.

•Manage cash and net working capital by running stress tests to understand where supply-chain issues will start to cause a financial impact.

•Get the most out of company-own inventory: Ascertain the quantity of the company-owned inventory. Keep exactly what is needed; nothing more than that for the cost of holding and storing inventory is quite high but it's essential that you are very calculative and proactive.

Include demand planning and forecasting to optimize company-owned inventory.

•Ameliorate the distribution network: This tells about studying the components of the distribution network, understanding how the components work and employing the best distribution system.
•Subscribe to modern technology - The global economic train is now technological driven, virtually all areas of human endeavors are governed by technology, all aspect of SUPPLY CHAIN is not exempted. The extent to which a company will survive whatever challenge it faces or may face will be determined by the ability of such company to tap into current modern technology in all facets of its operations including logistics.
•Have a solid supply chain council - Set up a council that gives a clear strategy for functionality and efficiency. Their duty is to give directions and align the supply chain strategy with the company's main goals. The council helps in removing bottleneck within the organization. It also improves the business's cross-functional communication. This enables leaders to provide effective supply chain management (SCM) in future projects.
•Building safe and healthy supplier relationship create strategies to maintain healthy supplier relationships, a healthy relationship with suppliers birth success. Make room for continuing value, measuring performance and maintaining conflict resolution and ;
• Subject your procedures to review and do this from time to time.

Conclusion and recommendations

The work has highlighted and analysed the impacts of COVID 19 pandemic in global supply chains. From findings, it is recognized that companies and Supply chain (SC) need to improve in all its activities by increasing supply chain's visibility, Automating where necessary and keeping all necessary parts well-managed. Adoption of organizational and management policies and practices , technologies for digitalizing, Assess training programs as at when due, regular reviews of plans and putting up a very sound logistic system for hitch free movement up and down the stream.
It is known that Supply chain consists of different interconnected agents, findings has it that firms are facing challenges due to supply, demand and logistics side. Particularly due to globalized and lean structures in supply chain, firms have become more vulnerable to COVID-19 Pandemic and its effects. The study therefore recommend that firms need develop capability to improve resilience to better handle with future pandemic.
SCM team should figure out issues faced during pandemic and the factors that need to be focused upon for mitigation those challenges incase such problem is faced in the nearest future. On the supply side, effort should be made towards identifying critical components, shift focus on local vendors, conduct supplier evaluation and levy more emphasis on welfare of labours. On demand side, SCM team would need to provide end to end order lifecycle visibility to the customer, battle with delay in delivery by putting up an effective logistical system and also train their personnel with regards to safety, hygiene and other protocols to follow during similar disruptions. From all partner devices to monitor real time tracking and movement of material across the supply chain should be put in place. (Belhadia *et al.*, 2020). These would create a believe system / build trust and cooperation with customers and as a result, stabilize demand.

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THE ROLES OF ENGLISH AND INDIGENOUS LANGUAGES IN ALLEVIATING POVERTY AND INSECURITY IN NIGERIA

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Abstract
The insecurity and poverty issues have grown out of proportion in the last two decades. These twin hydra- headed social monsters have threatened the foundation of Nigeria nation since independence and have dealt a heavy blow on the human's political and socio-economic development of the country. Undoubtedly, Nigeria and its economy has continued to slip downward on a global scale. The study examined and established the imperativeness of English and indigenous languages towards reducing the menace of poverty and insecurity in a multi- lingual society like Nigeria where the problem of mutual intelligibility and language choice have remained part of our linguistic challenges. Lamentably, this study is triggered by an unending upsurge of security challenges and poverty growing rate that are yet to be abated despite several policy formulations and interventions of successive governments to reduce the menace. It is therefore the contention of the authors of this paper that faithful adoption of the roles language as one of the panacea would go a long way in bringing the needed peace, security and poverty alleviation to the linguistic heterogeneous country of ours.
Keywords: English language, Roles, Indigenous Language, Alleviating, Poverty, Insecurity.

Introduction

The diverse and complex nature of language has made it difficult to pin it down to a particular definition. Ndukwe (1988) quoting Bloch and Tragers (1945) who defined language as a system of arbitrary vocal symbols by which social groups cooperate. Fromkin, Rodman and Hyans (2011) also see the possession of languages as important attribute that distinguishes human from other animals. These social functions of languages show the importance of language to man as all the activities of the man are anchored on the presence and the use of language. Achadu (2005) asserted that man uses language to preserve, conserve, transmit and appropriate functions across space and time. Corroborating this notion, Iwara (2005) described it as the heart of human relations while Nobia (2015) emphasized its importance in its description of language as a conduit for transmission of culture, norms, ideas and beliefs. It is a distinct and an invaluable human heritage that is used to express love, praise, satisfaction, hatred, happiness, and mutual social relationships. Languages remain a veritable tool or vehicle through which human being pass their culture from generation to generation. It is a God- given gift to man for promoting peace and security. However unexpectedly, this indispensable instrument of has not been deployed effectively to eradicate our national challenges. The inability of the present and past administrations to use language to enhance and promote socio- cultural, political, economic and scientific advancement has only fueled the environment with its tribal hatred and diminishing social interaction. Ehusian in Mekiluwa (2018) also described language as the chief medium of communication for civilization, customs, traditions, habits, wisdom, values and lifestyle of a people.

Poverty

Poverty is a universal phenomenon affecting both the developed and the developing countries of the world Ogunniyi *et al. (*2017) described it as a multi-dimensional and multifaceted problem that tends to hinder sustainable development around the world. As important as it is, it has continued to be in the front burner of national and international socio- political discourses for a long period of time. Omobowale (2014) opined that poverty is a state where the people are deprived of good things of life and ability to achieve the desire of well-being and socially acceptable standard of living. Webster New Collegiate Dictionary (2004) defined poverty as the state of one who lacks usual and socially acceptable amount of money or material possession. In the world of the United Nations, poverty is described as denial of choices and opportunities, a violation of human dignity and lack of basic capacity to participate effectively in the society. It also means not having enough to feed and clothe for a family, not having a school or clinic to go, not having a land on which to grow one's food or a job to earn one's living, not having access to credit.it means insecurity, powerlessness and exclusion of individuals, households and communities. It means susceptibility to violence and it often implies living on marginal or fragile environment without access to clean water or sanitation or hygiene fees poverty ability to create and generate different deprivations for its victims. These include personal and physical, social, cultural form of deprivations as it tends to affect the victims values, beliefs, attitudes, knowledge, information and orientation. In addition, Onisabi (2011) saw poverty as inability of people to meet economic, social and other standards of well-being. It is an unacceptable form of deprivation in terms of economic opportunities, education, health and nutrition as well as lack of empowerment and security. Thus, the term poverty does not limit itself to human actors as causative agents but it include others such as systems, institutions and policies also encourages the spread of poverty in the country as most of their policies are not induced by perfect thoughts, insights and realities but on vague ideas and self-service.

Poverty in Nigeria

Aderohunmu, (2018) submitted that billions of people are living in dehumanizing conditions enriched with hunger, diseases and desperation globally with a huge proportion of people living below poverty lines of the 80% that are constricted by social and infrastructural amenities .In addition, Clock (2018) indicated that 86.9 million people in Nigeria spend less than than 1.90 US per day. Poverty as a global phenomenon has attracted the attentions of national and international bodies and in a bid to stem the ugly tide of poverty, several programmes of interventions have been articulated and implemented to reduce the spread and mitigate the effect of the menace on the people .It however appears that the policies, huge resources and structures deployed have not been able to alleviate the sufferings of the teeming masses. In Nigeria since independence various socio- economic reforms and interventions have been articulated to sustain her development in key sectors like agriculture, infrastructure, education, housing, health etc. (Benyon , Ugochukwu and Amaechi 2015) The phenomenon of poverty remains pervasive and monstrous to Nigerians and its environments despite efforts by all African states and the Nigerian Government to realize the MDG objectives and reduce the sufferings through various alleviation programmes and other economic reforms from their countries, including global bodies such as World Bank, I.M.F, ADB and other recognized financial institutions..

Causes of Poverty

Poverty can be described as a man-made problem deliberately articulated by either the individuals, or government, an institution or any instrument of a state. This is so because

some countries and individuals are categorized to be rich while some are listed as poor due to an individual unplanned lifestyle and government insensitivity to its citizen's welfare system. Nigeria is a nation blessed with riches and abundant wealth but deliberately but its citizens in abject poverty through their inconsistent policies, corruption, dearth of infrastructure, inefficient service delivery and many others. Out of all the factors identified above, corruption remains the central cause of poverty in Nigeria. This is because the country has over the years being categorized as one of the biggest producers of oil in Africa and the six producer of it in the global market but despite this, surprisingly, it has continued to rank as one of the poorest nations in the world. Though, the past and the present administrations have made several attempts to reduce the scourge since independence with the creation and establishment of various institutions like Accelerated Food Production Programme, Nigerian Agricultural and Cooperative Bank,Mass Mobilization, Social and Economic Research, Directorate of Food, Road and Rural Infrastructure (1986), Sustainable Development Goals (SDGs) (2008), Family Support Programme (1993). Family Economic Advancement Programme, Third National Fadama Development Project (Fadama III) (2008),National Poverty Eradication Programme, Subsidy Reinvestment Programme (Sure-P) and the recent N-Power Programme of the immediate Past President.

Ucha (2010) listed factors that contributed to endemic growth of poverty in Nigeria to include non-diversification of the economy, income inequality, poor educational system and laziness which has led many of our youth to embrace and engage in illegal activities such as yahoo yahoo, pipeline vandalism and banditry etc.

Concept of clarification

Insecurity

Insecurity can be described as a general term used to describe several unhealthy climate of attacks and challenges that has bedeviled the country through poverty, diseases, terrorism, militancy, ethnic violence, ignorance, agitation for cessation, illiteracy, kidnapping, rape, armed robbery and corruption etc. According to Wikipedia, it is defined as the degree of resistance to, or protection from harm. It applies to any vulnerable and or valuable assets such as persons, dwellings, communities, items, nations or organizations. In another development, Beland (2005) described insecurity as the state of fear or anxiety stemming from a concrete or alleged lack of protection. This view is corroborated by Achimba et al(2013) who refers to it as lack or inadequate freedom from danger; that is, a state of vulnerability to harm and loss of life, property or livelihood. The level of insecurity in Nigeria has reached an unprecedented level in the Nigerian history such that people have to battle with economic deprivation caused by insecurity and its concomitant effects on institutions that have been attacked by Boko Haram and bandits. This has led to unexpected closure of schools as many students are still under these marauders in the forest awaiting negotiations and payment of ransom. In the South Eastern part of the country, the conflicts between the foreign corporations and indigenes continue unabated leading to a high degree of impoverishment of the people of the Niger Delta who felt they are being maltreated and short- changed by the foreign oil companies to deny them of their rewards and adequate compensation for environmental pollution or degradation of their areas. The violence, which is traced to frustration has led to wanton destruction of pipelines and other means of livelihood for the inhabitants of the community. The North Central states of Plateau, Benue also have their own shares of insecurity as the internal conflicts between some local governments that were traceable to chieftaincy disputes, land matters and other community fight for supremacy had led to the death of innocent Nigerians. In the South South, the radicalization of the unemployed youths have led to the formation of MASSOB, MEND, OPC, BADOO BOYS etc. This youths restiveness has taken an unexpected dimension as the country has lost huge

revenue and property due to the crisis. Moreover, the mother of them all is the Boko Haram insurgence which is yet to be defeated by the security establishments. The youths who are supposed to be involved in nation building have decided to take arm against the Nigerian nation and engaging in criminal activities. Of recent, the migration- bred insecurity called Japa Syndrome has led to more of the Nigerian youths getting out of the country in droves instead of staying around to contribute to national development. This is traceable to the hopeless situation of the country and unstable environments. Many of them leave through our porous borders into Sahara desert and the Mediterranean Sea. This of course has led to untimely death of many of them in their quest to seek greener pasture elsewhere.

Causes of Insecurity in Nigeria

Many scholars have attempted to identify the root causes of insecurity and poverty threats in Nigeria. Akinsowon (2021) listed the root causes of insecurity to include but not limited to the followings: moral quandary which includes corruption of varying degrees, ambition and lust for material wealth, breakdown of our cherished values, religious intolerance, faulty justice system, unchecked inflow of lethal weapons, greed and self-centeredness, ethno-religious conflicts, disconnection between the people and government over the year, weak and poorly funded military establishments, intra-agency rivalry, non- prosecution of perpetrators of violence in Nigeria, loss of socio-cultural and communal values, huge corruption by the military top brass of various security agencies . These factors have gone to corroborate the fact that security breaches are not natural but artificially created by a set of unpatriotic citizens to rip the society of the needed wealth and security.

Language for Alleviating Poverty and Security

The ability of language to perform reformative roles cannot be underestimated (Adedimeji 2014) who asserts that language can be used to cure, heal and motivate. This is seen in the power of language to greet, console, condole, sympathize, persuade and to convict the wrong. Language is important as a facilitator for effective communication because of this, the different institutional structures within a community have to inculcate language to drive their agenda and to influence the populace on the subject of conflict, peace as well as poverty reduction mechanism. As a principal weapon to unite people, it helps to determine the behaviour of people as it makes it possible to communicate ideas, transmitting values, feelings and goals. Olugbenga (2013) citing Englolim (1978) asserted that language is the key to the heart of the people and if we lose the key, we lose the people. If we treasure the key and keep it safe, it will unlock the door to unfold riches which cannot be guessed at from the other side of the door. This shows the importance of language in solving societal problems whether poverty or insecurity. Moreover, for any country to develop technologically, the crucial use of language for communication and development is inevitable as what is learnt or communicated is expressed through the medium of language the individual or community understands. To eradicate poverty, Raji (2016) advised that indigenous languages can be used to promote and develop our local indigenous technologies such as welding, dyeing, blacksmithing, carpentry, metal and fabrication to pull people out of poverty. Poverty alleviation programmes are conducted and communicated to the beneficiaries or victims in either English or indigenous languages depending on the level of education whether literates or illiterates. The English language can be used for the educated ones while the market women are reached through the language they speak and understand.

The current state of insecurity in Nigeria can be reduced and alleviated considerably if the power of language is deployed faithfully to resolve the glaring inadequacies in our security system. Language is needed to curb the restiveness of our teeming youths who are frustrated by the system of administration in Nigeria while dialogue remains an inevitable option to

settle ethnic- religious conflicts through an appeal, plea or bargaining to put a stop to all these treacherous activities including terrorism.

The State of Language Education in Nigeria

The appalling state of language education in Nigeria is very scary despite the existence of language policy statements on the roles of language directed at developing the nation and its citizens. This ineffective language education implementation has endangered national development in terms of poverty and insecurity alleviation. The unfaithful implementation of language education pronouncements can be seen through acute shortage of qualified teachers, dearth or insufficient laboratories in schools, poverty of funds, and payments of lip service to the teaching and learning of English and indigenous languages by the students to enhance the understanding of themselves and the society. The curriculum that is supposed to spell out the aspiration of the country are left unreviewed and unattended to for a long period of time. While some subjects and courses are needed, some are supposed to have been expunged from our curriculum to give way for national development. This state of our educational system has robbed the students of the acquisition of the right knowledge. The new curriculum needs to take care of new development in the areas of poverty alleviation and insecurity. Students need to know the danger of being cultists, kidnappers, terrorists, restive youths, and the social miscreants.

Classification of Poverty

Oguntoye (2016) citing Kuper and Kuper (1996) classified poverty into different types Absolute or Subsistence Poverty: This has to do with the human needs that are being measured by resources to maintain physical efficiency. Those in this category cannot afford to obtain the types of diets needed for the lowest standard of living. They are unable to obtain things such as food, clothing, shelter, portable water, education etc.

Relative Poverty: A poverty is described as relative when an individual or a household earns income that is lesser than the average income of the population in the society being considered. These vulnerable groups are usually excluded from ordinary living matters, customs and activities.

Rural Poverty: This is characterized by low level of education, poor material, low investment, under employment etc.

Urban Poverty: This is characterized by over-crowded accommodation, environmental degradation, low income. These urban areas are full of slums, ghettos and shanties.

Conclusion

Our quest for social order and prosperity through alleviation of poverty and insecurity may continue to be a mirage if we fail to intensify our efforts at integrating language as part of our solutions to these identified social quagmire. Persistent poverty and insecurity can lead to a state of frustration and hopelessness for the citizens and therefore, continue to destabilize the polity and general environments and breeding a haven for terrorism and other illicit behaviors. The government needs to buckle up in their efforts to bail the people out of poverty and insecurity through serious programmes and faithful use of right language, while the people or citizens need to cooperate with the government in their numerous plans to stem the tide of poverty and insecurity .There is the need to discourage the use of hate speech within the polity to express concerns and opinions. Indeed, if every Nigerian is made to speak or learn their indigenous language apart from their mother tongues, they would see one another as brothers and sisters. The solution to combating insecurity in particular goes beyond guns and drones. The solution involves concerted efforts of all and sundry where the language will be made to perform its social and reformative functions judiciously.

Recommendation

1. Poverty and insecurity, like siamese twins, are symbiotically related. Hence, the two dreaded phenomenon need to be tackled holistically using pragmatic steps to reduce or lessen their incursion into the human and social economic lives of the people.
2. The need for total overhauling of our security system becomes imperative at this juncture. The security agencies have to be ripped off bad eggs and new policy directions should be introduced to allow for effective and well-structured and reliable security institutions. They must be well equipped and motivated to perform their duties effectively and without fear or favor.
3. Youth restiveness terrorism and kidnapping can be solved through the provision of employment opportunities starting from the small scale enterprises and workable industrialization to meet the present century global industrial development as devil finds job for lazy hands. For Nigeria to achieve the desired peace, there should be a massive provision of employment for both the educated and the non-educated classes.
4. There is the need to engage review of our moribured curricula to enable our language education policies to function effectively and efficiently and contribute meaningfully to the efforts of the government to alleviate poverty and insecurity in our nation.
5. Government should rather embrace effective use of language to dialogue with marginalized eplinic nationalizes to bring peace and national development in the country instead of massive deployment of arms and ammunition to quell or suppress the agitations.
6. The government has the obligation to deploy security resources such as the CCTV Cameras in cities and towns, most especially some crime- prone zones to provide safety for its citizens.

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DYNAMIC RELATIONSHIP BETWEEN SMALL, MEDIUM AND UNEMPLOYMENT IN LAGOS STATE ENVIRONMENT

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Abstract
The Small and Medium Enterprises (SMEs) in Nigeria are performing below expectation but still contributing to the gross domestic product and reduce the rate of unemployment. The inability to meet up with befitting business environment, economic dimension and technology turbulent are the major issues which SMEs are facing. This study look into dynamic relationship between small and medium scale enterprises and unemployment with special reference to Lagos State. The study employed a cross sectional research design, while a multi-stage sampling technique was used for the study, approximately 382 was sample size but 500 copies of the questionnaire were distributed, 432 were returned and 424 found usable. Multiple Regression was used for data analysis. The findings revealed that to achieve a full employment rate, the government should try and put more and likely pressure on the mass in the creation of more SMEs which could increase the Gross Domestic Product (GDP) of the economy. The study concludes that there are positive and significant relationship between the variables and their dimensions and it was recommended that there is a suggestion that the area of policy shift for the government to allow the mass to be able to access more loan facilities as a way of reducing unemployment and also to achieve a full employment rate the government should try to put more and likely pressure on the mass in the creation of more SMEs, which could also increase the country gross domestic product (GDP).

Keywords: Business Environment, Gross Domestic product, Small and Medium Enterprises, Technology Changes

Introduction
Developing economies seems to be faced with different challenges on the issues of generating employment, reducing poverty, income growth, etc. and find it very difficult in sustaining economic growth because of the high number of the youths in the country. Nigeria also has so much common factors as India because she was also blessed with young vibrant population youth with entrepreneurial growth. However, this can only be achieved when the necessary, imperatives are put in place so as to promote the SMEs by using the youth entrepreneurship as the driving vehicles. Youth entrepreneurship has become more important to the society than it has ever been when considering the rate of youth unemployment situation in Nigeria. The results of youth unemployment are very disastrous. Some recent research in Nigeria considering the youth in the Niger Delta region and when there were youth gangs clashes in Lagos and other cities are as a result of unemployment (Gbam, 2017).
Despite importance of SMEs and priority given to it by the serious economies, numbers of challenges were as well generally noticed to be hindered the progress recorded so far which can be grouped into internal (inadequate fund, inaccurate mode of operation, poor accounting records among others) and external (epileptics power supply, poor infrastructural facilities, high bank interest rate among others) in Nigeria. Based on the fact stated above (business environment, technology turbulent and economic dimension) the existing literature are very scanty to address the problems and this gave room for the study to bridge the gap.

The broad objective of the study is to find out the relationship between small, medium enterprises and unemployment in Lagos State, Nigeria. While the specific objectives are to examine the effect of business environment regarding the reduction of unemployment in Lagos state Nigeria, investigate the effect of technological changes on the reduction of unemployment in Lagos State, Nigeria and examining the effect of economic factors on the reduction of unemployment in Lagos State, Nigeria. Based on the above objectives, the below relevant questions were raised and to be addressed, How as the business environment reduces the unemployment rate in Lagos state, Nigeria? What are the effects of technological changes on the reduction of unemployment in Lagos Nigeria? and How as economic factors affect the reduction of unemployment in Lagos State, Nigeria?. Three hypotheses were formulated to test for the above questions,

$H_0$1: Business Environment has no significant effects on unemployment (evolving technology, government policies, competition) in Lagos state, Nigeria,

$H_0$2: Technological changes have no significant effect on the reduction of unemployment in Lagos State, Nigeria and

$H_0$3: the economic factors have no significant effect on the reduction of unemployment in Lagos State, Nigeria

Literature Review

Bello, Jibir and Ahmed (2018) explained that for a country to experience sustainable economic growth through reduction in unemployment, reduction in the poverty rate as a result of small and medium scale enterprises (SMEs) intervention. They concluded that SMEs should be referred to as the economic and social engine for country development. They believed that SMEs is the key ingredient which is needed for economy development of developing and emerging economies as well as to sustain growth of developed economies. Gbam, (2017), researched conducted SMEs on employment generation in Plateau State, Nigeria. he made use of the survey research method. include a total of 133 small business owners in the questionnaire administration, and he used the Chi-square analysis for data analyses. The study later revealed that SMEs have a significant impact on employment generation in Plateau State because they help in the expansion of markets for local goods and services, improved economic growth and development, and a reduction in the unemployment problems of the state.

Acho and Abuh, (2018), examined the contributions of small-scale enterprises to the development of the Nigerian economy, and they used the Polytechnic Energy Product (PEP) Ventures, Federal Polytechnic, Idah, Kogi State as case study, and observed that when there is effective management in small scale enterprises it helps in enhancing the development of Nigerian economy. And also reduced the rate of unemployment they also brought out the challenges which militates the small scale businesses is the financial challenges and its affect their contribution to the development of Nigerian economy.

Methodology

Using the approach, data is gathered with the use of measurement techniques, by analyzing to determine the trends and relationships, which lies between the variables, and verification of the measurements made. Watson (2015). The study comprises of total registered SMEs in Lagos State, which according to SMEDAN/NBS was 8,395 that span across the subsection of SMEs. Data was source through registered SMEs records of SMEDAN/NBS.

Data Presentation and Analysis

In the present case of how as the business environment the reduction of unemployment in Lagos state Nigeria the summary table looks like below.

Table 4.1.1

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.430[a]	.185	.152	.400

Elements from table 4.1.1 is relevant for interpreting the results:
R-value represents the correlation between the dependent and independent variable. A value greater than 0.4 is taken for further analysis. In this case, the value is .430, which is good. R-square shows the total variation for the dependent variable that could be explained by the independent variables. A value greater than 0.5 shows that the table 4.1.1 is effective enough to determine the relationship. In this case, the value is .185, which is not good enough.

Table 4.1.2

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.207	17	.895	5.577	.000[b]
	Residual	67.041	418	.160		
	Total	82.248	435			

a. Dependent Variable: Educational Qualification

Elements from table 4.1.2 relevant for interpreting the results are:
P-value/Sig value: Generally, 95% confidence interval or 5% level of the significance level is chosen for the study. Thus the p-value should be less than 0.05. In the above table, it is .000. Therefore, the result is significant. F-ratio It represents an improvement in the prediction of the variable by fitting the model after considering the inaccuracy present in the model. A value is greater than 1 for F-ratio yield efficient in the table 4.1.2. In the above table, the value is 5.577, which is good.
These results estimate that as the p-value of the ANOVA table is below the tolerable significance level, thus there is a possibility of rejecting the null hypothesis in further analysis.

Another table, which is generated in a linear regression test in SPSS, is table Summary provides detail about the characteristics of the table.

Table 4.2.1

Table Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.556[a]	.309	.276	.543

Elements from table 4.2.1 is for the interpreting of the results:
R-value represents the correlation between the dependent and independent variable. A value greater than 0.4 is taken for further analysis. In this case, the value is .556, which is good. R-square shows the total variation for the dependent variable that could be explained by the

independent variables. A value greater than 0.5 shows that the model is effective enough to determine the relationship. In this case, the value is .309, which is not good enough.

Table 4.2.2
ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	54.769	20	2.738	9.298	.000[b]
	Residual	122.229	415	.295		
	Total	176.998	435			

Elements from table 4.2.2 is relevant for interpreting the results are:
P-value/Sig value: Generally, 95% confidence interval or 5% level of the significance level is chosen for the study. Thus the p-value should be less than 0.05. In the above table, it is .000. Therefore, the result is significant. F-ratio: It represents an improvement in the prediction of the variable by fitting the model after considering the inaccuracy present in the model. A value is greater than 1 for F-ratio yield efficient model. In the above table, the value is 9.298, which is good. These results estimate that as the p-value of the ANOVA table is below the tolerable significance level, thus there is a possibility of rejecting the null hypothesis in further analysis.
In the present case of the hypothesis two what are the effects of technological changes on the reduction of unemployment in Lagos Nigeria the model summary table looks like below.

Table 4.3.1
Table Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.737[a]	.543	.522	.329

Elements of table 4.3.1 are relevant for interpreting the results:
R-value represents the correlation between the dependent and independent variable. A value greater than 0.4 is taken for further analysis. In this case, the value is .737[a], which is good. R-square shows the total variation for the dependent variable that could be explained by the independent variables. A value greater than 0.5 shows that the model is effective enough to determine the relationship. In this case, the value is .543, which is not good enough.

Table 4.3.2
ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	53.629	19	2.823	26.049	.000[b]
	Residual	45.075	416	.108		
	Total	98.704	435			

Elements of table 4.3.2 are relevant for interpreting the results are:

P-value/Sig value: Generally, 95% confidence interval or 5% level of the significance level is chosen for the study. Thus the p-value should be less than 0.05. In the above table, it is .000. Therefore, the result is significant. F-ratio: It represents an improvement in the prediction of the variable by fitting the model after considering the inaccuracy present in the model. A value is greater than 1 for F-ratio yield efficient model. In the above table, the value is 26.049, which is good.

These results estimate that as the p-value of the ANOVA table is below the tolerable significance level, thus there is a possibility of rejecting the null hypothesis in further analysis.

Summary of findings, conclusion and Recommendation

The major findings of this research work are presented in this section. This section also provides a formal conclusion of the findings on the study of the effects of SMEs (with respect to business environment, technology turbulence and economic dimension) on Unemployment (evolving technology, government policy and business competition) in Nigeria. It covers the following issues, implications, recommendations to organisations, the main contributions of the study to the frontier of knowledge, suggestions for further studies and the limitations of the study

Conclusions

This research work was carried out to investigate the effects of SMEs (with respect to business environment, technology turbulence and economic dimension) on Unemployment (evolving technology, government policy and business competition) in Nigeria. The findings from this study have led to the conclusions reported below.

1. There exists positive but insignificance business environments on unemployment.
2. The result shows there is causalities which are unidirectional coming from the technological turbulence to unemployment which means the presence of some technologically factors leads to obsolesce and retrenchment of staffs.
3. Above all the results also revealed that there is a positive relationship between the economic dimensions and unemployment and also show positive coefficients with the variables

Recommendations

Based on the findings of this study, the following recommendations are suggested

1. This research suggests that there is an area of shift in policy for government and policy maker so as to have a strategy of economic diversification in order to reduce the rate of unemployment and in achieving improvement on positive coefficient and probability to be highly significance and not insignificance level
2. With the results, there is a suggestion that the area of policy shift for the government to allow the mass to be able to access more loan facilities as a way of reducing unemployment.
3. To achieve a full employment rate the government should try to put more and likely pressure on the mass in the creation of more SMEs, which could also increase the country Gross Domestic Product (GDP).

Other recommendations, which are similar to the studies, could be carried out in other sectors, which are different from the researcher's choice to make evaluation

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COMBATING POVERTY AND YOUTH UNEMPLOYMENT IN OSUN STATE – A CASE OF OSUN YOUTH EMPOWERMENT SCHEME (OYES)

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Abstract
Poverty is a state of relative deprivation of basic necessities of life. It is majorly caused and exacerbated by unemployment. Noting this, successive governments at different levels continue to make efforts at reducing unemployment and controlling poverty. One of such efforts was the establishment of Osun Youth Empowerment Scheme popularly known as O-YES by the Government of the State of Osun under the administration of Engr. Rauf Aregbesola. This paper posits the success of the O-YES programme at combating poverty and youth unemployment in Osun at the period during which the O-YES lasted. As the paper is not unaware of certain hindrances in the effective implementation of the O-YES, it is recommended that successive governments understudy the O-YES programme with a view of establishing and implementing a better programme of unemployment control and poverty reduction.
Keywords: O-YES, Poverty, Unemployment, Youth

Introduction

Poverty in Nigeria results from disproportionate distribution of opportunities, income, and national wealth by the ruling few (Duru and Ogbonnaya, 2012). All empowerment policies and poverty alleviation programmes have fundamentally failed to enhance the productive base of the society by providing productive employment for the people especially the youths. They were of the opinion that empowerment policies in Nigeria must seek to provide not just employment opportunities for the people but also productive employment that can enhance the productive capabilities and base of the society, especially at the rural level (Shiyanbade *et al.*, 2017).

Aluko (2003) refers to poverty as a lack of command over basic consumption needs. There is an inadequate level of consumption such as rise of insufficient food, clothing and shelter. He further notes that the conventional notion depicts poverty as a condition in which people are below a specific minimum income level and are unable to provide or satisfy the basic necessities of life needed for an acceptable standard of living. This explanation however has failed to provide the graphic picture of those who are poor, how to change their conditions and what to do.

Fayemi, (2012) opines that the primary cause of poverty, which has caused living standard below the National poverty level is failure to distribute the country's vast oil revenue more equitably. He suggested that there is the need to empower the youth by giving them functional educational training and motivation. Ilemona and Akoji, (2013) on the contrary posit that poverty has been so endemic as a result of high rate of unemployment that has become the major characteristic of developing and underdeveloped countries of the world. Poverty, arising mostly due to unemployment, can be alleviated through various empowerment schemes. Similarly, in the view of Ifenkwe, (2012), youth development and empowerment are vital stages in life for building the human capital that allows young people to avoid poverty and lead a better, and possibly have a more fulfilling life. They noted that youth unemployment is highly dependent on the overall status of the economy. Omotere,

(2011) argues that governments do not empower people as it is the people empower themselves. What governments' policies and actions can do is to create a supportive environment or act as a barrier to the empowerment process. He asserts that empowerment is often about both groups and individuals. Because the poor and powerless in today's world lead such fragmented and marginalised lives, group solidarity can be a powerful fostering force.

A 2004 survey by the Nigerian Bureau of Statistics (NBS) puts the estimated percentage of Nigerians living in poverty at 54%, while 22% were living in abject poverty (Nigerian Bureau of Statistic - NBS, 2005; Shiyanbade *et al.,* 2017). Despite the 7.8% marginal annual economic growth rate captured in 2010, the poverty profile of Nigeria has not improved (NBS, 2013). As at October 2012, the Nigerian Bureau of Statistics puts Nigeria's poverty rate at 69% meaning that over two-thirds of Nigerians are still living in extreme poverty (NBS, 2013).

Consequently, this leads to a growing level of urban poverty and the pauperization of the other sectors. This analysis shows that the growth experienced in the past decade has neither produced any improvement in job provisions nor reduction in the level of poverty and income inequality (Shiyanbade *et al.,* 2017). Job and wealth creation are the antidote to poverty. An empowered youth is a fortified youth. The youth so empowered and given new orientation and skill are liberated from the shackles of extreme poverty.

Unemployment, especially among the youth, has been noted as a foundational cause of poverty. Unemployment occurs when people are without jobs and they have actively sought for within the past four weeks (Ukpere, and Ugoh, 2009). In the same vein, Ohize, and Adamu, (2009) referred to unemployment as a situation where people who are willing and capable of working are unable to find suitable paid employment. Abefe-Balogun and Nwankpa (2012) defined unemployment as a situation in which people who are capable of working and who are qualified by age to work but cannot find employment. It is a situation in which people who are capable of working on wage employment or self-engagement, and who are qualified by age to work legally but cannot secure employment. Such employment can be of permanent, contractual or part-time nature (Shiyanbade *et al.,* 2017).

Existing studies have shown how millions of graduates are produced annually with hundreds of thousands of these young people ending up unemployed. More disturbing and painful is the fact that there is a worrisome bond between poverty and unemployment. A country where unemployment is at a high index is likely to be confronted and occupied with the questions of how to curb insecurity and tackle poverty. This makes it a point of necessity, urgency and duty for most governments to see unemployment as a challenge that has to be fought to a standstill. Unemployment is not easily curtailed in any economy because it is consequential. The following are some of the consequences of unemployment in Nigeria:

Consequences of Unemployment in Nigeria

1. **Pressure on other forms of government spending:** Greater unemployment leads to social crimes such as prostitution, armed robbery, kidnapping, vandalization of government institutions and installations, rape among the others. It is believed that large numbers of people that engage in criminal activities are those without gainful employment.
2. **Urban-rural migration:** Unemployment can also serve as motivation for the young people by moving from a particular part of the country to another.
3. **Low level of personal well-being:** Unemployment in Nigeria has a very serious negative effect on the personal well-being of the unemployed. Until recently when a very small number of the affected people benefited from the poverty reduction programme of the government, the effect was quite serious on those involved.

4. **Poverty:** One of the core causes of poverty in Nigeria today is the inability of many job seekers to secure gainful employment. This has further worsened the income inequality crisis that characterizes most African economies. High level of unemployment has conditioned many people to a very low and undignified standard of living in Nigeria.

In view of this, governments at every level often seek means of creating employment opportunities especially for the youth to reduce unemployment and curtail the spate of poverty in the country. Among the steps taken by the Osun State government during the tenure of Governor Rauf Aregbesola between 2006 – 2012 was that she established the Osun State Youth Empowerment Scheme (OYES). Similar schemes, sometimes with similar names, were also replicated by other states of the federation including Oyo State which christened its scheme Youth Empowerment Scheme – YES-O.

Osun Youth Empowerment Scheme (OYES)

Osun Youth Empowerment Scheme (OYES) is a socioeconomic intervention arrangement intended to address the problems associated with social exclusion -predisposition factors such as extreme poverty and vulnerability, physical challenges, family dislocation, and adolescents' trauma occasioned by intolerable social and economic policies. OYES was aimed at addressing the endemic incidence of joblessness, as well as providing laudable solutions to the challenge of unemployment among the youth. The ever-growing army of jobless youth with the attendant frustration and desperation is posing a major threat to development in the country. The youth that are untrained and alienated become agents of anti-social activities such as armed robberies, political thuggery, communal crisis (conflicts), terrorism, insurgency, prostitution, internet fraud, ritual killing, kidnapping, vandalization of oil pipelines and other public utilities, drug and human trafficking, syndicates, impersonation, document racketeering, among the other vices (Shiyanbade *et al.*, 2017).

The youth living in the rural areas are particularly more disadvantaged than their peers in the urban settings. The predicaments of these unemployed youths call for special attention by all stakeholders. This development informed the decision of the Governor of Osun to include "banishing unemployment" as one of the items of the Six-Point Integral Action Plan (Blue print). Towards this end, the OYES Scheme took off within the first 100 days of the Aregbesola administration, precisely in February 2011. 250,000 unemployed youth across the State applied for placement in the scheme. After thorough screening, 20,000 of them were recruited, trained and absorbed into the scheme. This figure covers the 30 Local Government Areas and the Ife East Area Office in Modakeke, Ile-Ife in the State. OYES is a revolving volunteer scheme, which lasts for two years for each batch. The 2011-2012 teams left in February, 2013 and another batch of 2013-2015 has just exited the scheme (OYES Bulletin, 2013).

The youths engaged through OYES are distributed to Public Works Brigades, Sanitation Czars, Green Gangs, Osun Sheriffs, Osun Paramedics, Traffic Managers and Relief Teachers. By and large, OYES is not a destination but a halfway house for graduates and school leavers to acquire practical skills and real life experiences before securing permanent jobs or full empowerment. At the global level, the World Bank and other International agencies concerned with the social protection and welfare of the down-trodden like DFID, ADB, EU, UNDP, USAID among others have championed the course of implementing Youth Empowerment Schemes. OYES is comparable to the Caribbean Youth Empowerment Programme (CYEP) launched in 2008. The CYEP equips vulnerable youths with the technical, vocational, entrepreneurship and life skills needed to develop sustainable livelihoods.

According to the website of the Youth International Foundation, this programme (CYEP) targets the school leavers, ages 17 to 25 with a particular attention given to young males who

are currently unemployed, under-employed and lack the skills to participate in an increasingly service-oriented economy or are unable to successfully launch and sustain small business enterprises. The CYEP participants receive job and placement services and are supported in serving as positive agents of change in their communities (World Bank Publication, 2003). The Kenyan Youth Empowerment Project is another homologue of the OYES. In its own case, the initiative is to support the the efforts of the Government of Kenya to increase access to youth targeted temporary employment programmes and to improve youth employability. The scheme also provides an opportunity for the promotion of education, job training, job creation and moral development of youth in Kenya (World Bank Publication, 2003).

Conclusion

This paper espoused the Osun Youth Empowerment Scheme (OYES) as a successful policy at reducing unemployment especially among the youth, controlling poverty in Nigeria. It is also seen that substantial people were of the view that OYES was a palliative measure that actually helped to create jobs and empower the youth in Osun State, thereby reducing unemployment and poverty in the state.

- The National Bureau of Statistics (NBS) puts the unemployment rate in Osun State in the year 2007 at 6.3% while it has risen to 12.60% by 2009 and dropped to 3% in year 2013.
- Unlike the other youth empowerment programmes adopted in Osun State, the Osun Youth Empowerment Scheme (OYES) was a well thought-out policy in that it allowed for identification of unemployed youths on local government basis and combining training with remuneration. By so doing, it appears that the scheme offers solution to the perennial youth restiveness and negative tendencies common among the unemployed youth.
- The OYES Scheme is an attempt to treat the youths as an asset and a creative force rather than viewing them as the problem.
- Despite the success of the OYES programme at reducing unemployment and controlling poverty in the Osun State of Nigeria, the implementation of the programme was not perfect and had some challenges. Hence, there was a gap between the expected outcomes of OYES and its achievements. Be that as it may, the implementation of the scheme has positively affected youth empowerment and eventually reduced unemployment in the state.

- The programme has been in existence since early 2011 and has successfully engaged over 100,000 youth (cadets) up till date.

Recommendation

The modus operandi adopted for implementing the OYES programme should be understudied by other governments for successful tackling of the youth unemployment menace of poverty. Efforts should also be invested to study the extent to which the programme has achieved its set goals and to identify challenges which militated against its smooth implementation.

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ACADEMIC STRIKE AND SERVICE DELIVERY, A CASE OF ACADEMIC STAFF UNION OF UNIVERSITIES, UNIVERSITY OF IBADAN

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Abstract
This study examined the relationship between strike and service delivery, using the industrial strike of academic staff union of universities, university of Ibadan chapter as a case study. The paper used qualitative approach to analyse, using secondary data such as journal publications, newspapers, textbooks and questionnaire. This study examined three objectives which are: the employees' efficiency of the academic staff; Investigate the effect of strike on employee training, development and promotion; and the effectiveness of strike actions on the academic performance of students. This study adopted the descriptive survey method as research design. The target population of the study consists of 300 Academic staff members in University of Ibadan. The result revealed that the R-value represents the correlation between the dependent and independent variable that is R can be considered to be one measure of the quality of the prediction of the dependent variable. The study concluded that there is relationship between strike and service delivery using the industrial strike of academic staff union of universities It is recommended that Workers should be well paid so that they can meet up with their daily needs and it should not be delayed for any reasons at all.
Keywords: Strike, service delivery, academic staff union, Universities

Introduction

Ivancevich (2007) documented that strike is an effort by an employee to withhold work so that the employer will make greater concessions at the bargaining table. It is opined that it is a major bargaining weapon used by the labour union. Michael Armstrong (2004) asserted that strikes are most politically charged of all the features of industrial relations. Strike is a very powerful weapon used by trade unions and other labour associations to get their demands accepted. It generally involves quitting of work by a group of workers for the purpose of mounting pressure on the employer to consider and possibly accept their demands. When workers collectively cease to work in a particular industry, they are said to be on strike. "Strikes are too often a weapon of first, rather than the last resort. However, labour unions have recognized that a strike is a legitimate last resort if all else fails," Armstrong, (2004).

In a bid to get government to pay attention to the deplorable situation of public universities and improve academic staff welfare, the Academic Staff Union of Universities (ASUU) have embarked on several strike actions which have further crimpled academic activities in Nigeria.

Ohiwerei and Omo-Ojugo (2008) stated the following as subject for which strike could be inevitable: negotiation, procedural matters, probationary period of service, disciplinary procedure, principles of redundancy, various unpaid claims, staff loan, pension and gratuity scheme; salaries and wages, leave, acting allowance, inconveniences allowance, out of station expenses, medical scheme, sickness benefits etc.

Service delivery is a set of interlink functions that deliver services to customers or clients, which are also in terms of inputs, processes, outputs, and outcomes. Service delivery measures the level of customer satisfaction (Russell 2021).

Service delivery as a business framework that supplies services from a provider to a client. Service delivery typically aim to provide the client with increased value by setting standards, policies, principles and constraints to guide their businesses and customer interactions (Indeed Editorial Team,2021).

On the Lecturers perception, result revealed that there is non-commitment and disillusionment among them. This arises because the Lecturers have come to realise that their needs and aspiration are not met within their institution, some are beginning to engage themselves in other endeavours outside the university environment or overseas.

Statement of Problem

Following the serious altercations between government and the Academic Staff Union of Universities resulting into persistent industrial actions, most studies carried out on ASUU strike actions focuses on the impact on the student and academic activities in universities. An instance is that of O.T Amie-Ogan et al (2022), Tumba Ardo et al (2020) etc. Not many researches have been done on the service delivery in the university system as impacted by the strike action. Closing this knowledge gap on service delivery and cause relationship with ASUU strike will form the basis for this study procedures of ASUU and ethical expectations of the Government that could have averted the strike actions, therefore, will form basis of the problem of this study.

Research Objectives

The main aim of this study will be to examine the relationship between academic strike and service delivery using the industrial strikes of the academic staff union of universities, University of Ibadan as case study. The specific objectives will be to:

investigate the causes of strike actions by academic staff union of universities.

examine the effect of strikes on the teaching qualities of the universities.

examine the influence of strike actions on the academic research output on promotion of academic staffs.

Research Hypothesis

H_{01}: There is no significant relationship between Academic strike and service delivery of academic staff union of universities.

Significance of the Study

Education stakeholders in Nigeria have been complaining about several education interruptions occasioned by serial labour strikes over the last two decades, but the perceptions of the actors in the system on this issue were hardly discussed. The need to investigate the perceptions of university lecturers on the effects of serial academic strikes on the quality of university education in Nigeria has therefore become imperative for a better understanding of the industrial conflict management in the Nigerian university system. This was because this investigation may create awareness for educational administrators, policy makers, and stakeholders in education on the perceptual consequences of labour strikes in the university system and thereby improve the industrial harmony, and employment prospect of graduates from the system.

Methodology

Data Analysis

Sampled questionnaires were administered on 100 Academic staff randomly selected. The data was analysed with the use of frequency distribution estimation as well as tables and percentages for proper presentations of the data collected.

In testing the hypothesis formulated, regression analysis was adopted using statistical package for social sciences (SPSS).

i. **Descriptive Statistics**

	Mean	Std. Deviation	N
Teaching Quality	2.9100	.64471	100
Research output	2.9120	.69823	100
Labour turnover	2.9040	.61265	100
Service delivery	3.0080	.73191	100

Source: Field Survey, 2023

The table request brief disruption of the data used in the study. Teaching quality, Research output, Labour turnover and Service delivery mean score; 2.9100, 2.9120, 2.9040 and 3.0080 with associated standard deviation .645, .699, .613, and .732 respectively. It is observed that the standard deviation in each of the variables are low and that signifies that absence of outrageous value in the series and the tendency of getting a spurious result is low.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	.377	.158		2.382	.019	.063	.691
	Teaching quality	.319	.087	.346	3.662	.000	.146	.493
	Research output	.151	.100	.143	1.511	.134	-.047	.348
	Labour turnover	.388	.082	.440	4.726	.000	.225	.550

Source: Field Survey, 2023

a. Dependent Variable: Service delivery

The data findings also show that a unit increase in Incentives will lead to 2.310 increases in Lecturers service delivery in the Universities. Consequently, it is observed that the independent variable is significant with P value less than 0.05 at 0.000.

Estimated model coefficients

The general form of the equation to predict ***Dependent Variable*** from **BD, BS,BG,** is:

Y = (117.382) + 51.01BD + 1.34 BS + 29.74BG

The table reveals both the relative effect and the significance of each of the explanatory variables on the dependent variables. It shows that there is a positive relationship between Teaching quality, Research output and Labour turnover with statistical value β = 51.014, 1.341 and 29.744; t = 2.829, 2.812 and 2.597on return on assets. The table further reveals the significance of the variables at 0.05 level of significance which will be used to test the hypothesis.

Interpretation of Results

The relevant hypotheses were tested using simple linear regression model with least square method. The stated hypotheses are:

Hypothesis

H_0: Academic strike has no effect on employee's service delivery in Universities.

Decision Rule: The coefficient table reveals that Incentives with significance value of 0.031 which is below 0.05 level of significance indicates that the null hypothesis will be rejected and concludes that there is a significant relationship between Academic Strike and employee service delivery in the Universities

Summary, conclusion and recommendations

Summary

The topic of this study is the influence of academic strike actions on lecturer's performance and service delivery using the university of Ibadan, Nigeria, as the case study. The purpose of this study is to find out whether strike actions influence the employee's performance and service delivery in their work place; to know whether delay in the payment of workers salaries is the major cause of strike in the university of Ibadan and to find out perceptions of the workers on the causes of strike action.

Finally, to suggest solutions to the problems in carrying out the research work, the following research hypothesis were formulated to guide the researcher:- i. examine the effects of workload on the teaching quality of the academic staff union of universities. ii. investigate the effect of strike on employee research output, development and promotion. iii. examine the effects of strike action on the labour turnover as it affects academic staffs.

The purpose of this study is to examine the relationship between strike and service delivery using the industrial strike actions of the academic staff union of universities, university of Ibadan chapter as a case study. From the findings of this study, it can be seen that strike actions have done more harms than good to workers. it has destroyed the pride of our working conditions and productivity. In all, strike actions are for progress, a threat to working condition development and to the employee performance and productivity of the worker to be precise. It should therefore be the last weapon to use in order to get ones' needs. Negotiations are better than strike actions as wherever there is a strike action, the workers suffer it.

Finally, from the findings it is clear that strike actions threaten the existence of an organisation and cause havoc to the employee performance of workers, in the university of Ibadan, Nigeria. The adoption of strike actions therefore is a step in the wrong direction. It is an enemy of progress. The corollary of strike action is better imagined than described.

Conclusion

The study concluded there is a relationship between strike and service delivery using the industrial strike of academic staff union of universities, university of Ibadan chapter as a case study.

Recommendation

Resulting from these findings, it is recommended, the following recommendations are strongly made by the researcher.

- Lecturers should be well paid so that they can meet up with their daily needs and that such pays should not be delayed for any reasons at all.
- Government should stop using threats on the academic staff as a solution to strike actions, rather they should use dialogue to bring a lasting solution.
- An atmosphere of cordiality should exist between ASUU and the federal government. This will guarantee Academic staff a qualitative teaching techniques and research output which invariably will enhance effective implementation of government working policies.

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PERCEPTION OF RURAL CRIME BY HOUSEHOLDS IN ISEYIN LOCAL GOVERNMENT AREA OF OYO STATE, NIGERIA

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Abstract
*The rural areas in Nigeria have become notorious with all kinds of crime. This study investigated perception of rural crime by households in Iseyin local government area of Oyo State. A multi-stage sampling procedure was adopted to select 105 respondents for the study. Structured questionnaire and interview schedule was used to elicit responses on forms of rural crime, effect of rural crime and perception of households towards rural crime in the study area. Data were analyzed using descriptive and inferential statistics at p = 0.05. The dominant forms of rural crime were livestock theft and agricultural crime (74.29%), domestic violence (58.09%), breach of public peace (55.24%), kidnapping/banditry (51.43%), human trafficking (51.43%) and property crime (49.53%). Effect of rural crime were majorly on loss of property(75.24%), decrease in income (74.29%), death (73.33%), homeless(71.43), anger, frustration, worry or depression (69.52), decrease in agricultural production (68.57%) and uncertainties and inefficiencies (66.77%). The level of perception of crime by households was unfavourable in the study area. There was significant relationship between the effect of rural crime (r=0.339**, p<0.05) and respondents' perception of rural crime. Therefore this study recommended that creative ways of funding social protection mechanisms though funded schemes should be adopted to make it sustainable.*
Keywords: Rural crime; Perception; Households; Arson; Vandalism

Introduction

Crime in Nigeria is one of the major social problems facing the country in recent time. Aside from the human and sociological effects of crime, there is a significant economic cost. They manifest in form of economic effects which includes; increase absenteeism from work, decrease in labour market participation and reduced productivity that lowers earnings. In many urban centres in Nigeria today, criminal activities and violence are assuming dangerous dimensions as they threaten lives and properties, national sense of well-being and coherence, peace, social order and security, thus reducing the citizen quality of life (Ahmed, 2010). Any crime that affects those living, working or visiting rural area is considered rural crime. Crime affecting rural communities should never be underestimated. It can have a knock-on effect on all. Crime in rural area takes many forms, and is made easier for the perpetrators to go undetected by some prevailing factors. Some of these abetting factors are relative isolation of homes and businesses, lack of street lighting, miles of legal public access close to properties and low visible police presence. Crime rates might appear to be lower in rural areas, but this is believed to be partly a consequence of a sparse population and a general reluctance to report crime due to perceived lack of action by a stretched and largely absent, very few or inadequate presence of police force. Crime, and the threat of crime, is a blight on rural life. Victims of rural crime can feel helpless to do anything about it. All types of rural crime can have expensive and often devastating effect on rural communities and rural businesses. The consequence of the theft of a gate for example may be the escape of livestock onto a relatively busy road with the potential for injury or worse to road users and livestock, and

eventual loss of business. Various crimes include farm crime, crime against property, domestic violence, child abuse, trafficking, arson, wildlife crime and theft of agricultural machinery. Over the years the rate of crime in Nigeria has been on the increase and these crimes are being carried out with more perfection and sophistication. This has led to the formation of various vigilante groups, to combat crime in some parts of the country (Fajemirokun *et al.,* 2006). Efforts have been made by the national, state and local government agencies, as well as non-governmental organizations and other stakeholders like vigilante group and Western Security Network (WSN) codenamed AMOTEKUN to help in crime prevention. However, these unrelenting efforts on crime issues have not yielded the much desired result. Much of the previous works on crime and disorder focused primarily on law enforcement agencies in urban settings. However, the research that does exist on rural crime often concludes that urban and rural crime are indeed vastly different in composition, that rural residents' perceptions of crime are different, and that the approach of rural law enforcement agencies varies from their urban counterparts given the differences in the social and geographical composition of their policed areas. However, the concentration of research efforts on crime in urban centres with little reports of crime in rural communities necessitated this study. This study therefore investigated the level of perception of rural crime by households in Iseyin Local Government Area of Oyo State. Specifically, the study addressed some research questions and considered the following objectives: forms of rural crime encountered by respondents in the study area; perception of households towards rural crime and the effect of rural crime on households in the study area.

Methodology

The study was conducted in Iseyin Local Government Area of Oyo State, Nigeria with its headquarters located at Iseyin. The populations of the study were the rural households in Iseyin Local Government Area of Oyo State. Multi-stage sampling procedure was adopted for this research work. The first stage involved random selection of 50% of the wards, out of the eleven political wards in the study area to give 6 wards. The second stage involved simple random sampling of two villages from each ward making 12 villages. The third stage involved random selection of 10 respondents from each village to give a total of 120 rural dwellers out of which 105 questionnaires were returned and used for analysis giving 87.4% response rate. Data collected were analyzed using both descriptive statistics such as frequency counts, percentages, mean scores and inferential statistics such as Pearson Product Moment Correlation (PPMC). The dependent variable for the study is rural households' perception of rural crime which was measured by providing the respondents with a set of attitudinal statement and this was assessed on a 5- point scale of strongly agree, agree, undecided, disagree, strongly disagree with scores of 5,4,3,2, and 1 assigned respectively. The mean score obtained from the statements was used to categorize respondents as having favourable or unfavourable perception of rural crime. Forms of rural crime was measured by requesting respondents to choose from a list of crimes using response options of yes and no with scores of 1 and 0, respectively. Effect of rural crime was measured with response options of yes and no with scores of 1 and 0 respectively.

Results and discussion

Forms of rural crime

Result in Table 1 reveals the forms of rural crime in the study area. It shows that livestock theft and agricultural crime (74.29%), domestic violence (58.09%), breach of public peace (55.24%), traffic violation (51.43%), kidnapping/ banditry, human trafficking (51.43%) and property crime (49.53%) were the dominant rural crime activities in the study area. The findings are in congruence with happenings elsewhere. This is in line with the submission of

Naswem *et al. (*2019) who revealed that destruction of crop, theft of farm produce and theft of small ruminants/ poultry were the dominant agro-criminal activities in their study area. Okuneye (2014) indicated that theft is the most common crime within the study area, followed by drug abuse. These thefts are usually driven by hunger, poverty and want. Agricultural products are the common items stolen in rural areas as attested to by (California Casualty, 2017). This result is in line with the crime statistics of the National Bureau of Statistics (2017) which stated that property crime was the highest reported crime in Nigeria.

Table 1: Distribution of respondents based on forms of rural crime (n=105)

Forms of rural crime*	Frequency	Percentage
Human trafficking	54	51.43
Livestock theft and Agricultural crime	78	74.29
False imprisonment	26	24.76
Arson	32	30.48
Rape	17	16.19
Prostitution	48	45.71
Vandalism	39	37.14
Breach of public peace	58	55.24
Auto-theft	37	35.24
Kidnapping/banditry	54	51.43
Domestic violence	61	58.09
Traffic violence	32	30.48
Unlawful arms possession	40	38.10
Drug crime	42	40.00
Assault	44	41.90
Property crime	52	49.52

*** Multiple responses**
Source: Field survey, 2022

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Effect of rural crime

Result in Table 2 shows effect of rural crime. It shows that loss of property (75.245%) ranked first, decrease in income(74.29%) ranked second, death (73.33%) ranked third, homelessness (71.43) ranked fourth, anger, frustration, worry or depression (69.52) ranked fifth, decrease in agricultural production (68.57%) ranked sixth, and uncertainties and inefficiencies (66.77%) ranked seventh . The distribution is not surprising as rural crime is one of the major challenges in rural area. Naswen *et al. (*2019) submitted that most of the respondent reported that agricultural crimes led to a decrease in their productivity. This is to be expected because a farmer's output could be negatively affected whether his produce was stolen on the farm or after harvest.

Table 2: Distribution of respondents based on effects of rural crime on the respondents (n=105)

Effect of rural crime*	Frequency	Percentage
Death	77	73.33
Loss of property	79	75.24
Uncertainty and inefficiency	70	66.66
Depression	62	59.05
Anger, frustration, worry and depression	73	69.52
Underreporting	53	50.48
Increasing fear of crime	67	63.81

Decrease in income	78	74.29
Discourages youths from being serious	69	65.71
Decrease in agricultural productivity	72	68.57
Homelessness	75	71.43

***Multiple responses**
Source: Field survey, 2022

Perception of rural crime by households

Table 3 shows the respondents' perception of rural crime in the study area using weighted mean score. The result shows that respondents strongly agreed that: rural crime makes people unhappy ($\bar{x}$ = 4.15), unemployment contributes to rural crime ($\bar{x}$ = 4.09) and inadequate self-education influences to rural crime ($\bar{x}$ = 4.03), lack of money for children education influences rural crime ($\bar{x}$ = 3.88), youth are the major set of people involved in rural crime ($\bar{x}$ = 3.81), rural crime renders people homeless ($\bar{x}$ = 3.73), inadequate number of police officers help to increase rural crime ($\bar{x}$ = 3.71). This corroborated Adebayo (2013) who opined that the frustration and desperation that daily torments the unemployed creates a fertile ground for crime to thrive.

Table 3: Distribution of respondents based on perception of rural crime (n = 105)

Perception statement	Weighted mean score	Rank
Rural crime makes people unhappy	4.15	1st
People do not benefit from rural crime	3.69	9th
Crime influences economic growth, income, labour force participation	3.67	11th
Information on security tips reduce the level of rural crime	3.59	15th
Extension services increase the rural dwellers knowledge on crime management practices	3.49	19th
Youth are the major set of people involved in rural crime	3.81	5th
Unemployment contributes to rural crime	4.09	2nd
Crime reduces companies investments	3.52	18th
Crime has impact on quality of life and property value	3.55	16th
Neighbouring police team has helped to reduce the rate of rural crime	3.49	19th
Inadequate self-education adds to rural crime	4.03	3rd
Rural crime renders people homeless	3.73	7th
Security light has not helped to decrease the rate of rural crime	3.33	22nd
Lack of money for children education influences rural crime	3.88	4th
Inadequate number of police officers help to increase rural crime	3.71	8th
Teaching of rural dwellers in local dialect the use of arms helps in reducing crime	3.64	14th
Instability of government policies encourage rural crime	3.69	9th
Poor access to good health care services influence rural crime	3.65	13th
Lack of infrastructural services influence rural crime	3.54	17th
Elite ones contribute to rural crime	3.49	19th
Crime affects housing price	3.24	23rd
Crime affects uncertainties and inefficiency	3.75	6th
Lack of stable job influences rural crime	3.67	11th

Source: Field survey, 2022

Categorization of respondents on perception of rural crime

The result in Table 4 reveals that the level of perception of rural crime by households in the study area was unfavourable (79.05%). This implies that the frequency of damages caused by crime perpetrators in the study area has a great impact on the households. This is supported by Okuneye (2014) that crime have the capacity to destroy source of livelihood of farmers.

Table 4: Level of perception of rural crime

Perception	Frequency	Percentage	Maximum score	Minimum score	Mean± Standard deviation
Unfavourable	83	79.05	125	25	87.80±14.61
Favourable	22	20.95			
Total	105	100			

Source: Data analysis, 2022

Correlation between effect of rural crime and respondents' level of perception of rural crime.

The PPMC result in Table 6.2 reveals that there was significant correlation between effect of rural crime and respondents' level of perception of rural crime. This implies that unfavourable level of perception of rural crime is due to the effect of rural crime on households.

Table 5: Correlation between effect of rural crime and respondents' level of perception of rural crime

Variable	r-value	p-value	Decision	Remark
Effects of rural crime	0.339**	0.000	S	Reject H_o

Source: Data analysis, 2022

Conclusion and recommendation

Based on the findings, livestock theft and agricultural crime, domestic violence, breach of public peace, kidnapping/banditry, human trafficking were the dominant rural crime activities in the study area. Loss of property, decrease in income, death, homelessness, anger, frustration, worry or depression, decrease in agricultural production and uncertainties and inefficiencies were the major effect of rural crime on the households. The study further revealed the perception of rural crime as responded by the households, in order of prevalence as rural crime makes people unhappy, unemployment contributes to rural crime and inadequate self-education influence rural crime. There was a significant relationship between the effect of rural crime and respondents' perception of rural crime. In line with the findings of the study, it was recommended that serious attention should be accorded the issues of rural crime by extension services among the other stakeholders in the study area. A social assistance or security system should be established to cater for vulnerable members in the society and creative ways of funding social protection mechanisms should be adopted to make it sustainable.

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ADOPTION OF CRYPTO-CURRENCY AND NIGERIAN ECONOMIC GROWTH: A LIBRARY RESEARCH APPROACH

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Abstract
The recent investment policies of the federal government in the digital economy have contributed significantly not only to the country's revenue growth but also to the socio-economic development of the people. The adoption of crypto-currencies as a medium of exchange for commercial and financial activities in Nigeria may also serve as a catalyst for further development of digital economy of the nation. The study was therefore conducted to determine whether there might be a link between crypto-currencies and the economic growth of Nigeria. This study adopted library research approach using existing literature obtained online through the internet and from review of articles by other researchers published in the available journals. The study identified that the uses of block chain technology have the potentials to improve payment efficiency of virtual currency thereby reducing multiple transaction costs in terms of banking charges, telecommunication charges and other related charges associated with banking transactions. It was also found that the adoption of crypto currency is capable of increasing the tax base of Nigeria's economy resulting in revenue generation growth for the government to create enabling environment for rapid economic development in the country. The study therefore concludes that crypto currency and official currency can co-exist as the purchasing power of each currency will determine their value as a medium of exchange. The study recommends that government should join other countries of the world to formulate regulatory framework for legalizing crypto-currency and make relevant laws that will mitigate cybercrimes associated with the adoption of crypto currency.
Keywords: Digital economy, crypto-currency, official currency, block-chain, cybercrimes.

Introduction

Nigeria, the most populous black nation and the heartbeat of Africa, has been unable to sustain its economy for some time. Numerous issues with the economy existed even prior to the official announcement that the economy is in recession as of the second quarters of 2016 and 2020. The Nigerian economy is predominantly primary product oriented, heavily dependent on imports, consumption-driven, and undiversified structurally. Manufacturing accounts for less than 1% of all exports, while agriculture contributes 40% of GDP and employs roughly 70% of the labor force, crude oil contributes more than 90% of exports and earns the majority of foreign exchange (Edet and Samuel, 2018). Although, the country is well endowed with varied natural resources including oil and gas, 68% of her population of over 200 million people is living below international poverty line of US$ 1.25 a day.

Surprisingly, digital economy of Nigeria appears to be making significant contribution to the economy of the country. Dantatta, (2023), the executive vice chairman of the Nigerian Communications Commission (NCC) recently reported that the investment profile in the nation's telecommunication sector now stands at US$75.6 billion as at 2021 as against the initial investment of US$500 million in 2001, when the sector was fully liberated. Consequently, the sector is now a significant contributor to the Nigeria's economy through an impressive sectorial contribution to the nation's GDP quarterly, up from 8.5% in the 3rd quarter of 2015, now contributing an unprecedented 15% to the nation's total real GDP in

2022 (NBS, 2023). This shows that ICT is gradually becoming one of the most vibrant industries in Nigeria; with a good internet penetration and a sizeable number of ICT experts; deploying digital economy is attainable; in the presence of proper regulation. More so, acceptance of crypto-currency as a means of exchange for business and financial transactions in Nigeria may serve as a catalyst for further development of digital economy of the country.

The universal financial system is absolutely embracing the current evolution from physical currency to almost virtual currencies through the medium of technology (Bartoletti, Carta, Cimoli, and Saia, 2017). Various forms of crypto currencies have been introduced such as Ethereum, Bit-coin etc; but only Bit-coin has been generally adjudged as the most successful one. In spite of the world acceptance of the digital currency, it is appropriate to note that the financial policy restrictions of Central Bank of Nigeria on foreign exchange have steered Nigerians from modernized bit-coin to access foreign exchange. Therefore, abolishing the currency would be viewed as irrational and unworthy of a nation that wants to encourage local innovation. In the light of the foregoing, this study was conducted to examine the potential impact of the adoption of crypto-currency on the Nigerian economy. This will help to identify probable economic impacts as the Federal government makes further attempts to reduce its economic dependence on the oil and gas industry so that the economy may transit quickly to the one powered by digital technology.

This study adopted library research approach using existing literature obtained online through the internet and from a review of articles by other researchers published in the available journals. The work was structured as follows: introduction, literature review on crypto-currency, theoretical review, empirical review and conclusion.

Conceptual Review:

Crypto-Currency

Crypto-currency (also known as virtual currency) is defined by the European Central Bank (ECB) as "a type of unregulated, digital money, which is issued and typically controlled by its developers, and used and accepted among the members of a specific virtual community." Williams (2017) defines crypto-currency as "a digital representation of value that can be traded digitally and functions as (1) a medium of exchange, (2) a unit of account, or (3) a store of value, but does not have legal tender status" (i.e., when presented to a creditor, is a legitimate and legal offer of payment) in any jurisdiction. Onyeke, (2020) believes that although crypto-currency is not issued by any government, the aforementioned functions of it are only ensured by the agreement within the community of its users. The study confirmed that fiat currency is distinct from virtual currency because the former which is made up of a nation's coins and paper money is designated as its legal tender, circulates, and is typically used and accepted as a form of exchange in the country of issue. Crypto-currency differs from e-money, a digital representation of fiat money used to transmit value electronically denominated in fiat money (World, 2019).

Systems like Flooz, Beenz, and Digi Cash first appeared on the market during the 1990s tech boom, but they all ultimately failed in their attempts to create a virtual currency. Early in 2009, a programmer or group of programmers operating under the pseudonym Satoshi Nakamoto unveiled Bit-coin, a type of crypto-currency (Peter and Akadiri, 2020). Crypto-currencies come in many different forms, some of which include Bit-coin (BTC), Lite-coin (LTC), Ethereum (ETH), Ripple (XRP), Bit-coin Cash, Neo, Iota, Dash, Qtum, Monero, and Ethereum Classic. Crypto currencies are therefore largely designed to operate without sovereign regulation and are protected from being regulated by government authorities for supervision (Agbo and Nwadialor, 2020). More importantly, numerous central banks have

recently begun to investigate the use of crypto-currencies for small and large value payments. For instance, the People's Bank of China wants to create a national digital currency based on block-chain technology; the Bank of Canada and the Monetary Authority of Singapore are researching its application for interbank payment systems.

Crypto-currency Technology: Block-chain

Block-chain, a system that permits secure electronic transactions without a centralized database and without double spending, is the foundation upon which crypto-currency transactions are founded (Europol, 2015c). By dispersing a shared (i.e., decentralized) public ledger of all previous transactions on the network, it creates a communal accounting in place of a centralized ledger (FATF, 2014). The block-chain is this ledger. When two parties want to conduct a transaction, they must broadcast it to the entire network, essentially requesting that users of the network verify its legitimacy. The technique is demonstrated by the example below. In order to convey the agreement's conditions to the network, Party A first broadcasts a message to it. As an illustration, "I, Party A, gives Party B one bit-coin." Then, after broadcasting its acceptance to the whole network, Party B approves the transaction by asking network users to confirm the transaction's legitimacy. Through a proof-of-work validation system, the network automatically verifies the transaction or protects it against the risk of double spending (Florencio and Herley, 2010). If the transaction is approved, the ledger is updated along with all of the network users' block-chain data. Or, to put it another way, once a transaction has been entered into this open, public ledger, it cannot be modified later (until it is offset by another transaction).

In essence, the proof-of-work validation mechanism is a contest among network users to validate transactions. By using their computing power, network users take part in this competition. A user's ability to wrongly influence validation (i.e., double spend) is constrained under this system by the total proportional computation power he may access. Because successful participants receive new bit-coin, users are motivated to pay the computational expenses of validation. As a result, new bit-coins are said to have been mined using the resources (computational time and electricity) that were used, similar to how gold miners used their resources to add gold to circulation. Due to the restricted total outstanding quantity, there will eventually be nothing left to mine. When that happens, the incentive to validate transactions will likely be the transaction fees. Importantly, this is an open-source protocol, meaning open innovation can occur around the technology’s various parameters.

In sum, the block-chain establishes trust between two parties to a transaction through both a decentralized public ledger and a cryptographic mechanism that ensures transactions cannot be changed after the fact (Hughes, Park, Kietzmann, and Archer-Brown, 2019). One can easily see why the creator of this technology called it purely peer-to-peer electronic cash. Leaving aside counterfeiting, physical transactions have never quite suffered from these acute problems of trust and assurance (FATF, 2014). Prior to the block-chain innovation, simple two-party exchanges of value over electronic networks could not occur.

Crypto-currency in Nigeria

There is ambiguity regarding the legal status of virtual (or crypto) currency in Nigeria. This is because of the proclamations of the Nigerian regulatory agencies, the Central Bank of Nigeria (CBN) and the Securities and Exchange Commission regarding the legality of the operations of these crypto-currencies in Nigeria, when compared to the reality on ground. Nigeria has no legal framework or regulation guiding block-chain technology adoption. Crypto-currency has been the frontline of block-chain application in Nigeria. The slow acceptance by the regulators is notable considering that Nigeria was reportedly in the second position in bit-coin

trading in the world as of 2017 (Hope, 2017), and in 2019, Nigeria ranked first in global online search for bit-coin volume (Jimoh and Olawale, 2020).

A circular was issued in February, 2021, by the Central Bank of Nigeria, prohibiting the trading of crypto-currencies by financial institutions in Nigeria. The CBN stated that any financial institution supporting the use of virtual currencies does so at its own risk. This caution is said to be pending "substantive regulation or decision by the CBN as they are not legal tender in Nigeria." The CBN cited its scepticism of crypto-currencies on the possible exploitation of Nigerian citizens by criminals and terrorists.
In the same vein, a public notice was issued by the Nigerian Securities and Exchange Commission (SEC) in January, 2017 stating emphatically that: "…none of the persons, companies or entities promoting crypto-currencies has been recognized or authorized by it or by other regulatory agencies in Nigeria to receive deposits from the public or to provide any investment or other financial services in or from Nigeria. The public should also be aware that any investment opportunities promoted by these persons, companies or entities are likely to be of a risky nature with a high risk of loss of money, whilst others may be outright fraudulent pyramid schemes." (SEC, 2017).

The successful implementation of block-chain technology in both the public and commercial sectors is now largely dependent on a legal/regulatory framework put forth by the government. It is clear that the asset feature of crypto-currencies, rather than the aspect of the currency that can promote international trade, is of more concern to Nigeria's regulatory bodies, especially the Nigeria Deposit Insurance Corporation. In any case, usage or investment in crypto-currency appears to be booming in Nigeria despite the frequent warnings from the CBN and other regulatory bodies.

Crypto-currency and Nigerian Economic Development
The birth of crypto-currency as a virtual currency has been generating waving reactions in the global economy even in a developing country like Nigeria. In the light of this outbreak, there has been a lot of positive and negative discourse on the value of crypto currencies on the Nigerian economy.
Ahannaya, *et al. (*2021) argued that the activity of crypto-currency may be difficult to regulate in an economy with an underdeveloped financial market and, as a result, may provide the platform for investors, both individuals and corporate bodies, to evade tax. This could result in a low-income generation for government relative to the level of market activities, which could affect the government's budgetary plans. The proper administration of crypto-currency, on the other hand, can improve tax revenue in a country with a highly developed financial industry, which would benefit the government's budgetary goals.

Moreover, crypto-currencies operate alongside official currencies. The current amounts are negligible and do not call into question the dominance of official money as the primary form of payment. However, their use and popularity tend to grow as algorithms are developed to reduce the volatility of crypto-currencies (Onyeke, 2020). This would certainly result in the coexistence of other recognized currencies. Fernandes-Villa Verde and Sanches (2018) go into great length about the relationship between crypto-currencies and the central bank monetary policy. Their theoretical model states that the existence of the central bank and private money depends on the monetary policies the latter adopts. Bech and Garratt (2017) noted that in particular, privately-issued currencies would be utilized if the official currencies failed to maintain price stability, but they would lose their utility as a medium of exchange once the central bank credibly guaranteed the true value of money balances. Nonetheless, from a practical viewpoint, central banks could face certain risks from the advent of crypto-

currencies as relevant mediums of exchange with stable purchasing power due to their high volatility level.

This claim cannot be disputed because the official currency of Nigeria has been experiencing a rapid devaluation in recent years. Nigerians' purchasing power has been negatively impacted by the recent currency devaluation since they rely substantially on imported products and services. Godwin (2023) remarked that as a result, the depreciation of the naira has rekindled interest in the use of crypto-currency among Nigerians. Some Nigerians are now turning to crypto-currencies as a hedge against inflation and a means of preserving their wealth and purchasing power. He argued further that virtual currencies have also enabled the Nigerians to access global markets and opportunities, bypassing the restrictions imposed by the traditional financial system.

Peter and Akadiri (2020) also noted that block-chain technology has immense possibility of solving significant difficulties in agriculture. The difficulty with block-chain is finding ways to integrate the technology with workable business models and compelling use cases. Block-chains offer a huge potential to develop and expand access to financing in the agriculture sector, consequently solving food scarcity and improving food security. Agbo and Nwadialor (2020) pointed out that the costs associated with their transactions are essentially minimal as crypto-currencies and block-chain do not require an actual brick-and-mortar building to exist. They further argued that all block-chain and crypto-currencies transactions are automated and digitized - they are all tracked in a distributed ledger. It is impossible for people or businesses to alter it. As a result, there is significantly less chance of fraud and corruption. This shows that the crypto-currency block chain technology can be used to lessen corruption, the cankerworm that is continuously sabotaging the nation's economic growth. This would be achieved by developing budget–tracking mechanism to track all government income and expenses thereby forestalling the common practices of budgetary slack inherent in the public sector.

Theoretical Framework:

Chartalism theory

The study was based on the Chartalism theory, which holds that the state plays a major role in the intricate web of social (debt) interactions where the origin of money is situated outside of private markets. According to the chartalism theory, a public authority designates money as a unit of account for the general purpose of codifying social debt responsibilities. In the current world, this debt relationship is more particularly one of tax obligations between the people and the nation-state. This implies that only the government has the authority to set tax rates and decide what forms of payment are acceptable at pay offices to pay off state debt. Ingham (2004) argued that money functions, first and foremost, as an abstract unit of account, which is then used as a means of payment and the settling of debts. Silver, paper, gold or whatever ‘thing’ serves as a medium of exchange is only the empirical manifestation of what is essentially a state-administered unit of account. Thus, the function of money as a medium of exchange is incidental to and contingent on its first two functions as a unit of account and a means of payment. The Chartalist perspective acknowledges that it is inappropriate to study money in isolation from state powers, – be it modern nation-states or ancient governing bodies.

Therefore, successful introduction and adoption of crypto-currency as a means of exchange must be approved by the appropriate agencies of the government for supervision. In this case, the Central Bank of Nigeria and Security and Exchange Commission must on behalf of the

Federal Government of Nigeria, approve and regulate virtual currency as means of exchange for the conduct of business and financial transactions in Nigeria.

Empirical Review

Study on crypto-currency and Nigerian economic growth has not significantly attracted the attention of many scholars in Nigeria. The paucity of extant literature is not unconnected with the present legal status of crypto-currency in Nigeria. A few extant literatures were analyzed as follows:

Mwangi (2014) used a descriptive research design to explore how digital currencies have affected Kenya's e-commerce environment. The analysis revealed that although Bit-coin use has significantly increased, it still remains small in comparison to more established electronic payment methods like credit cards and the use of money in circulation like dollars. In order to shed light on the necessity of block-chain technology in developing economies, Jimoh *et al. (*2019) also conducted an overview of the technology using Nigeria as a case study. The paper observed that block-chain application can be applied across various industries within Nigeria, increasing efficiency and transparency. The study acknowledged that the degree to which the government and other pertinent stakeholders take the initiative to encourage and publicize market-creating innovation on block-chain platforms will determine the adoption of block-chain. Further research into the potential effects of crypto-currency technology on the Nigerian economy was conducted by Ebelogu *et al. (*2019). The study identified that the use of crypto-currencies has been on the rise and almost accepted generally in the world and that Africa as a continent is not left out in the adoption of block-chain and crypto-currencies.

Ajah and Chigozie-Okwum (2019) looked at the potential of information and communication technologies (ICTs) for national development and digital growth in respect to block-chain. The research adopted a descriptive research methodology where a field survey was conducted. The findings highlighted block chain technology as one of the important ICTs that are promoting digital growth, driving the digital economy, and advancing national development. The finding of this study further affirms the significance of block-chain as an instrument of promoting digital economy.

Building on the earlier studies, the effect of crypto-currency on a few key sectors of the Nigerian economy was studied by Peter and Akadiri, (2020). According to the study, the coexistence of government money and crypto-currencies can be beneficial by acting as a check on the central banks because currency competition can be effective in taming inflation and preventing the kind of interest rate and price manipulation to which governments have historically been prone. Onyeke (2020) also looked at crypto-currencies and the Nigerian economy. According to this report, the Federal Government of Nigeria (FGN) and its monetary authority should alter their perspective of crypto-currencies as simply risky investment assets rather than as a medium of exchange that makes it easier to send or receive money that is subject to criminal activity. In a similar study, the Nigerian economy was studied in Yunusa (2021) to determine how legalizing the usage of crypto-currency as a means of exchange will affect it. To gather pertinent information from the public and private management of financial institutions and businesses, questionnaires were sent. The study found, among other things, that there are drawbacks and advantages to using crypto-currencies and that doing so will promote economic growth. Ahannaya, *et. al.* (2021) also conducted a study to look at the impact of crypto-currencies on the Nigerian economy. The study showed that blockchain technology has benefits outside of the financial industry. According to the study's findings, a sizable proportion of consumers are now firmly convinced that digital currency is reliable and secure.

Ogunode, *et al. (*2022) recently looked at the current global usage patterns for digital and crypto currencies. The study cited a lack of faith in political institutions, a depreciating local

currency, and high inflation rates as major drivers of the expansion of crypto-currency usage in Nigeria and the need for people to use crypto-currency as a tool to protect their money and hedge against inflation. Finally, Fakunmoju, *et al. (*2022) looked into how the performance of the Nigerian economy was affected by crypto-currency. According to the findings, Nigeria's economic performance is negatively but significantly impacted by corrupt financial and monetary practices. The study comes to the conclusion that Nigeria's economic performance is impacted by crypto-currency and monetary corruption. The research recommends that the government, through the Central Bank of Nigeria (CBN), should regulate and control crypto-currency trading by using global digital financing system software to monitor and control crypto-currency trading in Nigeria.

Conclusion and Recommendations

The study was conducted with the primary objective of examining the nexus between crypto currency and the Nigerian economic development. The library research approach used in this study has clearly demonstrated that crypto currency, just like physical currency can serve as a medium of exchange which uses cryptography to secure financial transactions control through the creation of units and verifying the transfer of assets.

The study identified that the use of block chain has the potential to improve the payment efficiency of crypto-currency and reduce transaction costs in terms of banking charges, telecommunication charges and other costs associated with banking operations. It was also documented that the adoption of crypto currency is capable of increasing the tax base of an economy. This suggests that Nigeria can tap into that and increase her tax related income which could be used in providing infrastructure thereby creating an enabling environment for rapid economic development in the country. The existing literatures also confirmed that the coexistence of government money and crypto-currencies can benefit the Nigerian economy by acting as a reinforcing mechanism for central banks because currency competition can be effective in taming inflation and preventing the kind of interest rate and price manipulation to which government has historically been prone. More importantly, the review also affirm that due to current instability in the purchasing power of naira, many Nigerians are now turning to virtual currencies as a hedge against inflation and as a means of preserving their wealth.

The study therefore concludes that crypto currency and official currency can co-exist as the purchasing power of each currency will determine their value as a medium of exchange. Thus, an adoption of crypto-currency as a means of payment for business and financial transactions in Nigeria will certainly assist the citizens to preserve their wealth.

Several financial regulatory authorities and organisations in Nigeria have casually warned the public of the risks of engagement in digital currencies despite the numerous advantages linked with the acceptance and legalization of crypto currency. These cautions are not unrelated to the idea that digital currencies could be particularly alluring to fraudsters and cybercriminals and provide a variety of new difficulties for the Nigerian law enforcement.

However, the following precautionary steps are advised in order to mitigate the risks connected with its adoptions:

i. The government should develop its regulatory framework for legalizing crypto-currency and ensuring that the relevant government authorities are active regarding it. Although, a specific country cannot regulate crypto-currencies, exchanges can be required to follow anti-money laundering (AML) and counter-funding terrorist (CFT) laws in order to prevent the use of crypto-currencies for illegal purposes.
ii. Federal Inland Revenue Service should consider the tax evasion potentials of crypto-currencies and proactively make regulations to block all the loop holes it can present.

iii. Government should also compel the Nigerian communications commission to strength her regulatory environment for the operations of crypto currencies in order to further enhance the sectorial contribution of digital economy to the nation's economic growth and development.

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INSTRUMENT OF LANGUAGE: A REMEDY TO INSECURITY AND POVERTY

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Abstract
These are the days of hunger, starvation and insecurity. No where is secured and nobody is immuned against penury and starvation. Nigeria is passing through turbulent periods as the negative effects poverty and insecurity bite harder. Everybody is craving for solution. Nigerians are groaning under the burden of insecurity and abject poverty. Abject poverty is clearly written on the faces of ordinary Nigerian. To solve the problem, the instrument of language cannot be set aside. The authors opine that if language is placed and used properly, Nigerians will definitely overcome the challenges
Keywords: Language, Insecurity, Poverty, Stability.

Introduction

Nigerians are, at present, passing through terrible times. There is insecurity everywhere. The presence of bandits, unknown gunmen, herders, armed robbers coupled with hunger starvation and joblessness are slapping the faces of the average Nigerians. Businesses are folding up: Family heads cannot claim to have a grip of it any longer. Nigerians are dying under the heavy burden of debts, untold hardship, and untimely death occasioned by the presence of insecurity and abject poverty.

Hopelessness, and disillusionment are clearly evident on the faces of every Nigerian. At this point, when the governments at all levels are seeking solutions to alleviate the suffering of the People, the yearnings of people are to find solutions to this state of helplessness and hopelessness that Nigerians find themselves in.

Therefore, to cool their thirst and end their hunger, it becomes imperative to discuss the roles of language in this regard

Adeleke, Amusa and Ajao (2016) citing Fawehinmi (2010) while discussing the indispensability of language on Nigeria's stability, submit that language cannot be severed from its people. They are of the opinion that language cannot be easily separated from the culture and economy of each of the linguistic societies that are closely linked with the prevalent cultural heritage.

Olofin (2012) sees language as a powerful tool for the promotion of national consciousness and that at the same time, it facilitates the mobilisation of its resources for national development. Adeleke, Ajao and Amusa (2014) while citing Solanke (2011) are of the opinion that language cannot be divulged from the national development.

Concept clarification

Nigeria, economy and her development

The current state of the Nigerian Economy is a major concern to all and sundry. It has become a subject of discourse everywhere. Poverty and security cannot be fully discussed without discussing the state of the economy Fabiyi and Fawehinmi (2010), the labour, capital, land resources and the economic agents that socially participated in the production, exchange, distribution and consumption of goods and services.

Economic stability is associated with the fundamental growth and sustainability of its development and this involves putting up different monetary and fiscal policies that would entrench economic fortunes and discourage political instability and bad governance.

Amusa, Akintunde, Adeleke, Ajao, and Olawore H.O (2021) submit that available data indicate that the Nigerian economy has remained stagnated despite many consistent development plans from successive governments to tackle our various economic challenges. They are of the opinion that most economic policies did not yield desirable results because of the lopsidedness of these policies

Oil has been the major focus at the expense of other sources of income like agriculture, solid minerals, tourism and hospitality. The Nigerian economy is bedeviled with unfriendly business environments, ethnic biases, lack of comprehensive policies, weak institutions, poor economic management, over reliance on foreign aids, planning and strategies without data, underdeveloped human capital, language problems are a few of the challenges facing economic stability. Fabunmi (2010) highlights the causes of the economic hardship Nigerians are facing currently to include:

1. Greed and unregulated capitalism
2. Inconsistent monetary and fiscal policies
3. Politicians spendings and unsuitable macro-economic policies
4. Weak financial system and poor structures of the internal financial market

Corruption has greatly hindered the growth of Nigeria's economy. Poor economic condition, coupled with gross insecurity of lives and properties have brought untold hardship, and abject poverty on Nigerians

Amusa, Adeleke, and Ajao (2016) submit that past administrations have failed administratively to confront and solve economic problems despite numerous camouflage empowerment and economic policies such as the subsidy reinvestment programme (SURE P) and the National economic empowerment and development strategies (NEEDS) and the establishment of sovereign wealth funds. These programmes have no direct impact on the progress of Nigeria and her people. Nigerians have continued to wallow in abject poverty thereby creating more victims of all forms of insecurity

Insecurity and national development

Peace and tranquility of Nigeria is gradually disappearing at an alarming rate. In Nigeria, these are the days of confusion, hopelessness and gross insecurity.

Olusola and Ajao (2015) are of the opinion that insecurity, anarchy and killings are everywhere Nobody knows the next victims. There cannot be national development in a nation that is devoid of peace.

Ijaiya (2005), while discussing the importance of peace, submits that peace embraces freedom from violent conflicts and fear or anxiety. Nigeria, as a member of the global world has her own wound to nurse when we talk about security of life and property

Yusuf (2015) submits while discussing the indispensability of security citing wolfers (1962) submits that

"Security has to do with freedom from danger or with threats to a nations ability to protect and develop itself, promote its cherished values and estimate interest and has the well-being of its People. Thus, internal security could be seen as the freedom floor or the absence of those sentences which could undermine internal cohesion and the corporate existence of the nation and its ability to maintain its fighter institution for the promotion of its core values and social political and economic objectives as well as meet the legitimate aspirations of the people."

Security is a sine-qua-non for economic growth and development of any country. A country that neglects the security of her citizens is putting the future of our people in to jeopardy.

There cannot be a meaningful development, economic advancement, interactive cohesion, lawlessness and Insecurity. Adokutu (2013), as cited by Rasheed and Olusola (2013) submit

that the indices of our challenges as ethics and religious violence, political upheavals, corruption, employment, diseases, armed robbery, human trafficking, thuggery, illiteracy, proliferation, lack of information and orientation by the government, kidnapping and a host of others.

All the above, pose a great threat to the mind, desired peace and security in our land. In the past years, we heard about the dreaded Boko Haram but these days, in addition to the blood-thirsty Boko Harams are the hired assassins, rapists, kidnappers and of recent, ritualists.

Whether we accept it or not, Nigeria is steadily sliding into a state of lawlessness. Emeh (2011) as quoted by Rasheed and Adeleke (2015) opine that there is apparent anxiety in the land and the government knows it. Worsening the situation are the youth unemployment, restlessness and unprecedented high cost of living which have plunged the Nigerian citizens into untold hardship and unprecedented abject poverty

Poverty and Nigeria's citizens

Poverty can be defined as a condition characterised by severe deprivation of basic human needs such as shelter, food and clothing. The present Nigeria's economic down turn has subjected the average Nigerian to be wallowing in abject poverty and penury.

Stanley and Dirisu (2010), while discussing poverty in Nigeria see poverty as a standard of living below the minimum needed for the maintenance of life and health. They see it as a condition dominated by a scarcity and a lack of economic recessites.

Hornby (2001) sees the concept of poverty as a state of being poor or a state of social, economic and political inferiority.

Stanley and Dunsu (2010) also see Poverty as being characterised by lack of purchasing power, exposure to risks, insufficient access to social and economic services and a few opportunities for income generation.

Aghahowa and Atulanya (1995) as cited by Stanley and Dirusu (2010) noted that despite Nigeria's varieties of resources (both human and material), the country is still sliding deeper into the pit of economic backwardness and poverty.

The average Nigerian citizen is facing dearth of life necessities. They lack minimum physical requirements for existence.

Anthony (2023), while discussing 10 causes of poverty in Nigeria, submits that as of 2016, 112 million Nigerians out of the 186 million estimated population, were said to live in Poverty.

And most recently, in 2022, according to the world resources Institute and submitted by him, 71% of Nigerians live on less than 1 dollar per day, that is less than #600 everyday.

With the above submission, it is glaringly clear that poverty is biting harder on Nigerians.

Anthony (2013) goes further to give the following as the causes of poverty in Nigeria

1. Poor employment opportunity.
2. corruption.
3. Poor educational system.
4. Poor saving culture.
5. Over population.
6. Laziness.
7. Poor government policies.
8. Poor quality health care.
9. Poor investment knowledge.

Nexus between language, security and poverty

Language is a means by which human beings communicate. Opoola (2010) sees language as an instrument of persuasion, aggression, felicitation, entertainment, fabrication, interpretation, education, and other things of life. We pray, curse or bless our language.

Adeleke and Ajao (2014) citing Asade (2010) while discussing the nature and characteristics of language submit that

" *A widely acknowledged characteristic of language is that it is enigmatic in nature which makes it arduous to define or describe. In general, linguistics schedules have daily resources the creative characteristics of language, its arbitrariness and convention"*

Just as language cannot be severed from its users, it cannot be separated from their day to day activities. The role of language in the sustenance of peace cannot be underestimated.

Bolarade (2007) as cited by Adeleke, Ajao, Amusa (2016) while discussing the indispensability of language sees it as continuing to play a vital role during peace and imbroglio. It has been an instrument for initiating war and establishing peace. Industrial actions that occur all over and initiate instrument for negotiations are through language and final resolutions are reached through language. Effiong (2007), as cited by Adeleke and Ajao (2014) corroborated the above submission by describing language as an instrument of thought that is psychosocial interactive measure which binds the human society together in communities and linguistic groups. The submission gives credence to Iwara (2008) who sees language as a unified system of symbol conventionally agreed among its users to permit sharing of meanings. All these opinions see language as an important weapon in human existence. Adeleke and Ajao (2015) submit that language wields extra power as it constitutes an indispensable tool through which human beings integrate and coordinate their affairs. Asade (2010) also submit that

Language is the key to the heart of people
If we lose the key, we lose the people
If we treasure the key, we keep it safe
If we unlock the door to unlock riches
Which cannot be guessed at from the other side of the door

All the submissions above clearly show the requisite nature of language. The only way to sustain the future of Nigeria lies on the way we treat or handle our language.

Bamidele and Adamu (2019), as quoted by Adeleke O, Ajao R, Adeleke S, and Ajao M (2022) see language as a tool. They submit that language has the following multidimensional roles to the society. It helps the society to keep evolving. It is a tool for personal and communal communication. It eliminates misunderstanding of ideas, opinions and feelings.

The choice of words would make life easier for all but if otherwise, it would jeopardize the peaceful coexistence of all. What we do with language can make or mar our relationship. Those who control language control the world. Considering the above everybody should learn how to use language positively for the benefit of all. The use of words can build or destroy a nation. If we are to live in peace or otherwise depends largely on our use of language.

Language and its pivoting roles in poverty alleviation.

Successive governments in Nigeria have developed measures to alleviate poverty in the land. Success of those measures or programmes depend on the use of language used to package such, as programmes include the following

1) The National Directorate of Employee (NDE)
2) Nigerian Agricultural and Cooperative Bank limited (NACO)
3) Family Economic Advancement Programme (FEAP)
4) Family Support Trust Fund (FSTF)

5) Industrial Development Center

The above are few of measures set up by the government to deal with poverty in Nigeria. The point is whatever lofty ideas that the above may have, language is the vehicle through which their plans and programmes will be conveyed to their end users who are Nigerians. Godwin and Eunice (2021) Citing Igboamusi (2013) submit that several economic intervention schemes by international financial institutions such as the world Bank, IMF, ADB have good plans but Nigerians lack proper understanding of their programmes. Most of these programmes are with packaged sophisticated English language expression that are not within the reach of average illiterate Nigerians.

For the points raised above, it is crystally clear that there is a nexus between language and poverty.

Conclusions

As discussed in this paper, the roles played by language in Nigeria in term of security and poverty reduction cannot be underestimated. Therefore, language should be given an important place in our national life. It is used to cement relationship and also government programmes and projection would be clearly understood by all and sundry.

Recommendations

Having seen the indispensability of language in securing Nigeria and in poverty alleviation the authors of this paper therefore make the following recommendations.

1) Government at all levels should endeavour to use both English and indigenous languages to project all government programs
2) Every aspect of language skills, English, French and indigenous language should be properly taught in schools.
3) Indigenous languages should be used to project government programmes
4) Political office holders and in fact every Nigerian should be wary of using inciting words in public.

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ALLEVIATING POVERTY AND INSECURITY IN NIGERIA: THE ROLE OF GOOD GOVERNANCE

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Abstract
The negative effects of poverty and insecurity on individual citizens and the society at large is seriously affecting the development of Nigeria. These twin challenges need to be addressed. The poverty situation in Nigeria is one of the reasons that triggered people to indulge in kidnapping, oil theft, and other vices because they see them as means of exit from the track of poverty to riches. Therefore, this paper looks into how poverty and insecurity in Nigeria can be mitigated through good governance. It considers the causes and effects of poverty. It also looks into how poverty and insecurity can affect national development. Finally, it gives some recommendations which range from provision of job opportunities to the youth, improving basic needs to the poor, to organizing orientation programmes on security, among others
Keywords: Alleviation, Poverty, Insecurity, Good Governance, National Development

Introduction

The alarming spate of insecurity such as kidnapping, oil theft, militancy, armed robbery, ethno-religious crises, vandalization of oil installations, and political violence, among others bedeviling Nigeria which has become the order of the day is worrisome and needs urgent attention (Odetomi, 2015). The need for peace in Nigeria concerns every individual. Johnson and Johnson (2006), opines that peace can be divided into two distinct forms. The first area could be categorized as violence, strife and war. The second dimension could also be defined as the opposite of the first such as having common understanding, agreement and resolution that put an end to violence, war and strife. The absence of strife, violence as well as war is referred to as period of peace. In one side, there are discord, strife, uncommon ground, disagreement and winner or loser attitude which indicate social injustice while other side embraces common goal, mutual understanding and benefits and this signifying social justice. Based on these viewpoints, when there are positive beneficial human relationships, then there is the presence of peace. Once there are mutual understandings by individuals, nations or groups of people, then there is peace (Johnson and Johnson, 2006).

On the basis of all these propositions, Bar-Tal (2002), affirms that every society likes a peaceful environment and it is therefore mandatory for every member of any society to be educated on how to sustain a peaceful living with oneself and the others within the society. It is a common fact that if there is no peace and tranquility, no meaningful development can be achieved. For meaningful development to be achieved, there is the need for poverty and insecurity to be alleviated.

Poverty is a situation of low income and/or low consumption. World Bank Report (2001) indicated that Nigerians Human Development Index (HDI) was only 0.416 and that about 70% of the population are living below the poverty line, that is, earning an income less than the equivalent of one US dollar per day. Poverty has become a major problem widely acclaimed as deserving of urgent attention especially in the sub-Saharan African countries, Nigeria inclusive. In these countries, abject poverty has increased, widened, and has become ramified engulfing an overwhelming majority of the population (Jega, 2007).

Poverty has become one significant weapon that affects community-driven development project. In Nigeria, we don't have accurate data on Community Driven Development and

how it has influenced poverty, health and development in Nigeria. An estimated 54 percent of the Nigerian population lives below the poverty line, suggesting that the majority of the poor are being bypassed by the aggressive implementation of rural development programmes aimed at significantly reducing poverty (Okafor, 2010).

Poverty level in Nigeria appears as a contradiction to the country's immense wealth status. Oyeranti and Olayiwola (2005), stated that the poverty situation of the country has worsened despite the human and material resources that have been devoted to poverty alleviation programmes by successive governments in Nigeria. This situation has contributed immensely to the undermining of the foundations of peaceful co-existence and stable national development. The poverty situation in Nigeria is another reason that triggered people to partake in the kidnapping. They view it as a means of exit from the track of poverty for riches. This is because when an individual is kidnapped, a huge ransom is demanded, and until that ransom is delivered to the kidnappers, the kidnappee will never be released to his or her people. When the kidnappers secured the ransom, they suddenly turn rich compared to their former miserable poverty state. There cannot be national development without security.

Insecurity can be regarded as the state of lacking confidence or assurance of something or somebody or group of people, having no self-doubt or state of being secured. The prevalence of insecurity and its negative effects on the individual citizens and the society at large is seriously impinging the development of the Nigerian society if left unaddressed. This is because most people who engaged in these scourge and other vices are youths who should be the ones who are supposed to constitute quality human resources needed to drive the developmental strides in Nigeria. Hence, the incidence of insecurity among the youths calls for frantic efforts to stem it if not eradicating it totally.

Quite disturbing is the escalation of violence, problems of insecurity, religion and ethnic crises, criminal activities, kidnapping, the deadly Boko Haram insurgency. Insecurity is taking alarming dimensions in the various regions of the country, even though there is no country that is free of violence and crimes, but when a nation begins to have organized groups like the Boko Haram, armed banditry etc, then, it informs us that the apparatus of the state for maintaining security, law and order is being threatened. And when we analyze the age brackets of these criminals, it also informs us about the rate of unemployment in the country that cannot accommodate her youths.

Concept of Security

Security is a concept derived from the Latin word 'securitas', meaning, to be safe, free from anxiety or fear, to be emotionally secure, affording grounds to be confident. According to the Oxford Advanced Learners Dictionary, security means that activities involved in protecting a country, a building or a person against attack, danger, among others. However, in the works of Khan (1987), security encompasses the totality of measures instituted by government to protect the territorial and cherished value and interest of the people as well as guaranteed freedom of citizenry from anxiety, threats to life and property and their safety from natural or man-made disasters. National security means the process and act of effective protection of lives and property in a country. It involves policing and careful watch against elements that could breach the peace or anything that can jeopardize the social, economic and political development in the country. (Odedele and Egotancoa, 2010).

Security is the state of being secured from what would make you feel afraid, and or feel threatened. Cambridge (2021), defines security as the protection of a person,
building, organization, or country against threats such as crimes or attacks by foreign countries. According to Collins English Dictionary (2021), it is the state of being secured or having freedom from fear, anxiety, danger, doubt; state of safety or certainty. Dasuki

(2013), defines security to be absence of insecurity as a result of actions of law enforcement agencies stressing that security is understood to be the job of the defense force of the national frontiers and of the police inside the country.

Security is the degree of protection against danger, damage, loss and crime. Security as a form of protection consists of structures and processes that provide or improve security as a condition. Security is defined as a form of protection where a separation is created between assets and threats. Furthermore, security is a state of resistance to any type of behaviour that causes harm or damage to a person or property. Security can also be defined as protection against criminals, thieves and threats (Buzan and Hansen, 2009).

There are different dimensions of security. It can be economic security, food security, health, environmental, personal, community/national and political security (UNDP, 1994), which have all permeated the Nigerian society which is why we always refer to the term as national security. Human security is concerned with weapons. It is concerned with human life and dignity (UNDP, 1994). It is defined as an encompassing condition in which people, and communities live in freedom, peace and safely enjoy the protection of vital freedom. It means protecting people from critical and pervasive threats and situations, buildings on their strength and aspirations. It also means creating systems that give people the building blocks, dignity, and inhabits one environment which is not detrimental to their health and wellbeing. Security basically refers to the totality of measures undertaken to ensure the protection of lives and properties. It was averred that security is a protection or defense of the people against all kinds of victimization including protection from external military, economic want, poverty, illiteracy, disease or ill-health, political exclusion, social exploitation, criminality act, among others (Odekunle, 2012).

It is important to note that since the end of the cold war, there appears to be a shift from viewing security from state-centric perspectives to a broader view that places emphasis on individuals. National security also encapsulates human security, human rights and national development. It was explained further that security is any mechanism devised to alleviate the most serious threats that prevent people from pursuing their cherished values (Audu, Lukeman and Mohammed, 2014). According to Iredia (2011), national security simply means the capacity of a state to overcome challenges confronting her. He added that national security is not limited to military might, defense or law enforcement, it covers basic dimensions like job, water and food security.

Oyegun (2012), describes the security situation in Nigeria as a litany of unfulfilled dreams and disappointments. He observes cases of unrealized potentials, poverty in the midst of wealth, total lack of inspiration held for by insecurity due to incessant crimes and abject poverty. There are various symptoms of social disorganization and vices which have become overt and easily noticeable with: prostitution in urban centers; drug use/abuse and associated ailments; direct and indirect child abuse; child trafficking; severance of disregards for community values; general indiscipline; violent disorder; and ethno-religious conflicts.

All of these have generated into insecure environment and has called for the need to re-organize, strengthen and re-direct the delivery of functional, moral and value education in the broadest possible sense in our education system in such a manner as to affect the younger generation positively to build their level of consciousness as they seek to make the choices that will determine their future.

Causes of Poverty in Nigeria

The causes of poverty in Nigeria are multi-dimensional. Socio-economic causes include poor management of the country's resources, problems of access and endowment, inadequate access to education, health, sanitation and water services and destruction of

natural resources, among others. Nigeria is blessed with many mineral resources that could make her one of the wealthy nations but it is unfortunate that the resources are not well managed by government. The result of poor management of the resources is mass poverty among citizens (Okafor, 2010).

There are also problems of access and endowments such as inadequate access to unemployment opportunities. This is often caused by stunted growth economic activities or growth with labour saving device, lack of adequate access to assets such as lands, capital, inadequate access to means of fostering rural development programmes in poor regions, among others (Jimba and Yakubu, 2006).

Inadequate access to education, health, sanitation and water services emanates from inadequate provision of social services delivery which consequently results in the inability of the poor to live a healthy and active life and so take full advantage of employment opportunities. There is also the destruction of natural resources endowment which has led to reduced productivity of agriculture, forestry, fishery and so on (Okafor, 2010).

Effects of Poverty on the Nigerian Citizens

According to Okafor (2010), the effects of poverty on families in Nigeria are (i) child abuse, (ii) hunger and starvation, (iii) prostitution, (iv) early marriage and teenage pregnancies, (v) lack of adequate medical care, (vi) lack of quality education, (vii) prevalence of school dropouts who are into undesirable behaviours (armed robbery, kidnapping, sexual harassment, among others), (viii) teenagers of the poor engaged in hawking activities which expose them to diseases and death, (ix) the poor are prone to sexually transmitted diseases and infections and (x) a poor society is never recognized socially, economically or politically. Most of the social vices in the society today are as a result of poverty.

Poverty, Insecurity and National Development

According to Abubakar (2002), poverty is the totality of state of being where individuals, households or communities are unable to afford or fulfill the basic necessities of life, food (water inclusive), clothing, shelter and other economic and social obligations. Thus, he identified the following features of poverty: inadequate food supply, poor drinking water, poor nutrition, unsuitable house, high rate of infant mortality, low life expectancy, low educational opportunity, lack of productive assets, lack of economic infrastructure, insecurity and the inability to participate in decision making processes. World Bank (1999), defines poverty as an unacceptable human deprivation in economic opportunity, education, health and nutrition as well as lack of empowerment and security. Egwuatu (2002), stresses that poverty could be relative or absolute. Relative poverty shows that people are poor in relation to other people while absolute poverty indicates that people are living below a particular minimum standard in relation to the quality of life.

According to Achumba, *et al. (*2013), as quoted by Odetomi (2015), insecurity refers to lack or inadequate freedom from danger. They aver further that it is a state of vulnerability to harm and loss of life, property or livelihood. Thus, insecurity can be described as situations or circumstances that undermine safety of lives and properties in a country as a result of internal or external aggressions. It portends great threats to the efforts geared towards nation building and/or national development. In other words, it has to be emphasized that security plays vital roles in all human endeavours especially in the life of a nation as without it, the dream or desire of becoming a stable, strong and dynamic economy among comity of nations may become a mirage.

National development involves the transformation of the society through its institutions, organizations, social rules, customary usages and attitudes to an extent that makes the society more positively responsive to desired modern changes (Okafor, 2010).

Jimba and Yakubu (2006), define development as the reduction or elimination of poverty, inequality and unemployment within the context of a growing economy. Nwanokwai (2003), stresses that meaningful development must mean the development of man, the unfolding realization of his creative potentials, enabling him to improve his material conditions of living through the use of resources available to him.

The roles of government in eradicating poverty and insecurity

Alleviation of poverty and insecurity is a key to national development. This can be achieved through good governance. Governance is about how power is exercised and how important decisions in a society are taken. It is the total ability to organize, synthesize and direct the various actions of the working parts of government machinery for such a government to perform meaningfully, creditably and acceptably. It implies that government entails the governing class and the governed.

Governance provides the institutional legal and political framework not only for the design of poverty reduction policies but also for the enhancement of the capacity of the poor to deal positively with and improve their material conditions. Governance ensures the participation of the poor in decisions that affect them and empower them to get their views on the policy agenda (Adejumobi, 2003).

World Bank (2000), notes that governance encompasses the form of political regime; the process by which authority is exercised in the management of a country's economic and social resources for development, and the capacity of governments to design, formulate and implement policies and discharge functions (Santiso, 2001). There are six measured indicators of governance: (a) voice and accountability, (b) political stability and lack of violence, (c) government effectiveness (d) regulating quality (e) rule of law, and (f) control of corruption. Good governance must of necessity be democratic, involve popular participaion by the people, be accountable and ensure basic freedom. Also, good governance that engenders poverty and insecurity alleviation in Nigeria must entail the following measures: more efforts should be geared towards promoting peace, unity and harmony in the country; protection of the constitution; formulation and execution of robust policies that are masses friendly; federal character principle should be strictly adhered to. That is, marginalization in all ramifications should be avoided; equipping the military and other sister agencies with sophisticated weapons is highly essential; cost of governance should be drastically reduced; engaging dialogues as one of the potent tools of resolving conflicts; rotational presidency should be given consideration etc

If government can provide additional educational opportunities for the adolescents, some youths will be prevented from becoming involved with bad gangs, drugs abuse and violence, given the evidence linking the perpetrators of crime to be school drop outs (Ajakaiye and Adeyeye, 2002). Good health is basic to human welfare and a fundamental objective of social and economic development. Poor health human capital, reduces returns to learning, hinders entrepreneurial activities and economic development

Conclusion

This paper has shown how poverty and insecurity can be alleviated through good governance. It emphasized the causes and effects of poverty. How poverty as well as insecurity can affect national development was also discussed. Alleviation of poverty and insecurity should therefore be held in high esteem by the ruling class. In other words, there is the need for government at all levels to take drastic steps or measures in terms of conceiving and implementing good policies that will alleviate poverty and insecurity in Nigeria.

Recommendations

The following recommendations are made for poverty and insecurity to be alleviated:

1. Government should take more proactive steps that will alleviate poverty and insecurity by improving the basic needs of the poor.
2. Government should provide job opportunities for the unemployed youths as it will help in reducing poverty and crimes.
3. Poverty eradication programmes which will reshape the lives of the poor should be planned and implemented.
4. Orientation programmes should be organised for people on why security is essential in the society.

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ASSESSMENT OF SECURITY THREATS AND CONTROL MEASURES IN ACADEMIC LIBRARIES: IMPLICATIONS FOR OYO STATE COLLEGE OF AGRICULTURE AND TECHNOLOGY LIBRARY, IGGOORA, OYO STATE, NIGERIA

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Abstract
This study assesses security threats and control measures in academic library with special focus on the academic library of the Oyo State College of Agriculture and Technology, Igboora, Oyo State, Nigeria. The research design used for the study was "Explorative Design" with "Purposeful sampling technique using total enumerating method. The data collection instruments used for the study were direct observation through participation to determine and measure the effectiveness and efficiency of the security measures, already, in use. Semi- structured interview was also used by the researchers. Descriptive and inferential statistics of frequency counts and percentages were used to analyze the data gathered. A total of ten copies of structured interview was administered. All were duly completed and retrieved from the respondents. The study discovered that the academic library of the Oyo State College of Agriculture and Technology suffers adversely and heavily from security issues and other antisocial menaces and that, if all recommendations advanced by the this paper could be implemented, there would be drastic improvements on the situation.
Key words: Academic library, security, library security, library security threats, library security Measures, library security control

Introduction

The library is regarded as one of the pillars on which civilization flourishes. There is no nation in the world that can function effectively without proper involvement of the library. In the medieval era, materials of information were chained to the shelves so as to keep them from damage or any form of insecurity attempts such as theft and mutilation like underlining of sentences, writing words in the margin, joining and sometime ripping pages from books and other similar activities (Parul Gupta and Margam Madhusudhan (2019) and Grewal (2004).

According to Aloken (2003), libraries are essentially established to cater for the information needs of different categories of users which cover different areas of life such as economic, political, social and cultural aspects. In order to achieve these established purposes, libraries have to do their best in acquiring, managing and preventing library collections from whatsoever security threats in order to meet the demands of the heterogeneous users she is responsible to.

On the other hand, academic libraries are a set of library that is reflectively a complex institution that must have in possession, a large quantity of information resources to timely meet the intellectual joints like students, lecturers, faculty officers and offices, researchers and the likes. Consequently, the need to protect information materials or resources from divergent attacks of insecurity becomes imperatives. It is often said that "Prevention is better than cure". So, as information professionals, it is our generic responsibility towards mankind to explore all possibilities of finding methods or measures of securing, managing and preventing library and information materials. This paper therefore, focuses on a general

overview of the security of library materials and emphasizes the need for adequate library security measures to put in place.

Objectives of the study

The study aims to achieve the following objectives:

- **i.** to investigate security threats associated with the academic library in Oyo State college of Agriculture and Technology, Igboora, Oyo State, Nigeria.
- **ii.** to examine security control measures associated with the academic library in Oyo State college of Agriculture and Technology, Igboora, Oyo State, Nigeria.
- **iii.** to assess the adequacy of security measures in the academic library in Oyo State college of Agriculture and Technology, Igboora, Oyo State, Nigeria.
- **iv.** to suggest security control measures capable of curbing security challenges associated with the academic library in Oyo State college of Agriculture and Technology, Igboora, Oyo State, Nigeria.

Scope of the study

The study reviewed and examined library security challenges and measures, basically, in Oyo State College of Agriculture and Technology, Igboora, Oyo State, Nigeria. The work covers an investigation into the security challenges as experienced in the College: the security policies in place, the causes of the security challenges and the types of information that are prone to this challenge.

Research Methodology

Explorative research design was adopted for this study.The target population for the study was, mainly, the staff members of the college library of Oyo State College of Agriculture and Technology, Igboora. Purposeful sampling technique was adopted using total enumerating method. The data collection instrument used for the study were direct observation and administration of structured interview guide, personally conducted by the researchers. Simple descriptive analysis such as frequency and percentages was used and analysed.

The concept security and library security

"Security could be considered a "assured freedom from poverty or want, precautions taken against theft, espionage or a person or thing that secures or guarantees. (Collins English Dictionary and Thesaurus, 1992). Accordingly, Lavanga (2017), Fischer and Green (2004), security implies a "Stable, relatively predictable environment in which an individual or a group may pursue its ends without disruption or harm and fear of disturbance or injury: Traditionally, security may be the provision of private services in the protection of people, information and assets for individual safety and community wellness. (Craighead, 2003); while such a private security services may be considered a paid service in preventing undesirable, unauthorized or detrimental loss to an organization's asserts. In addition, security cannot be detached from safety. Therefore, safety means freedom from danger, protection from unauthorized access, harm prevention, loss avoidance, discount of long-term hazard crated by ways of unsuitable environmental conditions.

Likewise, security means "a state of being or feeling safe, freedom from danger, fear, anxiety, doubts, etc; state or sense of safety, tranquillity, certainty, etc; protection or defence against escape procedure to provide such protection or defence (Agnes, Micheal, Webster Dictionary, 2007).

Consequently, library security is a broad term that can be regarded as an arrangement provided for safe and secure facilities of the library staff, library resources equipment and users. According to ParulGupta and Madhusudhan (2018), the security system should be

allowed to perform her functions as seamless as possible without interfering with the primary objective of the library that is, providing user services with ease and simplicity. Library security include protection of personnel (staff and users); collections, equipment, physical facilitates and information resources from harm such as mutilation, theft, physical attack, accident, other than the hand of God.

Security issues associated with academic library

Mostly, people consider security issues associated with any system as protection against theft and deliberate destruction alone, while taking into consideration the concept of security for planning aside theft and deliberate steps to destruction. There are also other security threat which could either be man-made or natural such as accidents through fire, flood, earthquake and any other tsunami to be taken into consideration. The events of accidents do not only cause loss of material and other equipment but also missing of collections. These are the surface answers to the quest for needs and important security measures ranging from library buildings to collections.

However, as identified by scholars, security issues in academic libraries can be ranged as:

a. **Theft and mutilation:** Theft and mutilation are two basic different concepts combating libraries and her resources. According to ParulGupta and Madhusudhan (2018) Muostapha (2022) academic library collection theft is a deliberate and common challenge deserving serious attention from the library management and librarians and para-professionals working in the library and other stakeholders. It is considered as immoral act to mutilate library materials and deny others the opportunity of gaining access to it.

   On the other hand, mutilation is carried out by lazy and uncultured users for their selfish ends. Both attitudes are by students always while some adults are not also left out.

b. **Vandalism:** Vandalism was derived from the Germanic Tribe word "Vandals" and defined in the eyes of the law as a crime of intentionally damaging property belonging to other people or something that was good. Theft and vandalism cause costly and in many instances, irreplaceable damage to the holding of archives, libraries and other special collections.

c. **Descriptive behaviour:** This is another challenging act of insecurity in the library. It is synonymous to criminal behaviours or attitudes which are capable of causing security challenges in the library. Difficult and disruptive users include those who are intoxicated or uses drugs, mentally challenged ones and the others found out juvenile attitude (Ajegbomogun 2004, Momodu 2002 and Lorenzen 1996). To curb this behaviour as postulated by DeRosa (1980). The following measures can be put in place: admonishing disruptive patron**,** ordering the patron from the library**,** refusing admittance to the patron in the future**,** communicating with the patron's parents is under 18**,** getting police or court protection or injunctions**,** remaining calm and impersonal with the patron**,** retting limits with the patron and sticking to them**,** repeating requests to comply with rules or to leave as often as necessary**,** Offering the patron the option of challenging behaviour or leaving**,** avoid humour and personal remarks**,** alerting other staff of the problem and remaining considerate with the patron among the others.

   Damage and disaster: Damage and disaster is another security challenge that threatens library and her collections. Disaster can be natural as well as man-made. There is little or no control over disaster which comes naturally as flood, earthquake, landslides, storm, cyclone or hurricane. (Aziagba and Edet, 2008).

Book mis-shelving: This is another appearance of security mishap in the academic library. It is false appearance of library collection missing items because of wrong placement on the shelves, by either a library patron or incompetent library assistant. Book mis-shelving can either be accidentally done by the library users and staff alike as well as cases of mis-shelving by those wishing to have unique access to the materials at a later point.

Mutilation by humidity and microbe: There are no places on earth without humidity or the presence of water molecules in the atmosphere. The presence of high humidity provides a good medium for microorganisms such as fungi, algae, or bacteria to sustain life and flourishes where there is high humidity. Books of any library provide a medium for food and shelter to these microbes and become damp due to moisture.

Reasons for theft and mutilation of academic library materials

Mutilation of information resources in the library can be a result of several reasons. The reasons could be traced to the human nature, animals and other climatic conditions including hazards Parulgupta and Madhusudhan, (2018) and (Afolabi, 1993). Among possible causes as stipulated are direct access to the library shelves, placement of high risk resources such as rare and vulnerable resources on vulnerable places on in low visible areas, access to too many keys to the building and in particular circulation, apathy or indifferent about library crime, high cost of library resources, lack of photocopy machine, insufficient copies of information resources in the library, high demand for a particular information resource, user's expectation and behaviors, inadequate security measures, inordinate behaviors and attitude of library staff among others as well as inadequate security measuring among other things.

Security Systems associated with the academic libraries

a) Conventional or manual security systems include: fire extinguisher and security equipment, use of identity cards and access authorization, use of the lock and key system, use of security clearance procedure, use of security guards employed to patrol, gate registration (signature of every user) among others.
b) Modern or electronic security system includes the use of, 3M exit detection, use of burglar /

aalarm systems, biometrics system, use of close circuit television cameras, use of electronic eye detective system, use of electronic recording mechanism, use of radio-frequency identification system, smart card system, use of x-ray machine, use of robotic security system (RSS) among others

Findings of the study

Table 1: Demographic characteristics of the respondents

Sex	Frequency	Percentage
Male	4	40.0
Female	5	60.0
Total	9	100.00

Table 1 represents the demographic characteristics of the respondents. It shows that the female respondents were 5 (60.0%) while male were 4 (40%). This implies that the majority of the respondents that constituted the target population were, dominantly, females.

Table 2: Distribution of respondents by age

Age	Frequency	Percentage
31-40	4	44.4
41-50	2	22.2
51-60	3	33.3
Total	9	100.0

Table 2 shows the age difference of the respondents. It indicates that 4 (44.4%) of the respondents were between the age of 31 - 40. 2 (22.2 %) were of 41 - 50 years and 3 (33.3%) were between age 51-60.This implies that, all members of staff in the library were adults.

Table 3: Distribution by educational qualifications

Qualifications	Frequency	Percentage
Ph. D	1	11.11
MLIS	3	33.33
Degree	2	22.22
HND	3	33.33
Total	9	100.0

Table 3 shows that only 1 (11.11%) of the library staff had Ph.D., presently in the field of Library and Information Science. 3 (33.33) have MLIS. 2 (22.22) have Bachelor Degree in Library and Information Science and, another 3 (33.33) have Higher National Diploma in Library and Information Science. By indication, there is a urgent need for the staff to go on further studies as soon as possible, while the library staff capacity should be improved on, employing more qualified staff to work in the library.

Table 4: Distribution of respondents by marital status

Marital status	Frequency	Percentage
Single	-	-
Married	9	100.0
Divorce	-	-
Total	9	100.0

Table 4 shows the marital status of respondents. All the staff in the library are married 9 (100 %). This indicates that, they are all mature and should be responsible to effectively man the library and prevent it from any form of threat, should all other prerequisites are in place.

Table 5: Distribution of respondents by job status

Job Status	Frequency	Percentage
Library Assistant - Library Officer	3	33.33
Assistant Librarian - Librarian II	-	-
Librarian I - Senior Librarian	4	12.5
Principal Librarian - Deputy College Librarian	1	11.11
College Librarian	1	11.11
Total	9	100

Table 6 shows the job status of each of the staff working in the library as 3 (33.33) are between the level of Library Assistant and Library Officer. 4 (12.5) are between the rank of Librarian I and Senior Librarian, while only 1 (11.11) is between Principal Librarian and Deputy College Librarian and College Librarian respectively.

Table 6: Distribution of respondents by job experience

Year of Experience	Frequency	Percentage
1 – 5	-	-
6 – 10	1	12.5
10 – 15	3	37.5
16 years +	4	50.0
Total	8	100

Table 6 shows the level of each of the staff in the Library. 1 (12.5) is between 6-10 years, 3 (37.5) have been in the service for between 10-15 years and 4 (50.0) have had the practical experience for over 16 years.

Table 7: Distribution of respondents by religion

Religion	Frequency	Percentage
Christianity	5	60. 00
Islam	4	40.00
Aethist	-	-
Total	9	100.00

Table 7 shows that 5 (60%) are Christians while 4 (40%) are Muslims. This implies that, everyone working in the Library should have faith that should be expressed in their relationships with users and library resources.

Table 8: Distribution of respondents by person annual

Personal annual income	Frequency	Percentage
<1 million	1	11.1
>1 million < 2 million	2	22.2
> 2 million < 3 million	4	44.44
> 30000 < 4 million	1	11.1
> 40000	1	11.1
Total	9	100.00

Table 8 highlights the various levels of personal income of each of the respondents per annum. It was revealed that, only 1 (11.1 %) less than of the respondents earn lower than a million naira, while 2 (22.2 %) earn between a million and two million naira, 4 (44.4) earn between the range of 2 to 3 million and 1 (11.1 %) each earns between the annual income range of 3million to 4million and 4million respectively. By implication, it is expected that none of the library staff member is expected to abet users or library client in the uncultured attitude of threat to any of the resources in the library.

Further findings revealed that the College Management in collaboration with the Library Management has a lot to do in minimizing the level of present security threat in the library. It was discovered through the structured interview administered on the staff in the library that, the College Library has no security policy in place since the start of the College. It was, also, established that, on several occasions, the library staff have been exposed to abuse from users ranging from intentional disobedience to library directives, confrontations, and the like. It was unanimously agreed that, the College Library neither has resources' redemption policy nor disaster control measures and training have ever been implemented. It has been evaluated to be on record that, the library is prone to natural disasters such as flooding because of the recent happenings or experience in the library. Although, attention has been paid to of recent. All respondents to the guided interview attested to the fact that, the college has no disaster measures in place at all to check and forestall any disaster occurrence at the moment and that the Library has not been enjoying the expected institutional recognition and independence

attached to academic library as being experienced in other academic institutions, among the others.

Recommendations

This paper postulates a lot of recommendations which are expected to be used in ensuring library management's assistance to alleviate security threats to library resources. These include that:

1. the library management should work with the college management to have an ultra-modern library set up on campus.
2. the library management should advance for the incorporation of electronic security control measures and devices to forestall library security breaches.
3. the Library should give adequate library use literacy a wider publicity among the college community staff and students in compliance with the recent Information and Communication Technological development.
4. the library management should have a written security policy that covers all aspects of information resources' preservation and conservation and that such should be brought to the awareness of all stakeholders.
5. the library should have a comprehensive insurance policies that could serve to mitigate losses that could arise from disasters.
6. the library management should be made to enhance the manual methods of safeguarding all the materials in the library especially the periodic random checks on users by the staff, installation security patrol, portal at the entrance of the library, while emphasis should gradually shift to electronic measures which have gained the expected global awareness and recognition.
7. the library needs to be adequately staffed for the purpose of staff job productivity.
8. the library administration should endeavour to provide continuous in-service training as well as institutionally based and sponsored programmes for library staff capacity development in order to acclimatize them with the current security information and maximize their skills.
9. Academic libraries, especially, OYSCATECH, should improve on her Collection Development Policy to cover security measures that will help both the staff and other members of the academic community.
10. there should be an installation of an ICT compliant security devices as revealed in the review of related literature.
11. the college library should be given the deserving operational autonomy as it is in practice in other academic institution.
12. The college library administration should make, as a matter of urgency, exit entries, in case of emergency purposes

Conclusion

It is obvious that the major factors encouraging illegal activities in the library are due to poor security system and criminal nature of individuals. Libraries in general have been facing a lot of challenges in this part of the world, unlike in the developed countries where information is held in high esteem. Perhaps, because of the low level of importance attached to the use of information for development in Africa. This same act has been transferred to academic libraries established in our different higher learning institutions that are supposed to be the hub of innovation, creativity and development. Among these limiting factors are defective orientation on the use of library, weather virtual or non-virtual. It is considered a serious difficulty replacing library materials that are stolen in academic libraries, so, mutilated resources may be out of print or the library may not have the where withal to purchase any

replacement copy of any lost or mutilated resources because of the cost of purchase that may be on the high side. Traditionally, manual checking of patrons' bags are both inefficient and often, not user-friendly. Therefore, the need for a better way to deal with security challenges in academic libraries is to embrace the modern security systems that will better ensure an effective security of life and resources from theft, mutilation, or other forms of criminality that are alien to library development. Although, implementation of modern security systems could be expensive at the initial stage but in the long run, it would work as cost-effective in terms of the development of overall library security and services. The financial issues are very much common for libraries of the developing states such as Nigeria. Moreover, a systematic planning and abundant support from the authority may solve this issue to some extent. Therefore, the College Management and the administration of libraries should be interested in the implementation and utilization of different security measures for the library.

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CITIZENSHIP EDUCATION AS A TOOL FOR MITIGATING INSECURITY IN NIGERIA

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Abstract
This paper examines the mitigating effects of insecurity in the country as the lives and property are unsafe. It identifies the conceptual clarification of insecurity and citizenship education. It also examine the Relationship between citizenship education and insecurity recommending among the others, trainings, and re-trainings of the social studies, civic education And citizenship educators so as to update their knowledge with new trends as regards security issues across the globe.
Keywords: Citizenship Education, Insecurity, Mitigating

Background

Insecurity has dominated the discourse across the country, it has been recognised as the primary condition that hampers progress and development in any country. There are several degrees of insecurity that are threatening the existence and level of development in the country. The indices of insecurity includes the high rate of kidnapping, violence, armed robbery, terrorism, high poverty rate, electoral malpractices and poor management of the country's economic resources, removal of fuel subsidy etc. though, governments in successive order had made several attempts to reduce this menace of insecurity, yet the status and still remains. Insecurity is a feeling of uncertainty, a lack of confidence or anxiety about yourself. It produces anxiety about your goals, relationships, and ability to handle certain situations. Everybody deals with insecurity from time to time.

Conceptual clarification

Citizenship Education

Citizenship education is a school subject that develops knowledge, skills and understanding that citizens need to play a full part in a democratic society as active and responsible citizens. Citizens are taught about democracy, politics, parliament arisen voting, they also learn about the human rights, justice and law, media and information literacy, climate change and sustainability, personal finance and the economy. Political literacy is developed alongside the skills of active citizenship through practical opportunities to address issues of concern by taking different forms of responsible, democratic action and campaigning. Though the subject teaching is brought to life using real topical issues and case studies from the local to the global contexts. Bernard, (2023).

One of the primary goals of citizenship education is to provide students with basic knowledge of factors that impact the communities in which they live. Citizenship education strives to teach new generations the principles, obligations, responsibilities, and privileges of citizenship. Up-to-date knowledge of issues, from local to global, helps equip students to work towards solving future problems in the best possible way. This knowledge can also strengthen citizens' sense of community and belonging to their country (Marija and Della, 2022).

Insecurity

Insecurity in the form of breach of peace and security is a big menace in the country, These recent times, Nigeria is bedevilled with more security threats, such as the Boko-Haram, menace, the various activities of the ritualists, armed robbers, farmers- herders clashes and the kidnappers, insecurity on the other hand is the lack of such protection. Instell, (2015), observes the insecurity of the country in this order; insurgency in the north, ritual killings in the west, kidnappings in the east, militancy in the south-south and political and non-political assassinations all over the country. The above scenario has been a thing of concern to equip the citizens (Okoli and Anazodo 2022).

The relationship between citizenship education and insecurity

Citizenship education broadens one's knowledge and understanding of the happenings in the society. This implies that without citizenship education, there may be no adequate knowledge and understanding of one's environment.

Citizenship education also provides economic benefits by increasing the productive capacity of its citizens (Onyishi, 2007). It can therefore, be concluded that citizenship education is the vehicle for political, economic and socio development of the country which will culminate into improved security of lives and property. Citizenship education also creates self-employment opportunities through the various skills, knowledge and values provided at various degrees as when one is busy doing one kind of job or the other, the rate of crimes and criminality will drastically reduce and shall be subsequently eradicated if citizenship education is well implemented across the level of our educational system.

Need for citizenship education in mitigating insecurity in Nigeria

Nigeria, as a multi-ethnic society is made up of diverse cultural groups with over 400 languages and dialects and the cultural group live in different geographical locations. Awoniyi cited by Fadeiye, (2001). To corroborate this view, Olapade and Aderibigbe (2002) assert that Nigeria, being a vast country with diversities in people, cultures, attitudes and interests is exposed to divergent thoughts, behavioural systems and beliefs. Nigeria,as a heterogeneous society,is characterised with ethnic sentiments which are instrumental to disunity, and violence which impede nation security.

In recent decades, social vices such as kidnapping, bribery, corruption, drug and human trafficking, terrorism, militancy, insurgency, cultism, bunkering, vandalization of oil facilities, sea piracy, armed robbery etc. have become the order of the day in Nigeria. In an attempt to halt or reduce the myriads of insecurity, the barest minimum, citizenship education becomes a potent tool to mitigate the problem of insecurity. One of the drastic efforts in this direction by the Federal Government of Nigeria is the introduction of citizenship education in the school curriculum across all educational levels. Apart from teaching citizenship education in the schools, various programmes aimed at citizenship education outside the formal school system have been pursued by various governments in Nigeria. For instance, the Shagari administration (1978 – 1983), introduced the Ethical Revolution, the Buhari – Idiagbon administration (1984 – 1985) introduced the War-Against-Indiscipline (WAI), the Babangida administration introduced the Mass Mobilization for self-reliance, Social Justice and Economic Recovery (MAMSER) and the Abacha Military administration re-introduced the War Against Indiscipline and Corruption (WAIC). Akinbote (1995). Also, the Obasanjo administration (1997 - 2007) introduced the National Orientation Agency (NOA). The body is saddled with the responsibilities of communicating government policies, staying abreast of the public opinion and promoting patriotism, national unity and development of the Nigeria society among others. This, a well-designed and carefully-taught citizenship Education would go a long way in equipping learners with some positive attitudes, values, knowledge etc. which usher in positive social behaviour among the citizenry.

Okwenu and Anyocha (1995) cited by Olapade (2005) see citizenship education as that type of education the individuals in the state receive for the positive development of ideals, beliefs, habits and attitudes cherished by the society to enable them live as useful and effective members of the society.

Importance of citizenship education towards mitigating insecurity in Nigeria.

- It exposes the citizens to the need for imbibing positive values such as patriotism, fair play, peaceful co-existence, hard work, diligence, honesty, mutual respect, tolerance and self-discipline among the, which are instrumental to mitigating insecurity.
- It helps the citizens to be well informed, thoughtful and responsible and to be aware of their fundamental human rights, duties and obligations with a view to avoiding lawlessness to be able to seek redress in the competent court of law whenever their rights are infringed upon.
- It helps the citizens to be able to critically thinking and be enlightened citizens who always give sound judgement in decision making processes.
- It teaches the young people the challenges and opportunities of adulthood and leadership
- It embraces all the efforts geared towards nation building and national security.

Essentially, citizenship education as a course has the potentialities of producing a functional citizen who will be an asset rather that a liability to the country

Conclusion

Citizenship education and social studies educators should be seen as important tools to mitigate insecurity in the country. To mitigate insecurity, all strategies employed by the country's successive governments yielded low result----. Citizenship education is seen as a tool to mitigate insecurity as the required skills and knowledge that will help promote good citizens in the country are all encompassing in citizenship education curriculum across educational level.

Recommendations

The following recommendations were put forward in order to mitigate and enjoy relative peace in the country:

- Training and retraining of both social studies, civic education and citizenship educators should be a continuous process so as to update their knowledge with the new trends as regards security issues across the globe.
- Skills acquisition centress should be established to take care of out of school and drop out students.
- Government should also initiate a conference or dialogue with the aggrieved group such as Boko-Haram, Fulani Herders to end their nefarious activities once and for all.
- Government should provide employment opportunities for the both skills, semi-skilled and the unskilled unemployed youth and adults. This shall make them unavailable for recruitment by any criminal groups.

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ALLEVIATING POVERTY AND INSECURITY THROUGH SPORTS RECREATION, TOURISM, AND HOSPITALITY

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Abstract
Poverty and insecurity have become a menace to the global populace, not only in the black continents but also it is intermixed various health risks, including environmental and economic factors which leads to high rates of illness, infectious diseases, poor shelter and several domestic and international problems. Poverty ascertain with some deviant behavior which leads to insecurity within society which include both Male and Female of various socio-demographic characteristics. Non-governmental organization, religious institutions, government as well as political leaders have tried all their efforts to empowered people so as to relief them from poverty and insecurity. However, this study re-affirm the needs to combat poverty and insecurity with the help of the spirits, recreation, tourism and hospitality.
Keywords: Alleviation, Poverty, Insecurity, Sports tourism, Hospitality.

Introduction

Owing to poverty, it is not surprising that Nigeria is rated among the other countries as the 16th, out of 178 in the failed states index in 2013, placed in the 153rd of 187 in Human Development index as revealed by the United Nations Development Programme (UNDP, 2019). Poverty is scarcity, death, or the other states of one who lacks a certain amount of material possessions or money (Marie, 2013). Baratz and Glisgby also defined poverty as a condition involving some deprivations and adverse occurrences that are closely (but not necessarily exclusive) associated with inadequate economic resources". Hence, poverty is defined contextually as economic inequality in the location or society in which people live (institute National de Estadistica, 2009). However, Watt, (2015) confirmed that poverty is a state of being in which we are unable to meet our needs. With all the aforementioned plethora of definitions, one could understand that poverty alleviation is a matter of necessity in our society.

Poverty alleviation refers to methods, ways or techniques adopted by the government, non-governmental organizations or wealthy individuals to reduce or eradicate poverty. Oviasuyi, (2022).

The researcher envisages that poverty is one out of the reasons for insecurity in the country, politically, economically, socially and emotionally and this has led to unethical situations that the country finds itself. He further stated that we have experienced insecurity in the country in so many perspectives, such as terrorism, lack of confidence, unassertiveness, uncertainty, lack of protection, danger, instability, illness, cybercrime, kidnapping, child abuse and child trafficking. However, poverty has exposed the populace, mostly the young ones to the feeling of inadequacy, uncertainty, fear and doubts, in the country, and globally. The consequences of poverty and insecurity are becoming unbearable to the whole world; such as interval refugees, within the country, disruption of economic activities, and discrimination of consumer confidence, unreliable electricity supply, poor transport infrastructure and inefficient judicial system.

Because of this fiscal growth of poverty and insecurity the researcher, re-affirm the position of sports, tourism, recreation and hospitality as an impetus for poverty alleviation.

Alleviating poverty and insecurity through sport, recreation and hospitality

Tourism can be define as travel for recreational, leisure or more business purposes. The world Tourism Organization (1995) defines tourism as people travelling to and staying in a place outside their usual environment for not more than one consecutive year for leisure, business and other purposes. Through tourism, new experiences and adventures are achievable. This leads to a healthy lifestyle of an individual, likewise the platform for boosting the Nation's economy. World Tourism Organization (1996) further stated that tourism is the investment of people away from their normal place of residence and work for a period of not less than twenty-four and not more than a year

The role of tourism industry for poverty alleviation is very significant, because, tourism is the biggest and fastest growing sector in the global economy and has a great significance on the environment, culture, the social and economic life of a country.

Leisure time and physical activities are these activities that are not required as essential activities of daily living and performed at the discretion of the person (WHO, 2012) Leisure time and physical activity contribute to the body mass index, support life style and health, and year of life gained according to Steven (Steven *et al.*, 2012). It is an activity that encompasses the activities that we engage in for reasons depends on individual voice for competition, or growth, such as reading for pleasure, mediating, painting, and participating in sports, travelling and so on.

Tourism is a social, cultural and economic phenomena which entail the movement of people to countries or places outside their usual environment for personal *or* business/professional purposes. (IPIS 2018). These people are called visitors (who may be either tourists or excursants, residents or non- residents); and tourism has to do with their activities, some of which imply tourism expenditure (UNWTO 2008).

Hospitality industry aims at providing comfortable, suitable accommodation and safe catering services or safe foods and drinks served in a friendly hospitable and pleasing manner to whosoever needs such provisions. It also include an auxiliary services such as entertainment, car time services etc. to people away from home who are ready to pay for the services rendered. Walker, (2013) illustrates that as part of economic growth, hospitality education and training must be encouraged; Flaxman (2012) stated that hospitality is immensely an important component of any emerging market.

The hospitality industry consists of broad categories of fields within the service industry that includes lodging, restaurants event planning, theme parks, transports, cruise line, and additional fields within the television industry. Resert (2004) expatiates that, hotel, or even an amusement parks, consults of multiples group such as facility maintenance direct operations (services, housekeepers, porters, kitchen workers, bar attendants etc.) management, marketing and human in any parts of the world, and serves as an income in some regions. Hence, hospitality is business of helping people to feel welcomed and relaxed and to enjoy themselves (Discover Hospitality, 2015). The hospitality industry is the combination of accommodation and food beverages grouping collectively, mapping up the target segment of the industry (GO2R, 2020).

Factors that hindered sport, tourism, recreation and hospitality industry

There are so many factors militating against the progress development of sport, tourism and hospitality industries, in which some of them may be highlighted below.

i. **Taxation**- There is no pre-requisite measurement by the government to implicate taxes on hotels, restaurants, resort centres, e.t.c. Therefore, heavy taxes being imposed on tourism and

hospitality industries, and mostly not give room for the existence of these industries.

ii. **The low regard policy**- In terms of budgeting, government does not have adequate plan, for sport, recreation, tourism and hospitality most especially at the local level and these negligence does not accommodate room for sustainable development of those industries. Few sport men ran out of the country and most of the stadiums, museums and resort centres were not well equipped because of poor funding, inadequate facilities, lack of infrastructure e.t.c. All these has affected sport, tourism, recreation and hospitality industries and they have suffered a lot of disadvantages at the both local and the international level.

iii. **Socio-economic influence**: The position of economy in the country has generated a lot of problems to the development of sports, tourism, recreation and hospitality industries. This leads to poor management of sport centres. Lack of funds for tourism and hospitality industries are poorly coordinated because of inadequate facilities for relaxation.

iv. **Erratic power supplies**- Sport, tourism and hospitality industries need adequate power supply and the present power erratic is one of the challenges facing those aforementioned sectors Amadu emphasizes (2008) poor services of power supply which have influence on tourism, hospitality and industries. (Awoseyin, 2007; Fraud Laughman and Schiano) (1999) explain that various factors ranging from socio-economic, political and religious factors have harnessed as causing serious threat to global peace and security. Israel, 2019.

v. **Insecurity**- National security, according to enote.com (2011) as criticized by Ogedebe and Jacob, (2012) means security from the threat or attack from people, organizations or countries that have impact on the well-being of a nation and its citizens as a whole, rather than of any specific individuals or within the nation. Such threats and attacks are usually directed at affecting the lives of people and country. Hence, it is a great factor that hinders the growth of sport, tourism and hospitality industries.

vi. **Political instability**- This has to do with the replacement or changing of government, and human resources, Bilitia, (1982) explains that human resources refer to human asset of an organization directing, co-ordinating and evaluating of people and other resources to achieve goals. Instability leads to change in policy and human resources which have effects on sports, tourism and hospitability industries.

Summary and conclusion

In a nut shell, sport recreation, tourism and hospitability industries have never reached its peak for sustainable development. However, sport recreation and hospitability industries have been in existence for long, providing employment for the young ones at both local and international, both skilled and unskilled work force.

But poor implementation of government policy, lack of infrastructure, religious bias, lack of motivation. Inadequate man power etc. hinder the growth of all those industries, and was off-track by having their natural death. Therefore, they cannot be considered as a factor of production in a workforce or a labour market.

Suggestions for the way forward

To achieve the sustainable development goal in this dwindling recession, the following suggestions were made.

(i) Heritage, culture and tourism resources development should be encouraged by the government, NGOS and individuals so as to provide more employment opportunities for the youth.

(ii) Establishment of more museums, preservation of momentum, wildlife, tourism resources, holiday resort e.t.c are needed to be improved locally and internationally economy so as to curb poverty and insecurity.

(iii) Government policies should of sport, tourism and hospitality for well being of the citizen so as to reduce insecurity.

(iv) Improvement on security, food safety, quality of food, accommodation, adequate infrastructure and healthy environment need serious attention by the government for the well being of the citizens.

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NATURAL SCIENCE

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BIOCIDAL AND INHIBITORY EFFECTS OF ETHANOLIC EXTRACTS OF *Adenopus breviflorus* (Tagiri) ON SOME SELECTED ENTERIC PATHOGENS

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Abstract
The emergence and spread of antibiotic resistance has been major source of concern and challenge to public health that has led to major setback in the health system. Hence, more work need to be done to validate the use of raw plant materials. This study evaluated the biocidal and inhibitory effects of ethanolic extracts of Adenopus breviflorus against selected enteric pathogens. The biocidal effects of the seed extracts and effect on the growth of bacterial were assessed for 24 hour incubation. Ethanolic extract with the highest 10 µg/ml *concentration had an inhibitory effect range of 25.8 to 34.5mm while the least concentration with 5* µg/ml) *had 31.8 to 32.5mm inhibitory effect range. Inhibitory effect of the extract depends on the concentration of the extract. This study has shown that this plant material (seed) has some Inhibitory and biocidal effect on selected enteric pathogens, and can serve as control measure of the disease causing agent.*
Keywords: Enteric pathogens, *Adenopus breviflorus*, Inhibitory effects, antibiotic resistance

Introduction
Enteric bacteria are disease producing pathogens which account for a substantial portion of intestinal illnesses. According to the Centre for Disease Control and Prevention (2023), these bacteria are becoming more resistant to some clinically important antibiotics, limiting treatment options. Hence, antibiotic resistant of enteric infections have been a common concern and poses a serious threat to global public health. The improper and unnecessary use of antibiotics and the limited availability of new antimicrobial agents have contributed to rise in antimicrobial resistance which represents one of the most dangerous public human health problems in the world. The spread and the alarming emergence of multi-drug resistant strains have necessitated the new trends in human health system in search for alternative drugs. The ongoing recent studies on anti-microbial activities of different medicinal plants extracts have unveiled their potentials in discovering antibacterial, antifungal and antiparasitic agents for developing new pharmaceuticals to control studied human pathogenic organisms responsible for human ailments. Therefore, this study attempts to evaluate the inhibitory and the biocidal lethal effects of enteric pathogens to plant extract of *Adenopus breviflorus* seed.

Materials and Methods
Experimental Site
The experiment was carried out at the Biology Laboratory in the Department of Science Laboratory Technology, Oyo State college of Agriculture and Technology, Igboora, Oyo State, Nigeria. Igboora is located in Oyo State and area covers about 440km^2 derived savannah zone to the west of Ibadan boundaries.

Collection and Identification of Sample
Adenopus breviflorus seed were obtained from Igboora and transported to the Laboratory for identification. The seed were shade dried and mechanically crush to coarse powder, weighed and stored for further use.

Extraction Process
Using cold marceration technique, one hundred grams (100g) of powdered shade-dried seed of the plant materials were marcerated in sufficient ethanol of 400ml enough to soak the

powdery seed. The glass containing the mixture was shaken intermittently for several times over a period of 24hours and was filtered using Whatman No 1 filter paper (Ogunleye *et al.,* 2020).

Microbial Tests

The inhibitory activity of *Adenopus breviflorus* seed on selected clinical enteric isolates (*Escherichia coli, Shigella sonnei and Salmonella typh*i) was studied using isolated enteric pathogens obtained from Lautech Teaching Hospital, Ogbomoso which was maintained on slant media. Incubations were carried out and the slants examined after 24hrs of innoculation at 37^{o}C

Preparation of Stock Solution

Zero point five gramme (0.5g) of ethanolic extract of seed of plant material was dissolved in 5ml of DMSO to obtain a stock solution of 100mg/ml. Serial dilution of different concentration of 10 µg/ml and 5µg/ml were prepared in the Laboratory

Susceptibility Test for Zone of Inhibition

The inhibitory effect of *Adenopus breviflorus* seed extracts on the selected enteric bacteria was evaluated using agar well diffusion method described by Babayi *et al*. (2007). The plant extract was allowed to diffuse and observe for 24 hours at 37^{o}C

Minimum Inhibitory Concentration

The minimum inhibitory concentration of the ethanolic extraction was carried out according to the method described by Babayi *et al.* (2007) with little modifications at the Biology Laboratory of the Oyo State college of Agriculture and Technology Igboora. The standardized test bacteria of 0.1ml were added to the predetermined concentration of the extract. The plated nutrient agars were incubated for 24 hours at 37^{O}C. The incubated plates were examined for the presence or absence of growth, while the lowest concentration that inhibits the growth of the cultured isolates was recorded as the MIC value.

Minimum Biocidal Concentration

Minimum Biocidal Concentration (MBC) of plant extract on selected species of bacteria was determined by taken a streak of cultured isolates on Minimum Inhibitory Concentration (MIC) plates without visible growth and streaked onto freshly prepared agar and incubated for 24 hours at 37^{O}C. The incubated plates were checked for presence or absence of growth.

Result and Discussion

The quest for bioactive plants which can be used as non- conventional antimicrobial has been in existence because of alarming rate of resistance to classical synthetic drugs. Traditional medicinal plants are widely used to treat the microbial diseases due to their rich source of antimicrobial activity and less cost. The activity of the extracts (Table 1) revealed good zones of inhibition against the three tested bacterial. Generally, the results showed that the zones of inhibition of the extracts against the tested organisms ranged from 21.8-32.5 mm (5(µg/ml), 25.8-34.5mm (10(µg/ml)). The result of the minimum inhibitory concentration (MIC) shows that the seed extract prevented the growth of all tested microorganisms at concentration (10(µg/ml) thus revealed that the extract contains bioactive compound that are effective at certain concentration on the tested organisms with the exception of *Salmonella typhi* at concentration (5µg/ml))(table 2) which still contains some bacteria growth. The result of the Minimum Biocidal Concentration (MBC) of the extract as shown in Table 2 indicated that the MBC for extract was 10ug/ml against all the test organisms while *Escherichia coli* and *Shigella sonnei* showed minimum biocidal Concentration at both plant extract concentration.

Table 1: Inhibition of tested organism with ethanolic extract after 24hours incubation

Enteric Microbe	Concentration (µg/ml)	Diameter zone (mm)
Salmonella typhi	5	21.8
	10	25.8
Shigella sonnei	5	27.8
	10	30.6
Escherichia coli	5	32.5
	10	34.5

Table 2: Biocidal effects of A. breviflorus ethanol Extract after 24hrs of incubation

Enteric Microbe	Concentration (µg/ml)	Diameter zone	
		MIC	MBC
Samonella typhi	5	Turbid	Turbid
	10	-	-
Shigella sonnei	5	-	-
	10	-	-
Escherichia coli	5	-	-
	10	-	-

MIC – Minimum Inhibitory Concentraction MBC – Minimum Biocidal Concentration

From the literature, *Adenopus breviflorus* as been implicated to show antimicrobial activities as its other family members to be broad and demonstrate antibacterial, antiviral, and antifungal properties (AbdEl-Aziz and AbdEl-Kaleek, 2011). Hence, this evaluative study support the literature on the antibacterial Inhibitory effect of bioactive compound in extracts of Cucurbitacae fruits such as *Adenopus breviflorus* against certain microbes. The ethanolic extracts of the sampled seed was effective on *Escherichia coli* and *Shigella sonnei* tested in this study. This agrees with the findings of AbdEl-Aziz and AbdEl-Kaleek (2011), who showed that the seed extracts of Cucurbita moschata was active on Staphylococcus aureus and Bacilus subtilis. This may be as a result of strain of the test organisms and the method use in evaluating the potency. Therefore, plant extract are inexpensive and contains naturally occurring compound in which microbial pathogens (bacteria , parasite, virus and fungi) cannot develop resistance but rather inhibit or kill them.

Conclusion

The outcome of this study demonstrated significant biocidal and inhibitory effect of *Adenopus breviflorus*. Hence, this study concludes that the use of biocidal concentration of the plant extract will be helpful in control of enteric illnesses.

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EVALUATION OF PROXIMATE AND SENSORY QUALITIES OF COMPOSITE BREAD FLOUR

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Abstract
The study investigated the proximate and sensory qualities of composite flour of cocoyam, sesame and wheat flour in bread production and this was carried out among the staff and students of Home and Rural Economics from which twenty (20) panelists were drawn using 9-pointhedonic scale ranging from like extremely (9) to dislike extremely(1)was used in evaluating sensory qualities and consumer acceptance of the blend of composite bread and the result revealed that sample B which is the production of bread using 80% wheat flour,10% cocoyam flour and 10% sesame flour had the highest score of colour (8.33%), flavor (7.33%),and overall acceptability (8.50%) with the same rate of texture (6.67%) and sample C which is the production of bread using 60% wheat flour, 20% cocoyam flour and 20% sesame flour had highest score in aroma (7.67%) and the proximate analysis result revealed that sample B had highest percentage in crude protein (20.29%), crude fibre (2.90%), crude fat (21.00%), ash (1.69%) and carbohydrate (15.14%).Based on the study, it is recommended that food processors should consider the use of composite flour of wheat, cocoyam flour and sesame and findings should be carried out on a large bread base with the aim of making it mass production for commercial purpose.
Keywords: Proximate, Analysis, Bread, Composite, Sesame, Cocoyam, Composite, Flour.

Introduction

Cocoyam (*Xanthosoma sagittifolium*), contains a high nutritional value compared with cassava and yam with substantial vitamins, minerals and procontent also known as staple crops in the undeveloped and developed countries (Asumugha and Uwalaka, 2010). It can serve as weaning food and can also be used for both medicinal and culinary purpose (FAO; 2010).However, the roots are very low in fats and protein than cereals and pulses. Its protein can be comparable to that of other tropical food source like yam, cassava, potato, banana (Aniedu and Christopher, 2006).Cocoyam is gluten which features high quality phyto-nutrition profile comprising of dietary fibre and antioxidants in addition to moderate proportion of minerals and vitamins (Enzyaguirre, 2010).

Sesame (*Sesamum indicum*) seeds are good source of healthy fats, protein, B vitamins, minerals, fibre, antioxidants, and other beneficial plant compounds. Regularly eating may aid blood sugar control, combat arthritis pain and lower cholesterol. Sesame seeds or beni-seed locally known as commercial viable crop are critical to Agricultural economy. Sesame seed are a good source of healthy fats, B vitamins, minerals, fiber, antioxidants and other beneficial plants compound. Regularly eating substantial portions of these seeds not just an occasional sprinkling on a burger ban many aid blood sugar control, combat arthritis pain, and lower cholesterol asserted by Ibebuchi and Uzoegbu (2002).

Wheat was the second most produced cereal in world production in the year. The grain is one of the first crops that could be easily cultivated on large scale and had the additional advantages of yielding that provide long term storage of food. Nutritionally, 100 grams of wheat provides 327 calories and is a rich of wheat (20%) more of the daily value of multiple essential nutrients such as protein dietary fibre, manganese, phosphorus and niacin several B-vitamins and other dietary minerals are insignificant content, also contain 13% water, 71% carbohydrates and 1.5% fats, 13% protein content is mostly gluten (75.80% of the protein in

wheat) source in protein have a low quality method illustrated by Eddy, Udofia and Eyo (2007).

Bread is a fermented baked product gotten from wheat flour, water, yeast and salt through processes which include proofing, Shaping and baking. Wheat flour is one of the vital ingredients in bread production due to the gluten it contain gluten (in wheat flour) accounts for the elasticity of the dough that aids in trapping carbon dioxide generated by yeast during fermentation Dewettinck *et al. (*2008). Nevertheless, wheat is a temperate crop and does not thrive under tropical condition in Nigeria and many other developing nations who had to rely on importation for wheat or its flour for their daily need.

Objective of the Study

The broad objective is to assess the proximate and sensory attributes of bread produced from composite flour of cocoyam, sesame and wheat.

i. Produce bread using composite flour of cocoyam, sesame and wheat
ii. Examine the proximate analysis of bread using 80% wheat flour, 10% cocoyam flour and 10%sesame flour and using 60% wheat flour, 20% cocoyam flour and 20% sesame flour.
iii. Assess the sensory qualities of bread using 80% wheat flour, 10% cocoyam flour and 10%sesame flour and using 60% wheat flour, 20% cocoyam flour and 20% sesame flour.

Materials and Methods: Wheat flour, sesame flour, coconut flour, yeast, salt, milk, egg, margarine and salt were purchased from Lafenwa, Market, Abeokuta, Ogun State.

Processing method: 10kg of cocoyam were collected, washed out all dirt and rinsed 3-5 times in clean water and oven dried and the sesame seed dirt was removed or blow and oven dried and dry milled the two(2) separately and later mixed with different percentage into three (3) samples namely: samples A which is control, sample B (80%WF, 10%CF and 10% SF) sample C (60% WF, 20%CF and 20% SF) and used in baking bread.

Ingredients for the Production of Bread using Different Percentage of Wheat, Cocoyam and Sesame Flour

Sample	Wheat	Cocoyam	Sesame	Salt	Shortening	Yeast	Sugar
Sample A	100	0	0	5g	40g	20g	60g
Sample B	80%	10%	10%	5g	40g	20g	60g
Sample C	60%	20%	20%	5g	40g	20g	60g

Source: Field Survey; 2023.

Methods of Bread production

- Get the 1kg of wheat ready
- 10g yeast, 50g sugar and salt to taste in 1 bowl of water was added to the sample followed by stirring using mixer for 5 minutes.
- Cut into different sizes.
- The dough was allowed to ferment in a bowl covered with wet clean muslin cloth for 55 min at room temperature (~25°C).
- The dough was proofed and put in the cabinet for 90 min at 30°C in 85% relative humidity and baked at 250°C for 30 minutes.
- The breads was cooled to room temperature and assessed for proximate composition and characteristics by the panelist.

Sensory Evaluation: A group of twenty (20) trained panelists among staff and student of the Department of Home and Rural Economics were used to evaluate the sample of the bread produced based on colour, flavour, texture, aroma and overall acceptability using 9-point hedonic scale ranging from like extremely (9) to dislike extremely (1).

Result of Sensory Evaluation of Bread

Sample	Taste	Flavour	Colour	Texture	Aroma	Overall acceptability
A (control)	10.00	9.00	8.50	8.67	8.33	9.67
B	8.33	7.33	8.33	6.67	6.33	8.50
C	8.00	6.33	5.67	6.67	7.67	8.33

Colour: From the result,sample B had the highest score rate of 8.3% which indicated that the production of bread (80% wheat flour, 10% cocoyam flour and 10% sesame flour) were liked by the panelists.

Flavour: The obtained results from shows is significant differences in different production of bread from the result, the highest score was gotten from sample B (80%wheat flour, 10% cocoyam flour and 10% sesame flour) with score of 7.33% accepted by the panelists.

Texture: The result shows that sample A and B had the highest score both in percentages and the result is 6.67%indicated that production of bread (80%WF,10%CFand 10% SF) and (60% WF, 20% CF and 20% SF) liked by the consumer.

Aroma: The result obtained shows that bread production using 60% wheat flour, 20% cocoyam flour and 20% sesame flour had the highest score in term of aroma accepted by the panelists.

Overall acceptability: The overall acceptability of bread produced B which is the production of bread using 80% of wheat flour, 10% cocoyam flour and 10% sesame flour had highest score rate of 8.50% accepted by the consumer.

Result Analysis on the Proximate Composition of Bread using Different Percentage of Wheat, Cocoyam and Sesame Flour

Sample	Moisture Content (%)	Crude protein (%)	Crude Fibre (%)	Fat (%)	Ash (%)	CHO (%)
A	20.45	15.10	2.11	21.17	1.78	18.90
B	15.67	20.29	2.90	21.00	1.69	15.14
C	14.46	18.88	1.80	18.29	1.59	13.39

Source: Tayo; 2023.

Moisture Content: However, lower moisture content values were obtained in sample C (60% WF, 20%CF and 20%) sesame flour. The higher reduction obtained in the moisture content on bread sample.

Crude Protein Content: Crude protein content with higher value were obtained from sample B (80% WF+10%CF+10%SF) with the score rate of 20.29%.

Crude Fibre Content: 80% WF+10%CF+10%SF had the highest score of crude fibre with value of 2.90% among all other samples.

Crude Fat Content: The fat content rages from 18.29% to 21.00% and sample B (80% wheat flour,10% cocoyam flour and 10%) sesame flour had the highest score of 21.00% and can be utilized in the body system.

Ash Content: The ash content on the production of bread varies and the lowest ash content was acceptable by the body system and from the result sample C had 1.59% and this is denoted as the production of bread (60% wheat flour, 20% cocoyam flour and 20%) sesame flour.

Carbohydrate Content: The high carbohydrate obtained from sample B (80% wheat flour, 10% cocoyam flour and 10%) sesame flour had 15.14%, implied that bread contained high calorie.

Conclusion: From the result obtained in this study, it is can be concluded that the production of bread using flour of wheat, cocoyam and sesame flour are rich in carbohydrate, crude fibre, fat significant differences in the degree of likeness between sample B (80%WF+ 10%CF+10% SF) and sample C (60% WF+ 20%CF+ 20% SF) both were even repeated in the acceptability.

Recommendation: It is hereby recommended that food processor should produce bread using composite flour of wheat, cocoyam and sesame flour to maximize degree of likeness of consumer and recommend this composite bread instead of ordinary wheat bread, its richness in crude protein, crude fat and food value as recommended dietary allowances for adult, aged, infant and adolescent.

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COMPARATIVE ASSESSMENT OF MICROBIAL LOAD OF CHEESE FROM FARMS AND HAWKED IN IGBOORA, IBARAPA LOCAL GOVERNMENT, OYO STATE.

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Abstract
This research compared and assessed microbial quality of cheese from farms and hawked ones in Igboora. Microbiological analysis of cheese samples from different source were carried out using standard methods. The results of colony forming units (CFU) from the samples collected from Iyana-Abibu, Sekere, Igbole and Isale-Onilado were 1.9 x10^7, 2.3 x 10^6, 3.0x10^7, 3.1x10^7 cfu/g in nutrients agar respectively while those of Potato Dextrose Agar from Iyana-Abibu, Sekere, Igbole, and Isale-Onilado were 1.8x10^8, 1.9x10^8, 2.4x10^8, 2.9x10^8 cfu/g respectively. The bacteria isolated were: Salmonella species, Bacillus species from 8 different samples and Proteus mirabilis isolated from 3 different samples while Flavobacterium aquatile were from sample 1 and Pseudomonas aeruginosa respectively. The highest microbial load and colony count was observed from hawked cheese. The morphological characterization of fungi was observed to have Penicillium pulvis, Rhizopus microspores and Aspergillus flavus. The result indicated the unhygienic conditions prevailing during distribution where most of the products were sold in an open container at hawking site. Thus, microorganisms isolated could be a potential pathogens that affect the human health when such cheese are consumed. Therefore, precautions should be taken to prevent contamination during, handling, transportation and processing of cheese.

Keywords: Villages, Hawking Site, Microbial load, Colony Forming Units (CFU), Lactic Acid Bacteria (LAB).

Introduction

Soft cheese ("wara") is a nutritious food supplement obtained from cow milk, particularly processed one. Milk is an aqueous colloidal suspension of protein, fats and carbohydrates that contains numerous product obtained from the processing of milk (Broadbent *et al.,* 2004). Cheese is a great source of calcium, fat and proteins. It contains high amounts of vitamin A and $B_{12,}$ along with zinc, phosphorus and riboflavin. Cheese made from the milk of 100% grass fed animals had the highest nutrients, also contain omega 3 fatty acids and vitamin K_2. Cheese is a fresh mature product obtained after coagulation of the whole skimmed or partially skimmed milk (Pauline and Karim, 1996). Its processing is based on the coagulation of the protein in milk, which about 90% of the milk fat is encapsulated. The coagulated mass is called curd and the remaining liquid is whey. Curd consists mainly of milk protein (casein) and milk fat; while whey mainly contain water, milk sugar (lactose) protein (serum proteins) and B. vitamins. Production of most cheese contained combined ingredients such as milk, rennet, microorganisms and salt. Cheese production in this part of country is under primitive condition which resulted in low yield, reduction in shelf life, poor quality and microbial attack (Ogbolu *et al.,* 2014). Difference in ingredient used has led to the evolution of many cheese varieties in Nigeria. Milk and milk products are highly nutritious food supplements that serve as an excellent growth medium for a wide range of micro-organisms (Rueggi, 2003). The microbiological quality of milk and dairy products is influenced by the initial flora of raw milk, the processing condition and post-heat treatment contamination (Richter *et al.,* 2006).

However, poor sanitary practice in local cheese production and distribution resulted in public or consumers health hazard due to the presence of pathogens such as coliform *Lactobacilli*, heat resistant, *Staphylococcus* can grow in cheese or the surface (Zottola *et al.,* 2001). Microbial contamination of cheese may originate from various sources like period of production (Temelli *et al.,* 2006), storage (Brito *et al.,* 2008) or from humans contamination (Callon *et al.,* 2008).

Soft cheese has been found to have outstanding antimicrobial properties. It contains a variety of factors and compound which have been reported to have health promoting effects and prevent disease attack. Many studies have observed lactic acid bacteria (LAB) to occur naturally as an indigenous micro flora in cheese (Fox *et al.,* 2005). Lactic acid bacteria (LAB) had been reported to have highest percentage occurrence (76%), followed by Enterobacteria (17%) and Staphylococci (7%). Four genera of lactic acid bacilli were isolated, and these include; *Lactobacillus*, *Lactococcus*, *Leuconostoc* and *Pediococcus* (Guessas and Kihal, 2004). Investigation of soft cheese microbial loads have found *E. coli* in 40-50% of the Italian soft cheese products examined (Aureli *et al.,* 1992) and associated the products to faecal contamination.

Although, the awareness of cheese in catering for health issues has been known all over the world. However, little is known about the microbial quality and acceptability of the locally made cheese especially in Ibarapa Local Government areas. This research is designed to assess the microbial assemblage of cheese bought from Igboora villages and hawked ones.

Materials and Methods

Study Area

Ibarapa areas were located in Oyo State, Southwest Nigeria on Longitude $3^{o}00$E and $3^{o}30^{o}$E and Latitude $7^{o}15$'N and $7^{o}55$'N. The region is bounded in the North by Oke-Ogun area of Oyo State namely Iwajowa, Kajola and Iseyin Local Government areas, to the East by Ido to the West and South by Ogun State of Nigeria (D'amico *et al.,* 2008).

Samples Collection: The samples were selected from villages and hawking site for consumption. Cheese samples were collected from 2 different villages (Iyana – Abibu and Sekere) and 2 different hawk centres (Igbole and Isale Onilado) using sterile glass jars. The samples were cooled and transported using Ice box, the samples collected were left free of dust, insect and kept under room temperature and taken to the Research Laboratory of Oyo State College of Agriculture and Technology Igboora (OYSCATECH).

Media Preparation: The media was prepared strictly according to manufacturer's instruction. The media was sterilized by autoclaving at 121^{o}C for 15minutes. After sterilization, the agar was allowed to cool down to a temperature of 40^{o}C and poured into appropriate petridishes. Culture media used were Nutrient agar for bacteria and potato dextrose agar (PDA) for fungi (Adebayo and Okonkwo, 2012).

Sample Analysis: Microbial load analysis was conducted at Research Laboratory of Oyo State College of Agriculture and Technology, Igboora (OYSCATECH) for the four (4) samples. A homogenate of each sample was made by blending 10grammes in 90ml of sterile water and then blended. Serial dilutions was made in sterile test tubes by several transfers of 1ml, of previously diluted samples from one dilution tube to 9ml of sterile water in another tube as described by Adebayo and Okonkwo (2012).

Inoculation and Incubation Procedures: After preparation of serial dilution, 1ml of serially diluted cheese sample was pipette out to each serially marked Petri dish. Nutrient Agar and Potato Dextrose Agar were poured into appropriate marked plates. The Nutrient Agar plate

was incubated at a room temperature of 37^{o}C for 24hours while the potato Dextrose Agar was incubated at a room temperature for 3 – 5 days following the procedure of Adebayo and Okonkwo (2012).

Microbial Count: The samples were incubated and the number of colony were counted and the colony forming units were calculated by multiplying number of colony by its serial dilution factors, following the procedure of Olorunfemi *et al. (*2007).

Observation of Bacteria Plates and Fungal Plates: The plates were observed daily for the rates of the isolate grows. The colour and morphology of the colonies were noted as described by Olorunfemi *et al. (*2007).

Morphological Characteristics and Identification of Isolates: Margin, Colour, Elevation, Texture, Form, Size, Surface, Opacity and shape of bacteria and fungi on the media were observed and recorded following similar procedure of Olorunfemi *et al. (*2007).

Gram Staining for bacteria: The gram stain was carried out on 24hrs cultures. A smear of each of the bacterial isolates was made on clean grease slide and heat fixed using flame. Crystal violet stains (0.3%$\frac{w}{v}$) was added and allowed to stand for 1minutes. The stain was washed off with distill water. Iodine (0,4%), a mordant was added and allowed to stand for 1minutes before being rinsed off with distill water . Ethanol (90%), a decolourizer was then added and allowed to stand for 30 seconds before being rinsed off with distilled water and counter stained with secondary stain, safranin (0.4%) and allowed to stand for 1minute, then washed off with distilled water and allowed to dry. The stained smear was observed under the microscope using oil immersion lens magnification (x100) by Adebayo and Okonkwo (2012).

Biochemical Tests: The following biochemical tests were carried out to determine the probable microorganisms that associated with the fresh cheese.

Indole Test: The test organism was inoculated into a broth that contained tryptophan and incubated at 37^{o}C for 48hours. Then 2ml of the broth suspension was transferred to another test tube under aseptic conditions. About 0.5ml of Kovac's reagent was added to the broth. The mixture was shaken properly to ensure a thorough mixing and observed for colour reactions. A positive result was indicated by a pink coloured ring round the interface between, the broth suspension and alcohol reagent which will rose to the surface following the procedure of AOAC. (2000).

Potassium Hydroxide Tests: One drop of 3% KOH was applied on a microscope slide and loop was used to transfer a generous amount of bacteria to the slide and stirred carefully. The solution of gram negative bacteria was viscous and forms a mucoid string with 30seconds following the procedure of AOAC. (2000).
Motility tests, Catalase tests, Oxidase tests were all carried out with the procedures prescribed by AOAC (2000).
Voges Proskaeur Test: A test tube containing 2ml of glucose phosphate peptone water was incubated with the bacterial isolate for 48hrs at 37^{o}C. 0.6ml creation and 3ml of NAOH was added and mixed. It was allowed to stand for 1hr and a slow colour change from pink to red was observed as described by Leroy (2004).
Mixed Acid Fermentation, Coagulase tests, Citrate tests were also examined using Leroy (2004)procedures while Christensen's Urea agar medium was employed for the determination of Urease Tests.

Results

Table 1: Colony forming units of Cheese Samples Tested with Nutrient Agar and Potato Dextrose Agar

Samples	Nutrient Agar CFU/g	Potato Dextrose Agar CFU/g
Iy	1.9×10^7	1.8×10^8
Se	2.3×10^6	1.9×10^8
Ig	3.0×10^7	2.4×10^8
Is	3.1×10^7	2.9×10^8

Keys
Iy – Iyana Abibu, Se – Sekere, Ig – Igbole ,Is – Isale Onilado

Table 2: Morphological Characteristics of Fungi Isolates in Cheese Samples

Isolates Code	Microscopic Appearance	Microscopic Appearance	Probable fungi
Is_{53}	Mycelia are pale yellowish brown with irregular margin and at the reverse and brownish in colour with a dark centre.	Conidiospores are long, the apices vescielate are wide and smooth wooted. Phialides are ampulliform. The conidia are in well arranged chains globose and finely ornamental.	*Penicillium pulvis*
Iy_{51}	Colonies are fast growing fading gradually, from a white to dark on the agar surface colonies are slightly dense.	The sporangia are form along stalk known as the sporangiophore. The sporangia are dark and contain the aplasporangiospores	*Rhizopus microspores*
Se_{52}	Pale, dull-green colonies with pale orange reverse. Rapid growth and with entire margin colonies are observed.	The Conidiospores are rough with uniseriate heads vessicles are elongated with sterigmate located on the top with column of smooth conidia.	*Aspergillus flavus*
Ig_{72}	Mycelia are pale yellowish brown with irregular margin at the reverse brownish in colour with a dark centre	Conidiospores are long, the apices vessicle are wide and smooth. Phialides are ampulliform. The conidia are in well defined, chains globose and finely ornamental	*Penicillium pulvis*

Keys
Se – Sekere, Ig – Igbole, Is – Isale Onilado, Iy – Iyana Abibu,

Table 3: Biochemical Tests of Cheese Isolates

Codes	*Gram Rx*	*Cell morph*	*Catalase*	*Oxidase*	*Casein Hyd*	*Galatin Hyd*	*Methyl Red*	*Voges proskaeu*	*Nitrate Redn*	*Growth* 60°	*Growth* 30°	*Coagulase*	*Urease*	*Growth at pH* 3.9	*Growth at pH* 9.2	*Starch Hydrolysis*	*Growth Nacl*
S61	+	*R*	+	+	+	+	+	-	+	-	-	-	-	-	(+)	-	-
SC61	+	*R*	+	+	+	+	-	-	-	-	-	-	-	+	-	+	+
Ig42	-	*R*	+	-	+	+	+	+	+	-	-	+	+	+	(+)	-	+
Is43	+	*R*	+	+	+	+	+	+	+	(+)	-	-	-	(+)	+	-	+
Igb62	-	*R*	+	-	+	+	+	+	+	-	-	-	-	+	(+)	-	+
SC41	+	*R*	+	+	+	+	-	-	+	-	-	-	-	-	+	+	+

IS22	+	*R*	+	+	+	+	-	-	+	-	-	-	-	-	+	+	+
Ig41	+	*R*	+	+	+	+	+	-	+	-	-	-	-	-	(+)	-	-
Se42	+	*R*	+	+	+	+	+	+	+	(+)	-	-	-	(+)	+	-	+
Iy43	-	*R*	+	-	+	+	+	+	+	-	-	+	+	+	(+)	-	+
Iy42	+	*R*	+	+	+	+	-	-	+	-	-	-	-	-	+	+	+
Ig43	-	*R*	+	-	+	+	+	+	+	-	-	+	+	+	(+)	-	+
Iy22	-	*R*	+	-	+	+	-	-	-	-	+	-	-	+	-	-	-
Se21	-	*R*	+	-	+	+	+	+	+	-	-	+	+	+	(+)	-	+

Keys:
Se – Sekere, Ig – Igbole, Is – Isale Onilado, Iy – Iyana Abibu,
+- Positive, - Negative

Table 3: Biochemical Tests of Cheese Isolates Contnd.

Codes	*Citrate Utilization*	*Motility*	*Indole Test*	*Glucose*	*Fructose*	*Maltose*	*Lactose*	*Sucrose*	*Galactose*	*Xylose*	*Arabinose*	*Raffinose*	*Ramnose*	*Dulcitol*	*Mannitol*	*Identity*
S61	-	+	-	+G	-	+	+	+	(+)	+	+	-	-	-	+	***Baccilus polymyxa***
SC61	+	+	-	+G	-	-	+	+	+	-	-	+	+	-	+	***Bacillus substilis***
Ig42	+	+	-	+G	+	-	-	(+)	+	+	-	-	-	-	-	***Proteus mirabilis***
Is43	D	+	-	+	+	+	+	-	+	-	-	-	+	d	-	***Bacillus cereus***
Igb62	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	***Pseudomona aeruginosa***
SC41	+	+	-	+G	+	+	+	+	(+)	+	+	-	-	+	+	***Bacillus megaterium***
IS22	+	+	-	+G	+	+	+	+	(+)	+	+	-	-	+	+	***Bacillus megaterium***
Ig41	-	+	-	+G	-	+	+	+	(+)	+	+	-	-	-	+	***Baccilus polymyxa***
Se42	D	+	-	+	+	+	+	-	+	-	-	-	+	d	-	***Bacillus cereus***
Iy43	+	+	-	+G	+	-	-	(+)	+	+	-	-	-	-	-	***Proteus mirabilis***
Iy42	+	+	-	+G	+	+	+	+	(+)	+	+	-	-	+	+	***Bacillus megaterium***
Ig43	+	+	-	+G	+	-	-	(+)	+	+	-	-	-	-	-	***Proteus mirabilis***
Iy22	+	-	-	+	+	+	-	+	-	-	-	-	(+)	-	+	***Flavobacterium aquatile***
Se21	+	+	-	+G	+	-	-	(+)	+	+	-	-	-	-	-	***Proteus mirabilis***

From the result, highest value in hawking cheese are recorded in Is_2 in both media, 9.9 X 10^3cfu/g in Nutrient Agar and 9.7 x 10^4cfu/g in Potato Dextrose Agar and the lowest recorded in Ig_6 in both media, 9.1 x 10^7cfu/g in Nutrient Agar and 7.3 x 10^7cfu/g in potato Dextrose Agar. Also, the highest value in village cheese are recorded in Iy_2 for both media, 8.0 x 10^3cfu/g in Nutrient Agar and 7.8 x 10^4cfu/g in Potato Dextrose Agar and the recorded in Iy_6 for both media, 5.9 x 10^7cfu/g in Nutrient Agar and 5.5 x 10^8cfu/g in Potato Dextrose Agar respectively in Table 1.

Both $Is5_3$ and $Ig7_2$ had the same morphological characteristics of fungi, the mycelia are pale yellowish brown in nature with irregular margin at the reverse and brownish colour with a dark centre, it also has the microscopic appearance with a long conidiospore, the apices

vessicles are wide and smooth, phialides are ampulliform, the conidia are well defined in chains, the globose wind are finely ornamental and identified fungi are *Penicillium pulvis.* $Iy5_1$ had the morphological characterization of fungi, the colonies are fast brownish fading gradually from white to dark on the agar surface colonies which are slightly dense in nature, the microscopic appearance are sporangia and form a long stalk known as sporangiophore, the sporangia are dark and contained aplasporangiospores, the probable fungi are *Rhizopus microspore.* In $Se5_2$ the morphological characterization of fungi in which the colonies are pale, dull-green with pale orange reverse, the rapid growth and entire margin colonies are also observed, the microscopic appearance are conidiospores that are rough in nature with uniseriate heads, an elongated vessicles with sterigmate located on the top with column of smooth conidia, the probable organisms are *Aspergillus flavus* as shown in table 2.

The Biochemical test revealed that all the bacteria isolated were rod-like in shape and those from eight (8) locations were found to be Gram Positive (+) while those from six (6) areas were Gram Negative (-) in nature. All were sensitive to catalase while some were not affected by oxidase, such as those from $Ig4_2$, $Ig6_2$, $Iy4_3$, $Ig4_2$, $Ig4_3$, $Iy2_2$, and $Sc2_1$. It was noticed that all were able to breakdown some compound into usable form. They demonstrated positive action of caseins, Galatin and starch hydrolysis. Only bacteria $Is4_3$ and $Sc4_2$ grow at 60^oC while only $Iy2_2$ grows at 30^oC. This indicated that they can only survive below 30^oC (Temp),. P^H ranged between 3.9 and 9.2. The average P^H from Sc_1, $Sc4_2$, $Iy4_3$ and $Iy2_2$ was 3.9, cheese from these locations were more acidic than the others. Most grow well at the salt concentration solution levels as shown in Table 1.

The carbohydrate and proteins were measured qualitatively and ranged from trace to Positive (++). All the samples yielded low level of lactic acid bacteria. *Bacillus* species were constantly isolated in most cheese samples. Some samples were more positive in gas production ($Se6_1$, $Se6_3$, $Ig4_2$, $Se4_1$, $Is2_2$, $Ig4_1$, $Iy4_3$, $Iy4_2$, $Ig4_3$ and $Se2_1$) while few are just positive in nature ($Is4_3$, $Ig6_2$, $Se4_2$ and $Iy2_2$) and proteins were also isolated from the cheese obtained. There was high viable bacteria count in all the cheese samples especially the hawked ones.

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Discussion

The results of an average total viable counts, coliform counts and fungi counts of the cheese from the village revealed higher coliform counts for bacteria and fungi compared to those sold in open places in Igboora i.e. Igbole and Isale Onilado (Hawked ones). This may be due to low hygienic quality of the product, Boor and Fromm (2006). It might have originated from the initial microflora of raw milk and other ingredients, environment, transportation, poor personal hygiene and handling as reported by Jay (2009). Similar observation of high colony count was also reported by KhamulHassan *et al. (*2014) in Bangladesh and Ajayi *et al. (*2018) respectively. Also, Abou Dawood *et al. (*2005) observed high count of bacteria, mould and that yeast was more than (50%) of the 20 samples examined in their study. Ogbolu *et al.* (2014) observed high viable bacteria counts in all cheese examined and reported an increase in total bacteria count from the point of production to hawkers. One major problem was that the producers or vendors are not educated and this consequently affects the methods and handling of the cheese products. Bhat *et al. (*1984) had earlier opined that unclean attitudes of workers, poor quality or materials used and water supplied for washing utensils could be among the source of the bacteria contamination of milk products and that contamination of raw milk and cheese poses a significant risk to human (Wells *et al.,* 1991).

Three fungi isolated from the samples were yeast and molds such as *Penicillium pulvis, Rhizopus microspores and Aspergillus flavus* and this is similar to the findings of Yoon *et al. (*2016). This may be due to the unhygienic materials, transportation, poor handling and

environment as stated in previous works (Franz *et al.*, 2011). In a review paper published by Alshareef *et al. (*2023), they reported *Geotrichum candidum, Candida famata, Penicillium* spp and *Cladosporium* spp. as common molds of cheese. Occurrence of these organisms may have resulted from either insufficient pasteurization of milk, or human exposure Kabuki *et al. (*2004). *Escherichia coli, or Klebsiella species* were isolated in all cheese examined by Ogbolu *et al. (*2014), however, they also observed *Aspergillus species* and mould as fungi isolated.

Although Gram-Positive (+) bacteria had the highest number of occurrence in both cheese from villages and hawked ones. Deviated report of Gram-negative bacteria, yeast and mold were isolated by Ogbolu *et al. (*2014) and related to cheese contamination. Bacterial isolated from the cheese examined were IY (*Proteus mirabilis, Bacillus megaterium, Flavobacterium aquatile*), Se (*Bacillus cereus, Bacillus megaterium, Proteus mirabilis and Bacillus subtilis*), Ig (*Bacillus polymyxa, Pseudomona aeruginosa, Proteus mirabilis*) and Is (*Bacillus megaterium, Bacillus cereus and Bacillus polymyxa*). Contrary observation was reported by Ajayi *et al. (*2018) where organisms isolated in boiled cheese were *Streptococcus* spp., *Clostridium* spp., *Lactobacillus* spp., *Staphylococcus epidermidis* and *Escherichia coli*. The *Bacillus species* that is common in the present study is an indication of poor hygiene of the milkers during milking processes. This present study is also similar to the report of KamulHassan *et al. (*2014) who also isolated *B. subtilis, B. cereus* and others in their study in Bangladesh. The samples examined that consistently contained *Bacillus species* and *Proteus species* was also observed by Vernam and Beuvier (2007). This is similar to the study of Vigano *et al. (*2007) where 98% of milk samples grew *Bacillus mirabilis*.

Conclusions

In conclusion, this study had shown that varieties of bacterial and fungi associated with the cheese examined subsequently inferred a great loss to the retailers and imposed clinical threat to the consumers via severe poisoning.

Recommendation

This research has been able to isolate and identify microorganisms associated with cheese. It is essential that the sellers should be properly educated and sensitized on the need to improve their personal hygiene which is one of the factors affecting the post-harvest processing of the cheese, thereby introducing contaminants that led to spoilage. It is recommended that proper handling should be ensured for a better quality of cheese production and supply.

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BIOSORPTION OF HEAVY METALS IN TIE AND DYE WASTE WATER USING *Aspergillus vesicolor*

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Abstract
Heavy metals have been excessively released into the environment due to rapid industrialization. However, the need to minimize this risk has become a global concern. This research was conducted to determine some heavy metals likely associated with textile and dye wastewater and remove them using Aspergillus vesicolor isolated and selected after screening of other fungal isolates, from e-wastes soil. The heavy metal (copper, chromium, lead, cadmium and cobalt) concentration of the effluent were analyzed using Atomic Absorption Spectrophotometer (AAS). The A. vesicolor with the highest biosorption capacity after screening was standardized and biosorption of heavy metals in tie and dye wastes at varied incubation time were examined. The result of the initial concentration of the tie and dye effluent revealed that sample B had the highest concentration of lead (157.86 mg/l) and copper (92.57 mg/l) while the least was chromium (0.77, 0.60 and 0.53 mg/l) in sample A, B and C respectively. The concentration of the heavy metals after biosorption revealed that, of all the samples, A and C had the highest sorption of cadmium and chromium (0.02 mg/l) at day 10 and the least adsorbed was lead in sample B (55.18, 48.06 mg/l) and C(40.20, 22.25 mg/l) at day 5 and 10 of incubation. Conclusively, the sorption capacity of A. vesicolor was most effective for the removal of cadmium, chromium and lead from the tie and dye wastes. Hence, A. vesicolor could be a potential adsorbent for the removal of these metals from textile wastes.

Key words; Effluent, e-wastes, sorption, adsorbent, heavy metals

Introduction

Textile Industries has been one of the largest generations that produce and release liquid effluents as pollutants with high quantities of waste water dyeing process. The amount of dyes produced annually throughout the world from textile industry, are more than 7*10 Tons among which are more than 10 different types of commercially available dyes which are estimated to be 2,800,000 Tons discharged from such industrial effluent every year (Jeenathunisa and Jeyabharathi, 2021). Tie and dye industry is one of the textile industries producing xenobiotics which when seeped into the environment particularly water bodies causes public health problem partly due to the presence of heavy metals that affect living organisms. The effluent released contributes to the pollution and toxicity of the environment (Mohammed *et al.*, 2021) when heavy metals enter into rivers, lakes, ocean and rivers as run-off, most become toxic at high concentration while others are toxic at low concentration, after accumulation in living tissues of human and animals. Some of the heavy metals present in dye wastes are cadmium (Cd), lead (Pb), copper (Cu), chromium (Cr) and Nickel (Ni) (Edelstein and Ben-Hur, 2018).

However, in the search for remediation of these metals, biological materials and processes have been used to remove heavy metals from textile and dye waste water but biosorption has been considered the most advantageous partly due to its non-toxic effects, accessibility and

cost effectiveness in a process termed biosorption (Kaushik and Malik, 2009). Micro-organisms are nature's original recyclers that convert toxic compound into harmless products usually carbon dioxide and water. Since scientists have discovered that microbes had the ability to break down xenobiotics, they have been exploring the diversity of microbes particularly in contaminated areas to search for organisms that could degrade large arrays of pollutants in the environment. These organisms include bacteria, yeast, algae, and fungi that are capable of tolerating unfavourable conditions, hence their use as biosorbents for the removal of metal ions from wastewaters. In lieu of these positive attributes of microorganisms towards bioremediation, this study investigated the biosorption potential of *A. vesicolor* isolated from e-wastes for heavy metals treatment in dye liquid wastes.

Methodology

Sample collection

The sample was collected from the outlet of tie and dye factory, Itoku in Abeokuta, Ogun State and Home and Rural Department, Tie and Dye Unit in Oyo State College of Agriculture and Technology, Igboora, Oyo State into a sterile bottle.

Quantitative and qualitative determination of heavy metals in ties and dye wastewater

The heavy metals (copper, chromium, cadmium, lead, cobalt) concentration of the tie and dye effluent were analysed using Atomic Absorption Spectrophotometer (AAS). The concentrations of the metal ions in liquid wastes were measured by spraying to the flame generated by AAS. The absorbance of the ions were measured at wavelength and standard calibration was plotted (APHA, 1998).

Collection of electronic waste soil

The Electronic waste soil was collected from an electronic dumping site at Apete Akufo area, Ibadan, Oyo State Nigeria. The soils were collected at four different locations on the site. Into a sterile polythene bags and were immediately transported to the microbiology laboratory of Oyo State College of Agriculture and Technology Igboora, for further microbiological analysis.

Isolation of fungi from E-waste soil

Ten grams (10 g) of the soil was weighed in 9 ml of sterile water in a conical flask and mixed on a shaker. Tenfold serial dilution was performed on the soil solution by pipetting 1 ml of soil solution into 9 ml of diluent (sterile water) in a test tube with gentle mixing. Desired serial dilutions (10^{-4}, 10^{-6} and 10^{-8}) were plated on the Potato Dextrose Agar plates (PDA) in triplicates using spread plate method. The inoculated plates were incubated at 25-28^{0}C for 3 to 5 days. Pure isolates of the fungi from soil sample was obtained and isolates were stored on agar slant for further study (Kumar *et al.,* 2010).

Screening of fungal isolates for biosorption of heavy metals

The fungal isolates were standardized using 0.5 McFarland Standard. Sterile molten nutrient agar containing 1 ml of 10 ppm of each heavy metals (Co, Cr, Cu, and Pb) prepared in 100 ml standard flask was poured on plates and each standard isolate was inoculated on agar surface by swabbing and in replicates. Plates were incubated at 25-28°C for 3 days. Colonies surrounded by a cleared zone were selected for further study. Bacterial isolates were selected for biosorption of the heavy metals (Kumar *et al.,* 2010; Olubode *et al.,* 2022).

Identification of fungal isolates

The fungal isolates were macroscopically and microscopically examined. The characterization was based on the colonial and morphological characteristics. The fungal

colonies were observed under the x40 objective of the microscope after immersing the mycelium in a drop of lactophenol cotton blue on a clean slide with cover slip (Baobil *et al.,* 2017).

Biosorption of heavy metals in tie and dye wastes

The method of Okereke *et al. (*2019) and Olubode *et al. (*2022) were used. Sterile 5 ml was inoculated with 1 ml of standard *Aspergillus vesicolor* S12 and was incubated at 28^{o}C for 5 days and 10 days with constant shaking. The quantity of the metals remaining in the solution was determined using AAS. The time of incubation was varied from 5 to 10 days. The percentage concentration of the heavy metals adsorbed by the biomass of *Aspergillus vesicolor* S12 was calculated using initial concentration – final concentration / x 100**%.**

Data analysis

Data generated from this study were subjected to statistical package for social science (SPSS 23) using one-way analysis of variance (ANOVA).

Results and Discussion

In the present study, Fungi were isolated from e-wastes soil and were screened for heavy metals biosorption for selection of the best bio-sorbent. Fungal isolate S12 and S14 were observed as the best bio-sorbent among all the isolates being able to successfully remove almost all the heavy metals (chromium, lead, cobalt and copper) from the solution as shown in table 1. The isolates were identified to be *Aspergillus vesicolor* and *Aspergillus niger* respectively (table 2). However, *Aspergillus vesicolor* adsorbed 1.32 mg/l of chromium and 0.23 mg/l of copper in solution than *Aspergillus niger* (0.12 and 0.13 mg/l) this agrees with the results of Tastan *et al. (*2010) where *Aspergillus vesicolor* bio-accumulated larger amount of chromium and copper in solution.

The amount of lead adsorbed in the work of Bairagi *et al. (*2011) by *Aspergillus vesicolor* was relatively lesser than the amount our strain adsorbed (0.17 mg/l) in aqueous medium, this may be due to the type of strain used relative to the environment where it was isolated (Electronic waste soil).

The initial concentration of some heavy metals in tie and dye effluent is shown in table 3. Chromium (Cr), cadmium (Cd), lead (Pb), copper (Cu) and cobalt (Co) were detected in the tie and dye wastewater samples A, B and C where lead and copper concentration were higher in sample B (157.86, 92.58 mg/l) as well as lead content in sample C (82.92 mg/l) than chromium, cadmium and cobalt but chromium had the least concentration in sample A(0.77 mg/l), B(0.60 mg/l) and C(0.53 mg/l). This research agrees with the findings of Adekunle *et al. (*2020) where similar heavy metals (lead, copper and chromium) were detected in ties and dye effluents but disagrees with the report of Jeenathunisa and Jeyabharathi (2021) where chromium (Cr) and zinc (Zn) were only detected in their textile effluent.

Table1: Fungi isolates screened for heavy metals bio-sorption capacity at concentration of 10 ppm

Isolates codes	Pb (mg/l)	Cr (mg/l)	Co (mg/l)	Cu (mg/l)
S12	0.17a	1.32b	0.17a	0.23ac
S14	0.14a	0.12a	0.15a	0.13a

Values within the column with different letters are significantly different at $p \leq 0.05$

Table 2: Phenotypic Identification of Fungal Isolates

Isolates code	Macroscopic appearance	Microscopic appearance	Probable fungi
S12	Colonies were slightly dark with a very dark centre and entire on PDA plates at the obverse while the reverse was creamy in colour	Conidia heads are biseriate, radiate and globose. They are prickly rough.	*Aspergillus vesicolor*
S14	Colonies are dark grey in colour entire creamy colour at the reverse	Colonial morphology is uniseriate with spherical vesicles and smooth stripes. Conidia head are globose and finely rough.	*Aspergillus niger*

Table 3: Initial concentration of heavy metals in tie and dye effluent before sorption

	Initial concentration of heavy metals (mg/l)				
Dye samples	**Cr**	**Cd**	**Pb**	**Co**	**Cu**
A	0.77	7.43	14.23	15.73	40.20
B	0.60	15.66	157.86	38.11	92.58
C	0.53	4.92	82.92	15.26	2.22

Table 4 showed the biosorption of heavy metals in tie and dye wastes by *Aspergillus vesicolor*. Cadmium was largely adsorbed than lead in sample-A (0.09 mg/l), B (0.99 mg/l) and C (0.09 mg/l) after 10 days of incubation. The research is similar to the work of Okereke *et al. (*2019) where Cd was adsorbed by banana peel than pb. The sorption of heavy metals from the tie and dye waste water revealed that, cadmium had the highest biosorption percentage, followed by cobalt and the least was chromium. This disagrees with the report of Pal and Basumajumdar (2002) where copper was observed as the highest adsorbed heavy metal followed by cadmium and the least was lead from Swine waste water when the same absorbent was used (*A. vesicolor*). This variation in sorption capacity of the bio-sorbent may be due to strains diversity as well as the environmental influence on the organism biosorption performance. The amount of chromium and lead that were left in dye waste water samples; A (0.27, 0.10 mg/l ; 3.25, 2.01 mg/l) B (0.11, 0.10 mg/l ; 55.18, 48.06 mg/l) and C (0.09, 0.02 mg/l ; 40.20, 22.25 mg/l) respectively, reduced below the maximum permissible limit given by WHO/FAO (Shirkanloo *et al.,* 2015) in soil (0.2, 67 mg/kg) after sorption by *A. vesicolor* at all the days of incubation except in sample A (0.27 mg/l) at day 5 of incubation. In this research, *A. vesicolor* was able to remove chromium from solution than *A. niger* used by Jeenathunisa and Jeyabharathi (2021) to adsorb chromium from textile and dye industrial

effluent. This may be due to differences in genetic make-up being of the same species. The amount of chromium which remained in solution decreased with increased incubation time in all the samples. Similar observation was made and reported by Jeenathunisa and Jeyabharathi (2021), where reduction in the amount of chromium in textile and dye effluent was imminent at 10 days of incubation and beyond.

Similarly, cobalt was effectively adsorbed from dye waste water at all the days of incubation by *A. vesicolor*. The result revealed that sample B (92.58 mg/l) which had the highest concentration of cobalt beyond the acceptable limit (73.3 mg/kg) of the metal in soil as recommended by WHO/FAO (Shirkanloo *et al.*, 2015) among the three samples, was greatly reduced to (2.01, 1.60 mg/l) through the sorption effect of *A. vesicolor*: an implication that our fungal strain is a promising bio-sorbent.

Table 4: Final Concentration of Heavy Metals in Tie and Dye after biosorption

Dye samples	incubation time (days)	Heavy metals concentration (mg/l)				
		Cr	**Cd**	**Pb**	**Cu**	**Co**
A	5	0.27a	0.09c	3.25e	15.05c	5.16a
	10	0.10b	0.02c	2.01f	8.09d	4.90a
B	5	0.11b	1.03a	55.18a	35.05a	2.01b
	10	0.10b	0.99b	48.06b	23.03b	1.60b
C	5	0.09b	0.32b	40.20c	4.34e	0.11c
	10	0.02c	0.08c	22.25d	2.84f	0.86c

Values within the column with different letters are significantly different at $p<0.05$

Conclusion

This study has able to emphasize the use of an eco-friendly alternative for the reduction of heavy metals before being released in to the environment. *Aspergillus vesicolor* effectively reduced cobalt and chromium in dye liquid wastes to the concentration that would not affect the plants and other living things on the soil surfaces. Hence, *A. vesicolor* could be a potential biosorbent for the treatment of tie and dye wastes water particularly in the developing nation.

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DETERMINATION OF SOME HEAVY METALS CONCENTRATION IN SOILS AROUND SOME MECHANIC WORKSHOPS IN IGBOORA, OYO STATE

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Abstract
This research was carried out to determine the concentration of heavy metals in soil around mechanic workshops in Igboora. Twenty (20) soil samples were collected in five locations from different areas of mechanic workshops at different distance and depth of 10m–20m and 5cm-20cm respectively. Five heavy metals were analysed. The samples were digested using concentrated hydrochloric acid. Heavy metal concentrations of the soils were determined by Scientific Buck 211 Atomic Absorption Spectrophotometer (AAS). The concentration of the metals (Pb, Ni, Cu, Cr and Cd) were found in the range of 0.003 – 0.034 ppm, 0.012 – 0.056 ppm, 0.0008 – 0.0048 ppm, 0.017 – 0.074 ppm and 0.000 – 0.021 ppm respectively. The trend showed Cr>Ni>Cu>Pb>Cd for the soils studied. Cr was very much higher than the other heavy metals concentrations. The levels of all metals considered were below the World Health Organization (WHO) recommended limit. Hence, the cumulative effect through bio – accumulation might be of concern in future, thus calling for urgent attention on regular monitoring of the anthropogenic activities and its influence on the environment. The result does not indicate serious pollution or contamination risk on the selected soils. Thus, relatively moderate concentration should be considered on bio-accumulation occurrence for further studies.
Keywords: Mechanic workshops, concentration, heavy metals, different depth, bio-accumulation.

Introduction

Heavy metal contamination in soil is a major concern because of their toxicity and threat to human life and the environment (Abida *et al.*, 2008). Heavy metals and other pollutants such as polycyclic aromatic hydrocarbons are major components of petroleum hydrocarbons including bitumen (Ajayi *et al.*, 2009). Toxic metals entering the ecosystem may cause geo-accumulation, bio-accumulation and bio-magnifications. These metals accumulate with time in soils and plants and would have a negative influence on physiological activities of plants (e.g. photosynthesis, gaseous exchange and nutrient absorption) (Suciu *et al.*, 2008).

Recently, soil is polluted by heavy metals with regards to mining, smelting, irrigating with sewerage and some other human activities. These activities may adversely affect soil ecology, agricultural production or product quality, and ground water quality, and ultimately harm health of mankind by food chain. These effects are closely related to the biological availability of heavy metals, which in turn are controlled by the metal ion speciation in the soil (Davis *et al.*, 1992).

In Nigeria high level of Pb and Zn has been reported due to emission from motor vehicle exhausts and vehicle component wear which they have been exposed to (Eruyogho *et al.*, 2007). The use of leaded gasoline in cars is one of the major sources of Pb pollution in cities around the world (Mathews, 2012). Soils, plants and foods are major receptacles for these

atmospheric emissions. The levels of heavy metals in the environment have been seriously increased during the last few decades due to human activities. Since the toxicity of heavy metals is related to their existing species, their speciation is increasingly attracting more attention (Emmanuel *et al.,* 2008). There is an increasing need to determine concentration of contamination rapidly and precisely, in particular those of toxic heavy metals.

Man's activity in the environment has led to the pollution of soil mainly by chemical contaminants. Presently in developing countries like Nigeria where findings have shown that; there is large number of illiteracy in the country, inadequate knowledge on eradication of the problem of soil pollution. The presence of heavy metals in soil can affect the quality of food, groundwater, micro-organisms activity, plant growth etc (Adelekan *et al.,* 2001).

Materials and methods

Materials

Sieve, Measuring Cylinder, Heating Mantle or Hot Plate, Beaker, Glass Rod, Concentrated HNO_3, Plastic Packer, Transparent Plastic Bottle, Polythene Bag, Filter Paper, Weighing Balance.

Sample Collection

A total of twenty (20) samples of soilswere collected from five locations (Site A, B, C, D and E). Four samples at each location were collected at different distance and depths. At each sampling point, samples were collected randomly using polythene bag and plastic packer. The plastic packer was used to excavate the soil while polythene bag was used for collection. Each sample was carefully labelled and stored in separate containers to avoid cross contamination and transported to the laboratory for analysis.

Preservation

Samples were air dried to remove excess moisture and kept in the laboratory.

Digestion of Samples

One gram (1g) each of the sieved soil samples were weighed out and transferred into a clean 100ml beaker. 10ml of 1.2 nitric acid and hydrochloric acid was added and heated gently on heating mantle until digestion. The beaker was allowed to cool down, after cooling; the mixture was filtered using a filter paper. De–ionized water was used to rinse the beaker until filtrate of 50ml was produced. The filtrate was kept inside white transparent polythene bottle. The concentration of heavy metals (lead, copper, nickel, chromium and cadmium) was determined by the use of Atomic Absorption Spectrometer AAS, Buck Scientific Model 211.

Result and Discussion

Result

The results of the analysis are shown in tables below.

Table 1: Lead (Pb) Concentration (ppm) in soils around some mechanic workshops

Site	10m 5cm	10m 20cm	20m 5cm	20m 20cm	WHO Value
	0.025	0.014	0.021	0.003	85
	0.027	0.016	0.023	0.004	
	0.029	0.018	0.025	0.006	
	0.031	0.021	0.028	0.008	
	0.034	0.023	0.026	0.009	

Table 2: Nickel (Ni) Concentration (ppm) in soils around some mechanic workshops

Site	10m 5cm	10m 20cm	20m 5cm	20m 20cm	WHO Value
A	0.038	0.025	0.026	0.012	35
B	0.042	0.029	0.029	0.015	
C	0.051	0.032	0.041	0.017	
D	0.053	0.038	0.045	0.021	
E	0.056	0.044	0.047	0.027	

Table 3: Copper (Cu) Concentration (ppm) in soils around some mechanic workshops

Site	10m 5cm	10m 20cm	20m 5cm	20m 20cm	WHO Value
A	0.0033	0.0029	0.0014	0.0008	36
B	0.0035	0.0027	0.0019	0.0011	
C	0.0043	0.0031	0.0024	0.0014	
D	0.0046	0.0034	0.0029	0.0016	
E	0.0048	0.0037	0.0031	0.0019	

Table 4: Chromium (Cr) Concentration (ppm) in soils around some mechanic workshops

Site	10m 5cm	10m 20cm	20m 5cm	20m 20cm	WHO Value
A	0.051	0.034	0.029	0.017	100
B	0.054	0.041	0.038	0.022	
C	0.063	0.046	0.042	0.025	
D	0.069	0.049	0.044	0.028	
E	0.074	0.055	0.048	0.031	

Table 5: Cadmium (Cd) Concentration (ppm) in soils around some mechanic workshops

Site	10m 5cm	10m 20cm	20m 5cm	20m 20cm	WHO Value
A	0.006	0.004	0.002	0.000	0.8
B	0.009	0.006	0.004	0.001	
C	0.021	0.009	0.006	0.004	
D	0.014	0.011	0.007	0.003	
E	0.017	0.013	0.009	0.005	

Discussion

Table 1 shows the concentration of lead (Pb) at 10m 5cm, 20m 5cm, 10m 20cm and 20m 20cm. The concentration of Lead (Pb) at site A to E, at different distances and depths ranges from 0.003 – 0.034ppm. The highest concentration of lead (0.034) was found at site E (10m 5cm). The range value for lead in this study is lower compared to FCT soils (Kabiru *et al.,* 2015). Table 2 shows concentration of nickel (Ni) at 10m 5cm, 20m 5cm, 10m 20cm and 20m 20cm. The concentration of nickel (Ni) at the different distances and depths ranged from 0.012 to 0.056 ppm. The highest concentration was recorded in 10m 5cm at site E area. The highest concentration of nickel (Ni) is 0.056 ppm and the lowest concentration of Nickel (Ni) is 0.012 ppm.

Table 3 above shows the concentration of copper (Cu) at 10m 5cm, 20m 5cm, 10m 20cm and 20m 20cm. The concentration of copper (Cu) ranged from 0.0008 to 0.0048 ppm at sites A to E. The concentration of copper (Cu) was also found to be highest (0.0048 ppm) in site E. the observed result agrees with studies reported by Khan *et al. (*2011). Table 4 shows the concentration of chromium (Cr) at 10m 5cm, 20m 5cm, 10m 20cm and 20m 20cm. The concentration of chromium (Cr) at different depths and distances in the samples was found in

the range of 0.017 – 0.074 ppm. The concentration of chromium (Cr) was found to be highest (0.074 ppm) in site E. Table 5 shows the concentration of cadmium (Cd) at 10m 5cm, 20m 5cm, 10m 20cm and 20m 20cm. The concentration of cadmium (Cd) in the soil samples was found in the range of 0.000 – 0.021 ppm. The highest concentration (0.021) was recorded in 10m 5cm at site C area which. The level of Cd in this study is lower than the values reported by Yap *et al. (*2010). From the results obtained, heavy metals were present in all the samples. The levels in some samples indicate higher concentration while in others, it indicated lower concentration. In this study the following trend of heavy metal contamination was established; Cr>Ni>Cu>Pb>Cd for the soil samples studied. Cr was found to be higher than other heavy metal concentrations.

Conclusion and Recommendation

Conclusion

The relatively low content of the metals investigated in this study shows a future risk. This does not rule out the possibility of increase in concentration of these metals with time, since the extent of heavy metals pollution varies with age. The concentration of the heavy metals in the soil suggested that the metals are of natural origin with contribution from anthropogenic influences. It can be concluded that there is low impact of automobiles exhaust emission on the soil around the selected locations. Hence, the cumulative effect through bio–accumulation might be of concern in future, thus demands for urgent attention on regular monitoring of the mechanics activities and its influence on the environment. The result does not indicate any serious pollution or contamination or risk on the selected soil. The moderate concentration should be monitored for proper determination of bio-accumulation.

Recommendation

It can be suggested from the results that heavy metals are present in the soil around us and an excessive accumulation of these metals in the body can result to different diseases. Therefore, parents should ensure proper care of children to prevent them from ingesting soil around mechanic workshops, as it may contain some heavy metals whose accumulation could have negative and adverse effect on children's health. Based on the observations from this work, the following were recommended:

(i) This research work should be carried out from time to time to monitor the amount of heavy metals released into the soil to avoid accumulation.

(ii) Also, the research should be repeated in the dry season or preferably in both dry and rainy season so as to get more accurate results.

(iii) There is the need to investigate water bodies close to the mechanic workshops so as to assess and monitor the concentration of heavy metals in the water due to the activities in the mechanic workshops.

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NUTRITIONAL AND PHYSICOCHEMICAL EVALUATION OF OIL EXTRACTED FROM CASHEW NUT (ANACARDIUM OCCIDENTALE) OBTAINED FROM IGBOORA IBARAPA CENTRAL LOCAL GOVERNMENT AREA, OYO STATE.

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Abstract
Nutritional and physicochemical Compositions of cashew (Anacardium occidentale) nut oil were determined using standard methods.
The proximate composition in percentage includes moisture (7.0), ash (3.9), crude fat (49.2), crude protein (35.9), crude fibre (3.5) and carbohydrate (1.5). The selected minerals composition (mg/100g) of Anacadium occidentale nut oil showed potassium (28.6±0.6), Magnesium (20.4±0.1) and sodium (8.4±0.1). Zinc and iron concentrations were lower. The physicochemical properties of nut oil of Anacardium occidentale were as follows: colour (yellow), refractive index (1.460), specific gravity (0.982), acid value (10.6mg/KOH/g), saponification value (135mgkoH/g), iodine value (40.6mgiodine/100g) and free fatty acid (5.5mgkoH/g). Vitamins also showed that vitamin E had the highest concentration of 22580ppm while vitamin had the lowest concentration of 6.3ppmVitamins A and D had concentrations of 334.8ppm and 48.5ppm respectively. This is an indication that the oil extracted is nondrying; edible may not be used for soap production and a source of fat soluble vitamins.
Keywords: Vitamin, Protein, soluble, Free fatty acid, carbohydrate, fats.

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Introduction

The *Anacardium occidentale* tree is originated from Brazil. It is a valuable cash crop in West Indies, India, Malaysia and Madagascar (Franked, 2000). The economic importance of this special tree is such that, it is now widely distributed throughout the tropics, particularly in any parts of Africa and Asia. The *Anacardium occidentale* tree will tolerate a wide range of environment condition.

The *Anacardium occidentale* nut is a high value edible nut, it yields two major oils one of these found between the seed pericarp and the nut. It is not a triglyciode and contains a high proportion of phenotics compound. It is used in industry as raw material for brake living compounds as a water proofing agent, a preservative and in the manufacturing of pants and plastics. It is toxic and corrosive to the skin (Adeyeye, 2004) ability of *Anacardium occidentale* applies to simply and fortify the institutional requirement for vitamin C, especially in Africa region was reported by Akinwale, (2000). The author carried out a physicochemical evaluation of some tropical fruits and compound them with those fruits and compound them with those of *Angrea occiddentale* apple. *Anacardium occidentale* apple juice was found to certain the highest amount of Vitamin C (203.5mg/100ml) of edible portionad when the *Anacardium occidentale* apple was blended with other tropical fruits, is boosted their nutritional quality. The usefulness of *Anacardium occidentale* nut oil cannot be overemphasized.

Fat soluble vitamins play an important roles in keeping the body healthy and functioning from immune system and muscle and heart function, easy flow and clotting of blood as well

as eye health. Fat-soluble vitamins are soluble mainly in liquid or oils and thus called fat - soluble vitamins (Panchumarthy *et al.*, 2015). Vitamin A maintain the right balance of these vitamins are transported with fat and stored in the liver and fat tissue. Deficiency in vitamin D can cause fragile, thin or deformed bones and ricket in children and osteomalacia in Adults.

The aim of the present study is to determine the nutritive value and investigate physico-chemical properties of *Anacardium occidentale* species in Ibarapa zone to confirm it usefulness.

Materials and method

Sample Collection

The *Anacardium occidentale* sample were collected from farm in Igboora

All organic solvents and chemicals used in the analysis were of analytical grade. The sample collected were cracked wth manual*anacardium occidentale* kernel cutter to separate the nut from the shells. The nuts were died at 45^0c in the oven for 4hrs. 200g of the nuts were ground into powder using a mains-separated food grinder (HR 2811 panasonic model). The powder sample were kept in air tight contain until ready for analysis.

Analysis of sample

Analysis of proximate composition.

The recommended methods of the association of official analytical chemists (AOAC, 2010) were employed in determining the level of moisture, ash, crude protein, and crudefiber crude fat. Moisture content was determining by heating 2.0g of each sample to a constant weight in a crucible placed in an drying oven (plus 14 sanyo Gallen kamp plc UK) maintained at 105^0c for 3hrs.

Ash was determined by the incineration of 1.0g samples placed in a murffle furnance (LMF4 from UK) maintained at 550^0c for 5hrs. Crude protein (% total nitrogen x 6.25) was determined by khedjal method using 1.0g samples. Crude fat was determined by exhaustively extracting 5.0g of samples in soxhletapparatus using N-hexane as extracting solvent (Onyeike and Onwuka 2009). Total carbohydrate was obtained by difference.

Analysis of mineral in *Anarcadium occidentale* oil

The minerals sodium, potassium, lead, iron, copper, zinc, magnesium and calcium were determined by atomic absorption spectrophotometer (AAS) 1.0g of samples in triplicate were dry ashed in a murffle furnace at 550^0c for 5hrs until white residue of constant weight was obtained. The minerals were extracted from ash by adding 20ml of 2.5% HCl heated in a steam bath to reduce the volume at about 7.0ml and this was transferred quantitatively to a 50ml volumetric flask. It was dilute to 50ml with deionized water stored in a clean polythene bottle and the mineral contents determined using AAS model AA 320N USA).

Analysis of physicochemical properties

The acid value, iodine value were determined using the method of Devine and Williams (1999). The saponification number was determined by method of Williams (1990). Specific gravity was determined by a universal hydrometer and refractive index at 25^0c was determined using Abbe Refractometer.

Determination of vitamin (A, D, E and K)

Vitamin A, D, E and K were determined according to the method of Perez-Ruiz *et al. (*2007) and wittiy *et al. (*2013).

Result and dicussion

The proximate composition of the *anarcardium occidentale* nut oil studied are shown in (table 1). From the data it was observed that the cashew nut (*anacardium occidentale)* oil

contain crude fat (49.2%) and protein (35.9%). It also contained moisture (7.0%), Ash (2.9%), crude fibre (3.5%) and carbohydrate (1.5%). Some of these % values were in agreement with those reported by (Eromosele *et al.*, 1994, Arogba *et al.*, 1999, Achal *et al.*, 2002). The content of *Anacardium occidentale* nut oil was 7.0%. This value fell within the range of mean value of moisture of legumes (between 7.0% and 11.0%) as reported by Arkroyed and Doughty (2004). This implies that Seed with low moisture content could store for a longer time without spoilage. Ash content of *Anacardium occidentale* nut oil in this study was 2.9%. Previous studies showed that ash content of Kolanut Jack bean and cowpea to be 3.1%, 3.6% and 3.2% respectively (Arogba *et al.*, 1999), and of cashew nut flour 4.4±0.1% (Aremu *et al.*, 2006). Ash content of 1.5-2.5% for nuts has been recommended for suitability as animal feeds (pomeranz and Clifton 2001). The values of fat and protein were also comparable to those obtained by Aremu *et al. (*2006). The crude fat (49.2%) is comparable to the values for varieties of melon oil seeds (47.9-51.1%) reported by Fagbemi and Oshodi, (1991). The crude fat content was higher than those reported for soya bean seed oil 23.5% (Paul and South gate 2000). This may be due to difference in the species of *Anacardium occidetale* nut and environment in which they are grown. Fat promotes the absorption of fat soluble vitamins hence it is very important in diets.

This value of fat is an indication that *Anarcadium occidentale* nut oil is a good oil seed particularly when compare with African yam been with a fat content of 2.5% (Edeni *etal.*, 1990). It is therefore a good source of edible oil that can be employed in cooking and food industries. The high protein and fat content reported in this study were in agreement with work of Arogba (1999) on *Anacardium occidentale*. The protein content (35.9%) is higher than previous work reported for a number of seed oil like Sahm seed oil (22.5%; Al-Jassir *et al.*, 1995), (Carica papaya seed oil (20.4±0.7%); passera *et al.*, 2001). That the protein content of cashew nut oil is higher comparable to previously report shows that, it is nutritiously rich (Achal *et al.*, 2002). The protein content of *Anacardium occidentale* nut oil analyzed suggest that it can contribute to the daily protein need of 23.6g for Adult as recommended by National Research Council (NRC) (2004). Protein also plays a part in the organoleptic properties of foods in addition the being a source of Amino acids (Akinwale, 2000). The crude fibre of cashew nut oil in this study was (3.5%) comparable favorably with the USDA nutrients data base for the fiber content of cashew nut by weight percent which range from (3.0-3.8%) Aremu *et al.* (2006) recorded a lower value (1.2±0.3%) for cashew nut floor crude fiber helps in maintenance of normal peristatic movement of the intestinal tract hence diet containing low fibre could cause constipation and eventually lead to colon disease (Okon, 2003).

Table 1 : proximate composition of cashew nut oil

Proximate	Composition (%)
Ash	2.9
Crude oil	49.2
Crude fibre	3.5
Moisture	7.0
Crude protein	35.9
Carbohydrate	1.5

Physicochemical properties of cashew oil

Table 2 shows the physicochemical properties of cashew oil. The extracted oil from the cashew nut is yellowish in colour. It had a specific gravity of(0.982) which showed that it is less dense than water and refractive index of (1.460) which showed that it is not as thick as

most drying oils whose refractive index value fell between 1.475 and 1.485 (Eromosele and Paschal 2002).

The iodine value 40.6mg iodine/100g of cashew nut oil is in close agreement with value 44.4±0.1mg iodine/ 100g from previous work on cashew nut by Aremu *et al. (*2006) and for Northern melon seed oil, 38.50±0.67% (Oladimeji *et a.l,* 2001). Oils are classified into drying, semi drying and Non-drying according to their iodine value. Since the iodine value of oil under study is lower than 100 it could be classified as a non-drying oil. The low iodine value indicates that the oil has a low content of unsaturated fatty acids which is an evident in the acid and free fatty acid value 5.5mg KOH/g. The saponification value of oil was 135mg KOH/g. this was lower than the value of some common oils like palm oil which ranges between (196-205mgKOH/g), groundnut oil (188-196mg KOH/g) corn oil (187-196mgKOH/g) (Pearson 2006). However, this saponification value is within the same range of some edible oils as reported by Eromosele *et al. (*2002). The low saponification value is an indication that the oil may not be suitable for soap production.

Table 2: Physicochemical properties of cashew oil.

Physicochemical	Concentration
Colour	yellow
Refractive index	1.460
Specific gravity	0.982
Saponification value (mgKOH/mg)	135
Iodine value mg iodine/100g	40.6
Acid value mgKOH/g	10.6
Free fatty acid mgKOH/g	5.5

Mineral composition of cashew nut oil

The mineral content of cashew nut oil is indicates in Table 3. Potassium (K) had the highest concentration (28.6 $\pm$ 0.2mg/100g). This is in line with previous work by Olaofe and Sanni (2008). This was followed closely by calcium (Ca) (22.3 $\pm$ 0.6mg/100g), magnesium (Mg) (20.4 $\pm$ 0.1mg/100g) and sodium (Na) (8.4 $\pm$ 0.6mg/100g). Magnesium has been reported to be involved in maintains the electrical potential in nerves and activation of some enzymes system (Ferro *et al.*, 2007). The calcium (Ca) content is in agreement with Aremu *et al. (*2006). Calcium is responsible for the formation of bone and teeth. Zinc, iron and phosphorus recorded low values in the oil, therefore the oil is not rich in Zinc, Iron and phosphorus as mineral elements.

Table 3: Mineral composition of cashew nut oil

Mineral	Composition (mg/100g)
Magnesium (mg)	20.4±0.1
Calcium (Ca)	22.3±0.6
Sodium (Na)	8.4±0.6
Potassium (K)	28.6±0.2
Zinc (Zn)	0.7±0.1
Iron (Fe)	0.5±0.3
Phosphorus (p)	0.3 $\pm$ 0.1

Values are means ± standard deviation triplicate determination

Vitamin composition of *Anacardium occidentale* oil

Table 4 shows the vitamin composition of cashew nut oil the result indicate that vitamin E has the highest concentration of 22580ppm indicating that the oil is highly rich in vitamin E.

the next vitamin with higher concentration is vitamin A with 334ppm while vitamin D and vitamin K have low value in the oil from all indications, it implies that the oil contains fat soluble vitamins which are used in nerve impulses and enzyme systems.

Table 4 vitamin compositions of oil extracted from cashew *anacadium occidentale*

Vitamins	Concentration in the oil (ppm)
A	334.8
D	48.5
E	22580
K	6.3

Conclusion: The cashew nut oil is of high economic value different ways. The result of this study had showed that the cashew nut oil is nutritionally richer than some other nut oils and seeds. The high protein content in cashew nut oil shows its potential to supply adequate amount of amino acids for children and adults. The physicochemical properties of the oil also indicate that it is a nondrying edible and may be unsuitable for soap making and the oil is richly in vitamin E and A. Further work could be done on the oil to exploit the advantage of phytochemical consistuents of the oil for further elucidation.

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ANALYSIS OF STUDENTS' PERFORMANCES IN WAEC, USING ENGLISH LANGUAGE AS CASE STUDY.

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Abstract
The study examined the passes and the failure rates of the students in WASSCE English Language in a selected School in Ogbomoso, Oyo State in Nigeria. The WASSCE results in English Language for eight consecutive years from 2010-2017 were collected from the school, with the cooperation of the school principal. It was discovered that between 2010 and 2017 the number of students who sat for May/June WASSCE English Language in George Green Secondary School, Ogbomoso, Nigeria was 557. Two research questions and a hypothesis guided the study. The research questions were answered using percentages while pearson correlation moment was used to test the null hypothesis. Findings from the research work showed that the population of students that sat for WASSCE English Language decreased by 21% after a period of 4 years, the null hypothesis was rejected and the research hypothesis accepted which showed that there was significant relationship between the students passes rate and the failure rates in the school. The study recommended among others that, more qualified English Language teachers should be employed into the secondary schools to cater for teacher and students ratio of 1:50, adequate provision and supply of teaching aids on English Language, construction of English Language workshop to Secondary Schools and English Language teachers should follow and complete the curriculum for the students.
Keywords*:* Achievement, English Language, Examination

Introduction

WASSCE is an examination annually conducted uniformly in all English speaking West Africa Countries for all the Secondary Schools. All the students in the secondary schools undertake this examination at the same time between May/June each year, based on the situations in the Country. English Language is one of the core subjects in the secondary schools which each student must pass at least at credit level before proceeds further in his education to Tertiary Institution. The curricular lay emphasis on it and it takes a higher rank (Aminu, 1987). WAEC (West Africa Examination Council) has been the no one examination body for Olevel for a number of years. The importance of English Language has been recognized worldwide especially as one of the major prerequisite for gaining admission into Tertiary Institution.

The WAEC is one of the major examining bodies in Nigeria, among others which are NTI (National Teachers Institute), NABTEB (National Business and Technical Examinations Board) and JAMB (Joint Admission and Matriculation Board). It was set up in 1952 as an inter-territorial body to conduct examination that will suit the need (Interest) of West Africa (Asuru 2006). Several researchers have worked in this area before among which we have, Akin(2007), which conducted a study to investigate if there is any significant relationship between the school certificate grade in English Language and the Federal University of Technology, (FUTA), Akure grade in General Studies (GNS) 104 Course that is ,Information Retrieval using two hundred and thirty eight students. The results showed that there was

significant relationship between the school Certificate grades in English Language and FUTA grades in Information Retrieval. Geishina (2006) studied students' achievement in NECO English Language examination to find out the level of correlation between the Use of English Language and communication Skills Course in the Polytechnics. Uguma (2013) studied academic achievement in WAEC/NECO English Language Examination, Use of English and Undergraduate Students' Performance in programmes of Study in Cross River State. Jolayemi, (1999) investigated the effectiveness of teaching technical English in two technology-based institutions, using a Skill oriented Interactive Oriented teaching method on learners' performance in their areas of study. Three hundred students in the fourth year in each institution were used for the research work. The national policy on education (FRN,2004) stresses the importance of proper teaching of the students for them to acquire the required skills that will make them fit for the society and for them to function well . Ajao, (2012),conducted a research on Correlational analysis of students' achievement in WAEC and NECO Mathematics. Adewale, (2016) ,carried out a research on academic performance in Biology in SSCE and the influencing factors among students in Owerri municipal of Imo State, Nigeria. Zalmon, (2017) comparatively analyzed the students' achievement in Mathematics WASSCE in Nigeria.

Aims and objectives of the study

The study investigated the passes and the failure rates of the students in WASSCE English Language.

The study shall:

1. Determine the significant relationship between the passes and failure rate in WASSCE English Language result.
2. Ensure the increase or decrease in the percentage of enrollment
3. Compare the percentage passes and the percentage failed

Research questions

1. What is the significant relationship between the passes rate and the failure rate in WASSCE English Language result?
2. What is the percentage passes (D8 – A1) and the percentage failed (F9)?
3. What is the comparison between the percentage passes and percentage failed?

Research hypothesis

Ho: There is no significant relationship between the students passes rates and the failure rates in WASSCE English Language in the selected school in Ogbomoso, between 2010 – 2017.

Methodology

The correlation coefficient (r_{xy}) of the relationship between students' achievement in WASSCE English Language from 2010 to 2017 in George Green Secondary School, Ogbomoso were calculated.

Pearson Correlation Coefficient $(r_{xy}) = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{[N\,\Sigma X^2 - (\Sigma X)^2)]\,[N\Sigma Y^2 - (\Sigma Y)^2]}}$

Where:

N = Number of pairs

X = Passes rate

Y = Failure rate

Results

Research Question One: What is the percentage increase in the population of students in George Green Grammar School, Ogbomoso that sat for the May/June WASSCE in English Language between 2010 to 2013 and 2014 to 2017.

Results:

Table 1: Total number of students that sat for the May/June WASSCE in English Language between 2010 to 2013 and 2014 to 2017.

S/N	Year	Total Enrollment	Year	Total Enrollment
1.	2010	100	2014	44
2.	2011	100	2015	69
3.	2012	72	2016	74
4.	2013	65	2017	33
Total		337	Total	220

Table 2: Decrease in the percentage of the number of students who enrolled for May/June WASSCE in English Language between 2010 to 2013 and 2014 to 2017.

Year	Total Enrollment	Decrease	Percentage decrease
2010-2013	337	117	21.0%
2014-2017	220		

Table 1 showed that the total number of students that sat for WASSCE in English Language between 2010- 2013 was 337 while 220 students enrolled for the same examination between 2014-2017.Table 2 Showed that after 4 years the population of students who wrote WASSCE English Language in George Green Grammar School, decreased by 117 (21%).

Table 3: The examination enrollment and the number of students for the selected years and the academic performance

Year	Total Enrollment	No. of Grades A1-C6	% (A1-C6)	Pass (D7-D8)	% (D7-D8)	%Fail	% Pass (Overall)
2010	100	63	63	37	37	-	100
2011	100	82	82	18	18	-	100
2012	72	56	78	16	22	-	100
2013	65	18	27.7	20	30.8	27	59.5
2014	44	31	70.5	12	27.3	1	98
2015	69	27	39	28	41	14	80
2016	74	39	52.7	19	25.7	16	78.4
2017	33	23	60.7	7	21.2	3	91

In the year 2013 the % passes overall was relatively lower (59%) than nat the year 2015 (80%), the highest percentage overall was recorded in the years 2010, 2011and 2012 (100%), 2014 with (98%) pass rate which was next to the highest.

The year that recorded the highest percent passes at credit level and above was 2011 (82%). The lowest was recorded in 2013 (27.7%). In three consecutive years (i.e 2010, 2011 and 2012) 100% pass was achieved overall, which means that, there was no failure at all. The next best was in 2014 (97.8%) followed by 2017 (90.9%). In the year 2015 (80%) pass was achieved, while in the year 2013 and 2016 the overall passes were 59.5% and 78.4% respectively.

The highest percentage failure was recorded in the year 2013 (41.5%), while that of the year 2016 was (21.6%). The year with the least percentage failure was 2014 (2.3%), followed by 2017 (9.1%), while 2015 recorded 20%.

Table 4: Percentage of scores for each year at the school

S/N	Year	Total Enrollment	Grades Pass	% Pass	Total failed	% failure
1.	2010	100	100	100	-	-
2.	2011	100	100	100	-	-
3.	2012	72	72	100	-	-
4.	2013	65	38	58.5	27	41.5
5.	2014	44	43	97.8	1	2.3
6.	2015	69	55	80	14	20
7.	2016	74	58	78.4	16	21.6
8.	2017	33	30	90.9	3	9.1

Pearson Correlation Coefficient r = $\frac{N\Sigma XY-(\Sigma X)(\Sigma Y)}{\sqrt{[N\,\Sigma X^2-(\Sigma X)^2)]\,[N\Sigma Y^2-(\Sigma Y)^2]}}$

Where:
N = Number of years = 8
X = Total passes
Y = Total failure
r = 0.00073

Interpretation of data

The strength of the relationship was shown from the value of the number (r), whether positive or negative. The result indicated that we have a very low degree of correlation since the value is zero.

Discussion and findings

The study investigated the achievement of students in WASSCE English Language May/June between the year 2010 and 2017.

From the result, we discovered that there was a significant correlation between passes and failure rates of the students in the selected school. The null hypothesis was rejected and the research hypothesis was rejected and the research hypothesis accepted which stated that there was significant relationship between passes rate and failure rate in the selected school.

The result in table I showed that the total enrollment between 2010 and 2013 was 337 while the total enrollment between 2014 and 2017 was 220. The result in Table 2 revealed that population of students in George Green Secondary School, Ogbomoso who sat for WASSCE English Language decreased by 21% after a period of four years.

Also, the result in table 3, showed that the highest percentage passes were recorded in the year 2010, 2011 and 2012 consecutively (100%), while that of the year 2013 was relatively lower (59%) than the percentage passes in the year 2015 (80%). The result indicated that the percentage pass in 2014 was closer to those of year 2010 to 2013 (98%), while the percentage pass rate in 2016 and 2017 are (78.4%) and (91%) respectively. Year 2011 (82%) recorded the highest percentage passes at credit level and above, while the lowest percentage pass at credit level and above was recorded in 2013 (27.7%). In three consecutive years (2010, 2011 and 2012) 100% pass was achieved overall, which indicated that there was no failure at all in those three years.

The next best was in 2014 (97.8%) followed by 2017 (90.9%). In the year 2015 (80%) pass was achieved, while in 2016 and 2013 the overall percentage pass was (78.4%) and (58.5%) respectively. Year 2013 (41.5%) recorded the highest percentage failure, followed by 2016 (21.6%) while 2014 (2.3%) was the year with the least percentage failure followed by 2017 (9.1%) while in 2015 (20%) failure was achieved.

Conclusion

From this research work, it was discovered that the number of George Green Secondary School that sat for WASSCE in English Language in the year 2010 t0 2017 decreased by 21% after a period of 4 years. This may be as a result of the poor performances in years 2014 to 2017. The results indicated that there was a significant correlation between passes and failure rates of the students in the selected school. In order to improve on this, there should be reformation of English Language curriculum, construction of English Language laboratory in secondary schools, provision of effective teaching and learning materials in English Language. Appointment of more qualified English Language teachers to Secondary Schools and to crown it all English Language teachers should make sure that they finish the contents of the syllabus with the students before writing WASSCE.

Recommendation

The following recommendations were made from this research work:

1. There should be reformation of English Language curriculum in order to meet up with the present age academic challenge.
2. Appointment of more qualified English Language teachers to our Secondary schools.
3. Adequate provision/supply of effective teaching and learning materials in English Language to our secondary schools.
4. Construction of English Language laboratory/workshops to our secondary school.
5. Organization of workshops/seminars for English Language teachers in Secondary Schools.
6. There should be motivation like grants etc for English Language teachers in Secondary Schools.

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PROXIMATE AND SENSORY EVALUATION OF COMPLEMENTARY FEEDING FOR HOUSEHOLD CONSUMPTION

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Abstract
The production of complementary diet was produced using roasted wheat, millet, groundnut, soybeans and sorghum. The cereals were selected by Sorting, washing, oven dried, roasted and dry milled to form a complementary diet, packaged, labeled and subjected to sensory evaluation in the Department of Home and Rural Economics. The products were assessed for colour 14 (70.0%), flavour 9(45.0%), taste 6(30.0%), aroma 8(40.0%) and overall acceptability 12(60.0%) respectively. It was also taken to food laboratory to test for the analysis, the result revealed that moisture (29.39%), ash (2.78%), crude fat (29.26%), crude fibre (2.11%), Crude protein (27.33%) and carbohydrate content (18.86%), this was confirmed by the panelists. It was recommended that complementary diet will meet the nutritional needs of the infants and alleviate the poverty level of households, food industries or companies should applied the techniques for roasting wheat, millet, groundnut, soybeans and sorghum in the production of complementary diet for an infants.
Keywords: Complementary, Diet, Proximate, sensory, Household, Consumption.

Introduction

Complementary feeding commenced when breast milk alone is no longer sufficient to meets the nutritional requirements of infants and therefore other foods and liquids are needed along with breast milk illustrated by World Health Organization (WHO). In the past, such foods were often called ‘weaning foods’. However, the term ‘complementary foods’ is preferred because weaning implies the cessation of breastfeeding, whereas the goal is that such foods should complement breast milk, not replace it. Breast milk alone is generally sufficient to meet the nutrient needs of infants during first six (6) months of life, but after that time infants need additional sources of nutrients. WHO recommends exclusive breastfeeding thereafter (along with the provision of safe and appropriate complementary foods) until two (2) years of age ranges of 6-24 months.

Soybean (*Glycine max*) is widely grown for its edible bean and it has numerous uses. Soybean contain significant amounts of phytic acid, dietary minerals and B vitamins and it also has protein and soybean oil content account for 56% of dry soybeans bt weight (36% protein and 20% fat, the remainder consists of 30% carbohydrate, 9% water and 5% ash. Soybeans comprise approximately 8% seed coat or hull, 90% cotyledon and 2% hypocotyls axis or germ asserted by Singh *et al. (*2006). Some of the most common products produced with soybeans are tofu, soy milk, soy sauce, tempeh, textured vegetable protein (TVP) and soy flour (Host *et al.*, 2008). Approximately 85% of soy bean grown around the World are used to make vegetable oils that are either sold to consumers or used commercially.

Groundnut (*Arachis hypogaea*) is a legume crop grown mainly for its edible seeds and is important to both small and large commercial producers and classified as both grain legumes due to its high oil content, an oil crop (Lack *et al.*, 2003).. The peanut belong to the botanical family Fabaceae (*leguminosae*), commonly known as the legume, bean, or pea family (Seijo *et al.*, 2007). Groundnuts are packed with vitamins such as vitamin E, magnesium, folate, copper and arginine. In addition, groundnuts are good sources of calcium, phosphorus, iron, zinc and boron. The groundnuts also contain small amounts of vitamin B complex, high in

calories, 5.6calories. Groundnuts are great blend of healthy fats, protein and fibre that curbs appetite lowers the risk of heart diseases and regulates blood glucose levels spined by Moretzsohn, Marcio *et al. (*2013).

Millets are highly varied group of small-seeded grasses, widely grown around the world as cereal crops or grains for fodder and human food. Millet is rich in dietary fiber, both soluble and insoluble. The soluble fiber in millet is known as a "prebiotic," that means it supports good bacteria in digestive system. The type of fiber is also important for adding bulk to stools, which helps keep regular and reduces risk of colon cancer (McDonough *et al.,* 2000). The nutritional values of millet per 100g are carbs (60.9gm), fat (5.2gm), iron (9.3gm), phosphorus (220mg), iron (9.3mg), calcium (17mg), calories (329kcal) and magnesium (114mg) illustrated by Pokharia *et al. (*2014).

Wheat is widely cultivated for its seed, a cereal grain that is a worldwide staple food and important source of carbohydrate which is globally a leading source of vegetable proteins in human food, having a protein content of about 13% which is relatively high compared to other major cereals but relatively low in protein quality for supplying essential amino acids and when eaten as the whole grain, wheat is a source of multiple nutrients and dietary fiber (Lu, Houyuan *et al.*, 2005).

Objective of the Study

The main objective of the study is to assess the sensory evaluation and proximate composition of complementary feeding produced from roasted soybean, groundnut, millet and wheat. The specific objectives are to;

i. produce complementary diet using roasted soybean, roasted groundnut, millet and wheat
ii. Assess the sensory evaluation of complementary diet produced from roasted soybean, roasted groundnut, millet and wheat
iii. Determine the proximate composition of complementary diet produced from roasted soybean, groundnut, millet and wheat

Materials and Methods

Collection of Materials: Soybean, groundnut, millet and wheat was purchased from Lafenwa Market in Abeokuta, Ogun State

Area of the study: This research work was carried out in the Department of Home and Rural Economics, Oyo State College of Agriculture and Technology, Igboora.

Sample Size and Sampling Techniques: The Department of Home and Rural Economics of Oyo State College of Agriculture and Technology, Igboora and about twenty five staff and four hundred (400) students from which twenty (20) respondents were used to assess the complementary diet.

Ingredients for the Production of Complementary Diet

Ingredients used	Quantity
Soybean	400g
Groundnut	200g
Millet (red and white)	300g
Wheat	300g
Salt	10g

Processing of Soy bean Flour

. Wash the soy bean completely and the drain
. Transfer the soy bean to a small pan and fry the soybean over low heat for about 15-20 minutes dry and crisy again.

. Set aside to cool down then blend until very smooth
. For a finer texture, use strainer to remove to remove any lumps.

Method of Roasting Groundnut

. Spread the peanuts in a baking tray or cookies sheet
. Preheat in an oven to 350F (1770C) Bake the peanuts for 15-20minutes
. Remove the nuts from the oven and allow to cool

Processing of millets (Red and White) and Wheat

. Remove all dirt from all cereal and wash the millet and wheat separately
. Drain millet, oven dried in an oven
. Allow to cool and dry milled
. Mixed all ingredients together after dry-milled and packaged

Sensory Evaluation: Twenty (20) taste panelists were used for the sensory attributes and this was graded using colour, flavour, taste, aroma and overall acceptability with the use of 9-point hedonic scale ranging from like extremely (9) to dislike extremely (1) and the research work was carried out in the Department of Home and Rural Economics in Oyo State College of Agriculture and Technology, Igboora.

Result on Nutritional Composition and Sensory Evaluation of Complementary Diet

Parameter	Score	Colour	Flavour	Taste	Aroma	Overall acceptability
Like extremely	9	14(70.0)	7(35.0)	6(30.0)	8(40.0)	12(60.0)
Like very much	8	5(25.0)	9(45.0)	10(50.0)	7(35.0)	4(20.0)
Like moderately	7	1(5.0)	4(20.0)	3(15.0)	1(5.0)	3(15.0)
Like slightly	6	00	00	1(5.0)	4(20.0)	1(5.0)
Neither like nor dislike	5	00	00	00	00	00
Dislike slightly	4	00	00	00	00	00
Dislike moderately	3	00	00	00	00	00
Dislike very much	2	00	00	00	00	00
Dislike extremely	1	00	00	00	00	00
TOTAL		**20(100.0)**	**20(100.0)**	**20(100.0)**	**20(100.0)**	**20(100.0)**

Source: Field survey; 2023

Discussion

Colour: The colour in the complementary food revealed that it was accepted by the trained panelist due to the highest percentage and score obtained denoted 14(70.0%), 14 in frequency, 70.0 in percentage, 9 in score and like extremely in parameter and the complementary diet was also liked by the consumer from the appearance.

Flavour: The flavour on the produced complementary diet for wheat, millet, groundnut, sorghum and guinea corn revealed the highest percentage, frequency and parameter with the result of 9(45.0%) and this means that the flavour of complementary diet was accepted by the trained panelist.

Taste: The taste score of the diet ranges from 1(5.0%) to 10(50.0%) in which the highest score was gotten denoted as 10(50.0%) with 8 in score rate and like very much indicating that the complementary diet was accepted by the consumers

Aroma: The score obtained in the term of aroma in the production and consumer acceptability revealed that it had the highest score in frequency, score and in percentage denoted as 8(40.0%) and like extremely means the aroma of complementary diet was accepted by the trained panelists.

Overall acceptability: In term of colour, flavour, taste and aroma on the complementary diet produced using wheat, millet, groundnut, sorghum, and guinea corn the results obtained was

accepted by the panelist and the highest score rate denoted as 12(60.0%) 9 in score and like extremely in parameter.

Proximate Analysis on the Production of Complementary Diet using Wheat, Millet, Groundnut, Sorghum and Guinea Corn

Nutrients	Nutritional Composition
Moisture	29-39%
Ash	2.78%
Fat	29.26%
Crude Fibre	2.11%
Crude Protein	27.33%
Carbohydrate	18.86%

Source; Tayo; 2023.

Moisture Content Determination: The moisture content of the complementary diet is denoted as 29.39% and indicated that the complementary diet with wheat, millet, groundnut, sorghum and guinea corn had lowest amount of water which indicated that it is not easily perishable.

Ash Content Determination: The total amount of ash content on the production of complementary diet had 2.78% of ash content determination of ash and this particular ash content present in the production of complementary diet using wheat, millet, groundnut, sorghum and guinea corn serve as an organic residue remaining after the water and organic had been removed during heating in the presence of oxidizing agents which provides a measure of the total amount of minerals with the complementary diet.

Crude Fat Content Determination: The result of the crude fat content presented in the production of complementary diet had 29.6% which moderately had benefit and had no harm during consumption by an infant or during infant feeding.

Crude Fibre Content Determination: The production of complementary diet produced from wheat, millet, groundnut, sorghum and guinea corn had 2.11% which is lower and without positive effect in the gastro intestinal tract of an infant during feeding.

Crude Protein Content Determination: There was a high amount of protein in the complementary diet and had 27.33% which shows that the complementary diet is a good source of protein that assist in the worn out tissues and maintain healthy living of an infant when consume appropriately.

Carbohydrate Content Determination: Finally, the result of complementary diet using wheat, millet, groundnut, sorghum and guinea corn revealed that the carbohydrate level of the complementary diet is high with the grade of 18.86% indicating enough calories for an infant daily activities.

Conclusion: it can be concluded that the production of complementary diet using roasted soybean, wheat, millet and groundnut are nutritive and contributes to human diet protein, fats, carbohydrate, fibre and many more and is totally accepted by the panelists in sensory evaluation.

Recommendations: Complementary diets should be introduced for household consumption to alleviate poverty, technical skill in the production of complementary diet should be given awareness and the nutritive value of complementary diet should be highlighted to the public food industries, government now through media sources.

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COMPARATIVE EVALUATION OF CAKE ENRICHED WITH COCONUT (*Cocos nucifera*) FLAKES AND COCONUT MILK

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Abstract
The study assessed the comparative and proximate analysis of cake enriched with coconut milk and flake were given and four (4) samples. The samples are: A the (control), sample B (cake production with 200g coconut milk), sample C(cake production with 200g of coconut flakes)and sample D(cake production with 100g of coconut milk +100gof coconut flakes). The result were evaluated by administering were questionnaire using twenty (20) taste panelists based on colour, texture, flavour, taste, aroma and overall acceptability. The result revealed that cake production using coconut milk and coconut flakes had the highest percentage among others given score 12(60.0%). The samples were also taken laboratory for proximate analysis and the result of nutritional benefits on moisture content sample D had (25.21-25.22%), ash sample A had(2.88-2.84%), sample A had highest score in fat, fibre and carbohydrate (29.12-29.40%), (5.10-5.09%) and (16.90-13.84%), sample B had the highest content of (27.70-27.45%). Hence, it is recommended that food like cake should be enrich with coconut flakes and coconut milk to maximize the degree of its likeness and nutrient availability.
Keywords: Comparative, Proximate, Cake, Enriched, Coconut, Flakes, Milk

Introduction

Cake is a confection made from flour, sugar and other ingredients and usually baked. Cake covers a wide range of preparations that can be simple or elaborate and shares feature with desserts such as pastries, meringues, custards and pies asserted by Castella Krystina, (2010). The most common ingredients in cake production are flour, sugar, eggs, fat (such as butter, oil or margarine), a liquid and a leavening agent such as baking soda or baking powder. Cake is often served as a celebratory dish or ceremonial occasions such as wedding, anniversary and birthdays. Cake contain 18% fat (12g) ,10% saturated fat (2g), 17% cholesterol (50mg), 8% sodium (80mg), 1% potassium (36mg), 13% total carbohydrates (38g), 1% dietary fiber (0.2g) and sugars 28g which assist in healthy living for human being as reported by Eckhard *et al. (*2005).

A coconut (*Cocos nucifera*) is the edible fruit of the coconut palm (*Cocos nucifera*), a tree of the palm family. Coconut flesh is high in fat and can be dried or eaten fresh or processed into coconut milk or coconut oil and the liquid known as coconut water is used in beverages, coconut offers numerous benefits including improved heart health, weight loss and digestion illustrated by Lebrun, Grivet; (2013). coconut meat is high in fat and calories and contains calories 283, protein 3grams, carbohydrates 10g, fat (2.7g), sugar (5g), fiber(7g), manganese 60% of the daily value (DV), selenium (15%) of the DV copper 44% of the DV, phosphorus (13%) of the DV, potassium (6%) of the DV, iron (11%) of the DV and Zinc (10%) of the DV. Coconut milk is are relatively stable oil-in-water emulsion with proteins that act as an emulsifiers and thickening agents. It is opaque and milky white color and ranges in consistency from watery to creamy asserted by Shukla *et al. (*2012). Based on fat content "coconut milk", and "coconut skim milk" are traditionally differentiated in many countries of the world. Coconut water is the clear fluid found within the coconut seed while coconut milk

is the extracted liquid derived from the manual or mechanical crushing of white inner flesh of mature coconut illustrated by and Henni et al; (2012). Coconut flakes are chockfull of flavour and nutritional contents are healthy source of fat, fiber, iron and protein. They can be enjoyed practically guilt free when consumed in moderation. The flavour of coconut meshes with a variety of foods including cookies, fruit, yoghurt, pies and even shrimp soups and curries. A cup of coconut flakes contains 33grams of fat and 40grams of sugar while those amounts may not work well for some lifestyles or diets reported by Resaba and Masa, (2004).Coconut flakes are different to desiccated or shredded with larger pieces of shaved coconut meat naturally dried, can be a stand-alone snack use in making bounty bars or to decorate a coconut cake. If necessary to use chopped nuts, coconut flakes can be preferred as illustrated by Adkins Foale and Samosir, (2006).

Objectives of the Study

The main objective of the study is comparative evaluation of coconut flakes and coconut milk in cake production. The specific objectives are to:

i. Produce cake enriched with coconut flakes and coconut milk.
ii. Assess the proximate content of cake enriched with coconut flakes and coconut milk.
iii. Evaluate the sensory attributes of cake produced with coconut flakes and milk enrichment.

Nutritional Benefits of Cake: Carbohydrates for energy, fiber for digestion, fats for warmth and energy, build muscle and strength and help in digestion asserted by Kalish and Dougal, (2001).

Health Benefit of Coconut Flakes: Dietary fiber**,** source of protein, iron and zinc

Nutritional Benefits in Coconut Milk and Nutritional Profile (Unsweetened Coconut Milk) 240g/1cup

Calories	552g
Protein	5.5g
Fat	57.1g
Carbohydrates	13.3g
Calcium	3.84milligrams (mg)
Potassium	631mg
Magnesium	88.8mg
Iron	3.94mg
Vitamin C	6.72mg

Source: Morgan, (2010).

Nutritional Profile on Sweetened Coconut Milk (244g/1cup)

Calorie	75.6g
Water	231g
Protein	0.51g
Fat	5.08g
Carbohydrates	7.12g
Calcium	459mg
Potassium	46.4mg

Source: Adsett,and Mudge;(2015).

Collection of Materials: Coconuts, margarine, sugar, nutmegs, eggs, baking powder, flour, flavor, and other materials were purchased from Towobowo market Igboora, Oyo state.

Methods: Butter and sugar were whisked together to trap air, eggs were added bit by bit, followed by the dry ingredients, then the flour was sieved and then added to the mixture and stirred gradually until properly mixed and put into baking pan for baking.

Ingredients for in cake production

Ingredients	**Quantities of Different Samples**			
	A	**B**	**C**	**D**
Coconut Flakes	------	-------	20g	5litres
Coconut Milk	------	*5litres*	-----	*20g*
Flour	500g	500g	500g	500g
Margarine	250g	250g	250g	250g
Eggs	15big size	15big size	15big size	15big size
Vanilla essence	3Tsp	3 Tsp	3Tsp	3Tsp
Nutmeg	2g	2g	2g	2g
Sugar	200g	200g	200g	200g
Milk	3 sachet	20sachet	20sachet	20satchet
Baking powder	3tsp	3tsp	3tsp	3tsp

Source: Field survey; 2023

Procedure for cake production

- Measure all ingredients with measuring scale.
- Sieve the flour and mix the dry ingredients together in right proportion in a bowl.

- Margarine and sugar were creamed together for about 30 minutes until light.
- Stir in sieved flour, add milk to give soft dripping consistency and mixed for about 5 minutes.
- Grease the baking pan with margarine (little) and bake at accurate temperature in the oven.

Evaluation and Sensory Qualities: Twenty (20) trained panelists from Department of Home and Rural Economics were set up and samples of cake produced were assessed one after the other in term of colour, taste, texture, aroma and overall acceptability using 9-point hedonic scale ranging from like extremely (9) to dislike extremely (1) and data obtained were subjected to statistical analysis.

Table 1: Result on Sample A: Cake (Control)

Parameter	**Score**	**Colour**	**Texture**	**Flavour**	**Taste**	**Aroma**	**Overall Acceptability**
Like extremely	9	8(40.0)	11(55.0)	7(35.0)	8(40.0)	7(35.0)	7(35.0)
Like very much	8	11(55.0)	8(40.0)	11(55.0)	8(40.0)	9(45.0)	9(45.0)
Like moderately	7	1(5.0)	1(5.0)	2(10.0)	3(15.0)	3(15.0)	3(15.0)
Like slightly	6	00	00	00	1(5.0)	1(5.0)	1(5.0)
Neither like nor Dislike	5	00	00	00	00	00	00
Dislike slightly	4	00	00	00	00	00	00
Dislike moderately	3	00	00	00	00	00	00
Dislike very much	2	00	00	00	00	00	00
Dislike extremely	1	00	00	00	00	00	00
TOTAL		**20(100.0)**	**20(100.0)**	**20(100.0)**	**20(100.0)**	**20(100.0)**	**20(100.0)**

Source: Field Survey, 2023.

Table 2: Result on Sample B: Cake Production from Coconut Milk

Parameter	Score	Colour	Texture	Flavour	Taste	Aroma	Overall Acceptability
Like extremely	9	13(65.0)	12(60.0)	11(55.0)	9(45.0)	12(60.0)	12(60.0)
Like very much	8	6(30.0)	7(35.0)	7(35.0)	10(50.0)	7(35.0)	7(35.0)
Like moderately	7	1(5.0)	1(5.0)	1(5.0)	1(5.0)	1(5.0)	1(5.0)
Like slightly	6	00	00	00	00	00	00
Neither like nor Dislike	5	00	00	1(5.0)	00	00	00
Dislike slightly	4	00	00	00	00	00	00
Dislike moderately	3	00	00	00	00	00	00
Dislike very much	2	00	00	00	00	00	00
Dislike extremely	1	00	00	00	00	00	00
TOTAL		**20(100.0)**	**20(100.0)**	**20(100.0)**	**20(100.0)**	**20(100.0)**	**20(100.0)**

Source: **Field Survey, 2023**

Table 3: Result on Sample C: Cake Production from Coconut Flakes.

Parameter	Score	Colour	Texture	Flavour	Taste	Aroma	Overall Acceptability
Like extremely	9	13(65.0)	11(55.0)	12(60.0)	12(60.0)	12(60.0)	11(55.0)
Like very much	8	5(25.0)	5(25.0)	6(30.0)	5(25.0)	5(25.0)	7(35.0)
Like moderately	7	2(10.0))	4(20.0)	210.0)	2(10.0)	2(10.0)	2(10.0)
Like slightly	6	00	00	00	1(5.0)	1(5.0)	00
Neither like nor Dislike	5	00	00	00	00	00	00
Dislike slightly	4	00	00	00	00	00	00
Dislike moderately	3	00	00	00	00	00	00
Dislike very much	2	00	00	00	00	00	00
Dislike extremely	1	00	00	00	00	00	00
TOTAL		**20(100.0)**	**20(100.0)**	**20(100.0)**	**20(100.0)**	**20(100.0)**	**20(100.0)**

Source: Field survey, 2023

Table 4: Result on Sample D: Cake production from Coconut Flakes and Coconut Milk

Parameter	Score	Colour	Texture	Flavour	Taste	Aroma	Overall Acceptability
Like extremely	9	12(60.0)	8(40.0)	12(60.0)	9(45.0)	10(50.0)	12(60.0)
Like very much	8	5(25.0)	11(55.0)	6(30.0)	10(50.0)	7(35.0)	6(30.0)
Like moderately	7	3(15.0)	1(5.0)	2(10.0)	1(5.0)	2(10.0)	2(10.0)
Like slightly	6	00	00	00	00	1(5.0)	00
Neither like nor Dislike	5	00	00	00	00	00	00
Dislike slightly	4	00	00	00	00	00	00
Dislike moderately	3	00	00	00	00	00	00
Dislike very much	2	00	00		00	00	00
Dislike extremely	1	00	00	00	00	00	00
TOTAL		**20(100.0)**	**20(100.0)**	**20(100.0)**	**20(100.0)**	**20(100.0)**	**20(100.0)**

Source: Field survey, 2023.

Colour: The colour evaluation indicated that the cake produced with coconut flakes had highest percentage of (56.0%) with 13 in score and like extremely in and denoted as sample C 13(65.0%). The appearance in colour was accepted by panelists.

Texture: The highest score of texture in evaluation of cake from coconut milk and coconut flakes with different grams were gotten from sample B i.e. 200g of Coconut Milk with 12 in score and 60.0% and like extremely in 12(60.0%) indicated that cake produced from coconut milk was liked by the consumers.

Flavour: For flavour highest score was produced from sample C with the score in both in percentages is 12(60.0%) indicated that it is accepted by the panelists.

Taste: The taste score from coconut milk and coconut production from sample C indicated that it was highly accepted.

Aroma: The aroma produced from all the four (4) samples, indicated that sample B and C were accepted with the same score and percentage of 12(60.0%), 9 in score and like extremely and was accepted by panelists.

Overall acceptability: From colour, texture, flavour, taste and aroma the overall score rate of cake production indicated that the highest and accepted samples were sample B and C, and were totally accepted by the panelists.

Table 5: Results on Proximate Analysis of Cake produced using Coconut Milk and Coconut Flakes.

Parameter (%)	Sample A	Sample B	Sample C	Sample D
Moisture	30.25	28.15	30.11	25.21
	30.20	28.12	30.09	25.22
Ash	2.88	1.55	0.98	0.94
	2.84	1.32	0.96	0.90
Fat	29.12	25.60	20.75	20.60
	29.40	25.60	20.74	20.58
Fibre	5.10	3.32	4.55	2.11
	5.09	3.30	4.54	2.10
Protein	25.98	27.70	25.44	24.20
	25.97	27.45	24.40	24.12
CHO	16.90	10.30	8.02	6.05
	13.84	10.12	8.01	5.04

Source: Tayo; 2023.

Moisture Content Determination: The highest moisture content of cake was gotten from sample A and B both are not accepted but with the lowest amount of moisture content that cannot are spoilt are produced from sample D and the moisture determination of 25.21% indicated that it was accepted with 0.01 in difference frequency.

Ash Content Determination: Different grams of ash were obtained from sample A and B with percentage of 2.88-1.55.

Fat Content Determination: The natural oily substance occurring in cake production is gotten from Sample A which is the control and Sample C , cake production using 200g of

coconut flakes had highest percentage of (29.40-20.75g) with the insignificant difference of >0.09.

Fibre Content Determination: From the result, Sample A which (control) produced 5.10% and sample C (3.55%).

Protein Content Determination: Protein content in cake production indicates the nitrogenous organic compound that have large molecules composed of one or more long chains of amino acids and are essential part of all living organism, especially as structural components of body tissues such as muscle, hair and as enzymes and antibodies contributors is gotten from sample B sample which is cake production using 200g of coconut milk with grade of (27.70-27.45%).

Carbohydrate Content Determination: The carbohydrate content of cake production using coconut milk and coconut flaked with different in grams; the highest percent of cake is cake produced using 200g of coconut milk with the range of percentage of (10.30-10.12%).

Conclusion: From the result obtained in this finding, it was concluded that coconut flake sand coconut milk in cake production are nutritive which contributes to human health in term of vitamins, fat, carbohydrate, protein, dietary fiber, protein and many more and it is totally accepted by the panelists in sensory evaluation.

Recommendations

Snacks (bread, cake, chin chin and other confectionaries) should be enriched with coconut milk and coconut flakes. The nutritional and health benefits of coconut milk and coconut flakes in cake production especially at Homes and schools should be enlightened on preparation of snack produced from coconut milk and coconut water to avoid repetition of flavour and colour known as monotonous.

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EFFECT OF LOCUST BEAN WASTEWATER ON GROWTH AND YIELD OF *AMARANTHUS CRUENTUS* CROP

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Abstract
Wastewater irrigation will improve crop productivity due to its high nutrient content that serves as a substitute for fertilizer. This study was carried out to determine the effect of African locust bean wastewater for irrigation on yield response of Amaranthus cruentus plant. The experiment was a complete randomized design (CRD) replicated five times consisting of seven treatments with different concentration of locust bean wastewater. Treatment T_1 serve as the control with 100% irrigation water and locust bean wastewater. While, treatment T_2, T_3, T_4, T_5, T_6 and T_7 with 20%, 40%, 50%, 60%, 80% and 100% concentration of locust bean wastewater respectively. It was observed that an increase in the concentration of irrigation water with locust bean wastewater had a significant effect ($p<0.05$) (plant height and number of leaves) and yield of Amaranthus cruentus plant with the highest of fresh yield and dry yield weight obtained at 100% concentration of African locust bean wastewater. The results obtained in this study established that, locust bean wastewater can be reused for irrigation purpose as a result of its high nutrient contents that improve plant growth and yield. Therefore, the characteristics of African locust bean wastewater should be considered in managing wastewater irrigation during crop production.
Keywords*:* African locust bean; Wastewater; Irrigation; Amaranthus cruentus; Yield.

Introduction

The use of chemical fertilizer for crop production is effective within a few years, demanding consistent use on a long term basis. The environmental hazards and high cost of chemical fertilizers make them undesirable, uneconomical and beyond the reach of the poor farmers, this calls for the use of organic fertilizer which is a readily available alternative, and proves more environmentally friendly (Adzemi *et al.*, 2017). The use of wastewater as a substitute for inorganic fertilizer in crop production has shown increase in productivity due to its high quantities and nutritional properties (Hamilton *et al.*, 2005). Wastewater is used as a key water resource for irrigation and especially in arid and semiarid regions. (Chopra and Pathak 2015). Wastewater reuse is advantageous for many reasons such as scarcity of water in arid and semi-arid regions; the high energy cost of advanced wastewater treatment, and pollution of surface waters because of direct discharge of wastewater effluents (Hamilton *et al.*, 2005). The all year round availability of wastewater ensures continual supply of fresh agricultural produce, and contributes to livelihood of many urban farmers. (Cornish and Kielen, 2004).
Locust bean wastewater possess great potential as a substitute for chemical fertilizer and could be used precisely to grow vegetables (Ogunremi *et al.*, 2022). Therefore, this research works aim towards investigating the effect of locust bean wastewater on growth and yield of Amaranthus**.**

Materials and Methods

Experimental Site

The experiment was conducted Oyo Sate College of Agriculture and Technology, Igboora experimental greenhouse to assess the effect of African locust bean waster on yield and response of amaranth. Igboora is located on longitude 7^o 26' 1.79"N, latitude 3^o17' 16.37' E. Igboora is approximately 66 km North-northwest of Ibadan, the Oyo State capital and about 32 km north of Abeokuta, the capital of Ogun State. Igboora lies within the tropical climatic

zone, marked by two distinct seasons of wet and dry periods (Adejumo and Adeyemi, 2021). The dry season extends from November to march with an average annual rainfall of 813 to 1853 mm, while the annual temperature ranges from 24 to 29^{0}C.

Sample Collection

Four days fermented locust bean wastewater sample was collected from the processing centers that use the same processing techniques in Igboora. Viable *Amaranthus cruentus* seeds were purchased from International Institute of Tropical Agriculture (IITA) Ibadan.

Experiment Design

The experiment was undertaken in pots with seven different treatments of growth and water concentration for irrigation. The experiment was in complete randomized blocks design with replications. The percentage concentration of irrigation water treatment was applied twice daily base on the water requirements of *Amaranthus cruentus* plant as presented in table 1.

Table 1 Treatments formulation

Treatment	Available Irrigation Water (100%)	African Locust Bean Wastewater (100%)
T_1	100	0
T_2	80	20
T_3	60	40
T_4	50	50
T_5	40	60
T_6	20	80
T_7	0	100

T_1 = 100% Available Irrigation water, T_2 = 80% available irrigation water + 20% African locust bean wastewater, T_3 = 60% available irrigation water + 40% African locust bean wastewater, T_4 = 50% available irrigation water + 50% African locust bean wastewater, T_5 = 40% available irrigation water + 60% African locust bean wastewater, T_6 = 20% available irrigation water + 80% African locust bean wastewater, T_7 = 100% African locust bean wastewater.

Data Sampling

During the experiment, Data was collected on growth (plant height and number of leaves) and yield parameters. Growth parameters were measured at two and four weeks after transplanting. While at harvest, fresh yield and dry yield weight were measured and recorded.

Plant height

A meter rule was used to take the height of plants in each experimental unit at 2 and 4 weeks after planting, and the mean was calculated and recorded. The height was measured from the ground level to the tip of the plant.

Number of leaves

Leaves of plants were counted in each experimental unit at 2 and 4 weeks after planting, and the mean determined. Only fully opened leaves were counted.

Fresh Weight of the Plant

The whole plant in the net plots after been uprooted and root washed was weighed, and then extrapolated to per hectare.

Dry weight of the plant

The separated parts of the leaves and the stems were then sun dried for 7 days, weighed to determine the dry matter of the net plot and then extrapolated to per hectare.

Data Analysis

Data obtained from the growth and yield response of *Amaranthus cruentus* was analyzed using one way ANOVA at significant level $p<0.05$. Means were separated using Duncan's Multiple Range Test (DNMRT) at 5% level of probability.

Results and Discussions

Results

Table 2: Effect of Locust Bean Wastewater on Plant Height and Number of leaves of *Amaranthus cruentus* Plant

	Plant Height (cm)		Number of Leaves	
Treatment	**Week 2**	**Week 4**	**Week 2**	**Week 4**
T_1	33.000 ± 1.000^{b}	31.00 ± 0.00^{e}	6.000 ± 1.00^{b}	13.33 ± 2.08^{d}
T_2	33.67 ± 4.04^{b}	45.67 ± 2.52^{d}	8.00 ± 2.00^{b}	16.33 ± 2.08^{d}
T_3	44.33 ± 2.52^{b}	55.67 ± 2.52^{c}	11.67 ± 3.06^{b}	20.00 ± 2.00^{cd}
T_4	58.33 ± 7.77^{a}	67.67 ± 3.51^{b}	14.67 ± 2.52^{b}	25.67 ± 2.52^{bc}
T_5	59.33 ± 5.13^{a}	73.33 ± 4.51^{b}	28.00 ± 3.61^{a}	29.33 ± 3.51^{ab}
T_6	61.000 ± 1.00^{a}	82.33 ± 2.08^{a}	29.67 ± 5.69^{a}	33.67 ± 4.51^{ab}
T_7	57.00 ± 3.00^{a}	88.00 ± 2.65^{a}	33.00 ± 3.57^{b}	37.33 ± 4.04^{a}

Means that do not share a letter are significantly different

Table 3: Effect of locust bean wastewater on Fresh and Dry Yield Weight *Amaranthus cruentus* plant

Treatment	Fresh Yield Weight (kg /ha)	Dry Yield Weight (kg/ha)
T_1	2090.0 ± 66.6^{g}	182.67 ± 9.45^{f}
T_2	4253.0 ± 11.1^{f}	579.3 ± 19.6^{d}
T_3	4841.3 ± 97.5^{e}	449.7 ± 24.8^{e}
T_4	6977.0 ± 66.8^{d}	749.0 ± 20.4^{c}
T_5	8064.7 ± 38.7^{c}	745.7 ± 18.1^{c}
T_6	9619.7 ± 69.0^{b}	937.0 ± 43.9^{b}
T_7	10212 ± 38.9^{a}	1074.0 ± 45.9^{a}

Means that do not share a letter are significantly different

Discussion

Effect of Locust Bean Wastewater on Plant Height and Number of Leaves of *Amaranthus cruentus*

The result of the locust bean wastewater on plant height and number of leaves of *Amaranthus cruentus* plant are shown in Table 2. The result shows significant effect on plant height. Treatment 6 with 80% wastewater recorded the tallest plant height of 61.00±1.00cm while treatment 1 gave the shortest plant height value of 33.000±1.00cm with 100% available irrigation water at two weeks of planting. At four weeks of planting, treatment 7 with 100% locust bean wastewater recorded the highest value of 88.00±2.65cm while treatment 1 with 100% available irrigation water had the lowest value of 31.000±0.00cm. Plant height as affected by different water treatments showed that, there were significant ($p<0.05$) variations in plant height as presented in Table 2. The plant heights variation between treatments 4, 5, 6 and 7 with a produced 58.33±7.77cm, 59.33±5.13cm, 61.000±1.00cm and 57.00±3.00cm respectively and not significant. Similar trend of increase in plant height was observed in

week two and four weeks except for decrease in height observed for treatment 7 (100% locust bean waste water) as shown in figure 1.

The effect of locust bean wastewater on number of leaves per plant of *Amaranthus cruentus* was shown in Table 2. Treatment 7 (100% African locus bean wastewater) recorded the highest number of leaves of 33.00±3.57cm while treatment 1(100% available irrigation) recorded the lowest, with a value of 6.00±1.00cm at two weeks of planting. Similar observation was noticed at four weeks of planting, treatment 7 (100% African locust bean wastewater) has the highest number of leaves of 37.33±2.08 while treatment 1 (100% available irrigation) water had the lowest value of 13.33±2.08. The result shows that the variation in the numbers of leaves present on plant per treatments. Treatment 5 and 6 had no significant difference but are significantly different ($p<0.05$) from other treatments in two weeks of planting. The number of leaves observed at four weeks of planting are significantly different ($p<0.05$). The increase in concentration of African locust bean wastewater in irrigation led to the increase in number of plant leaves as observed in figure 1.

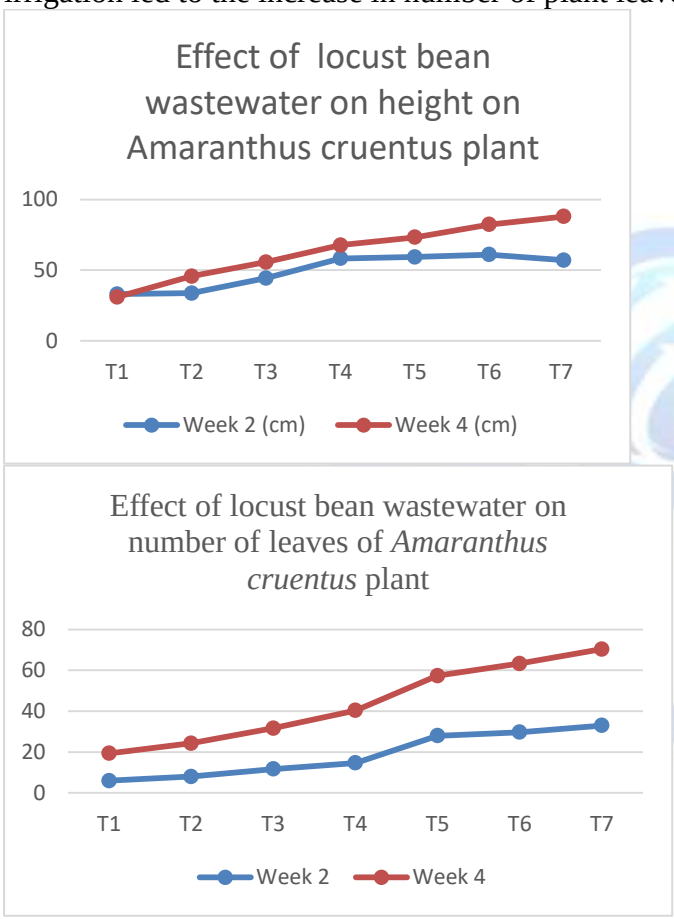

Figure 1 *Effect of African locust bean wastewater on growth parameters of Amaranthus cruentus plant*

Effect of African locust bean wastewater on Yield Quantity *Amaranthus cruentus* plant

The response of fresh yield and dry yield weight of *Amaranthus cruentus* as affected by locust bean wastewater are presented in table 3. The shows that locust bean wastewater had significant effect ($p<0.05$) on yield of *Amaranthus cruentus* in both fresh and dry yield weight. The increase in concentration of locust bean waster in irrigation water resulted in an increase in plant yield as shown in figure 2. The higher plant yield observed in concentration of locust bean wastewater compared with 100% available irrigation water may be associated with its enrichment with the essential plants nutrient (Khan *et al.*, 2008).

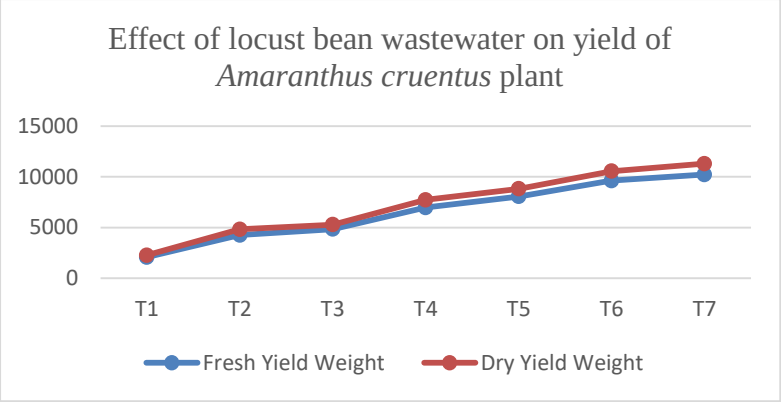

Figure 2 Effect of African locust bean wastewater on yield quantity of Amaranthus cruentus plant

Conclusion

The effect of African locust bean wastewater was studied at varied concentration of irrigation water for four weeks planting period. From the result, it was observed that an increase in the concentration of irrigation water with locust bean wastewater had a significant effect ($p<0.05$) on growth and yield response of *Amaranthus cruentus* plant with the highest value of fresh yield and dry yield weight obtained at 100% concentration of locust bean wastewater. This investigation revealed that locust bean wastewater can be reused for irrigation purpose as a result of its high nutrient contents that improve plant growth and yield. Therefore, the characteristics of African locust bean wastewater should be considered in managing wastewater irrigation during crop production.

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EFFECTS OF DIFFERENT SOLVENTS ON EXTRACTION OF PHYTOCHEMICAL COMPONENTS OF WHOLE LEMON FRUIT (*Citrus limon*)

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Abstract
This study examined the effects of three solvents (methanol, ethanol and acetone) on phytochemical compositions of whole lemon fruit (Citrus limon) (pulp, seed, peel and juice). The lemon fruit was oven dried at 50^0C and ground to homogeneous particle size. The phytochemicals were determined using standard analytical methods. The results of the study showed that the three solvents were able to extract phytochemicals from the lemon fruit. Methanol extracted the highest amount of phytochemicals followed by ethanol and then acetone. Qualitatively, the phytochemicals extracted were: flavonoid (55.67±0.33 - 83.40±0.35%) followed by steroids (7.13±3.07 -10.50±0.06%), terpenoids (1.27±0.07 - 1.59±0.04%), alkanoids (12.10±0.06 - 1.34±0.04%) saponins (1.06±0.01 - 1.07±0.01%) and phenols (0.78±0.03 - 0.80±0.01%). The study showed that methanol was the best among the tree solvents for the extraction of phytochemicals from whole lemon fruit.
Keywords: phytochemicals, lemon fruit, solvents, *Citrus limon*

Introduction

Fruits are important sources of many nutrients and vitamins and they are commercially valuable as human food and are either consumed fresh, dried or processed (Burt, 2004). Citrus fruits are from the family of Rutaceae which is one of the main fruit tree crops grown in the whole world (Okwu, 2008). Among members of the family, sweet orange (*Citrus sinensis*) is the major fruit representing about 70% of citrus output because of their high consumer demands (Okwu, 2008). The family also includes small citrus fruits such as tangerine tree (*Citrus reticulata*), grapefruit tree (*Citrus vitis*), lime tree (*Citrus aurantifulia*) and lemon tree (*Citrus limon, Citrus limonum*) (Okwi and Emenike, 2006).

These are good sources of vitamins, especially vitamin C. methods of consuming Citrus fruits results in a great amount of wastage (peels, seeds, and pulps), which accounts for 50% of the fruit (Anwar *et al.,* 2008). These wastes are valuable sources of d-limonene, flavonoids, carotenoids, dietary fibers, soluble sugars, cellulose, hemicellulose, pectin, polyphenols, ascorbic acid, methane, and essential oils (Sharma *et al.,* 2017, Martín *et al.,* 2010 and Rezzadori *et al.,* 2012). The presence of terpenes, flavonoids, carotenes, and coumarins is thought to be responsible for the strong anti-oxidative and antimicrobial activities (Viuda-Martos *et al.,* 2008 ,Ali *et al.,* 2017, Yu *et al.,* 2017, Roberto *et al.,* 2010 and Kostova *et al.,* 2011).

Lemon is one of the most generally used or consumed fruits globally due to its health and nutritional benefits to mankind (Janati *et al.,* 2012).

Phytochemicals are the chemical compounds available in plants. These Plants produce chemicals also known as secondary metabolites that are not directly involved in the process of growth but acts as deterrents to insects and microbial attack. They are alkaloids, cyanogenic glycosides, flavonoids, terpenoids and phenolic compounds etc. (Okwu, 2004, Okwu, 2005 and Chose and McArthur, 2002)

There are about 40 limonoids in citrus with limonin and nomilin being the principal ones (Craig, 2002). These compounds, which occur in high concentration in grape (*C. vitis*) lime and lemon fruit and orange juice (*C. sinensis*) partly, provide the bitter taste in citrus.

Physicochemical parameters of the lemon fruit essential oil showed its quality and functional uses in relationship to the properties of commonly used fruit oil and the recommended standard, and could be used favorably at home, in cosmetics and pharmaceutical industries and generally in folk medicine (Okewole *et al.,* 2023).

The extraction yield is strongly influenced by the solvent; due to the different polarity and different potential of compounds extracted (Seda, 2010). Therefore, organic solvent of higher polarity is more effective in quantitative recovery for phenolic compounds. Non-polar solvent and methanol were reported in many studies as a good solvent for extraction of phenolic compounds from the plants including olive leaves. However, it may lead to unacceptable levels of toxic residues in the final extracts. Ethanol and water are most widely employed as solvents for safety and abundances reasons (Seda, 2010).

Ethanol, methanol, ethyl acetate, boiling water, hexane, diethyl ether, chloroform and butanol were the main solvents used by researchers (Liu *et al.,* 2011). Of these solvents, aqueous methanol or ethanol was most commonly used and the concentration of solvent varied between 40% and 80% (v/v). Extraction with 80% methanol (v/v) was reported as the most effective method for olive leaves polyphenols (Malik and Bradford, 2008).

The complete extraction of the bioactive phytochemical compounds of different nature from plant material has ever remained a problem for researchers and manufacturers (Nawaz *et al.,* 2019). Due to the diversity in the nature of phytochemical compounds, it is very difficult and uncertain to extract all the phytochemicals using a single extracting solvent or extraction method. The polar components are extracted in polar solvents while non-polar ones are extracted in non-polar solvents. Similarly, the extraction yield is also different while using different extraction methods such as individual extraction or consecutive extraction in a series of varying polarity solvents (Nawaz *et al.,* 2019). There were results found, different for different extracts which was confusing to the researchers and the students. It is, therefore, necessary to find out the best solvent system and extraction method for the extraction of phytochemicals from plant materials for research and pharmaceutical application.

The present study was designed to study the effects of three solvents (methanol, ethanol and acetone) on the extraction of phytochemical components of whole lemon fruits (pulp, seed, peel and juice).

Materials and methods

Sample collection

Mature and good quality lemon fruits (*Citru limon*) were purchased from Towobowo market in Igboora, Oyo Sate, Nigeria.

Sample and sample preparation

The whole *Citrus limon* fruits (pulp, seed, peel and juice) was cut into smaller pieces before they were dried in an oven at 50^0C for 2 days (48 h) till they were considerably maintained constant weight. Afterward, the *Citrus limon* fruits was pulverized with a blender. The pulverized materials was sieve (0.020mm mesh size) then packed into sample plastic bag and was labeled for analysis

Preparation of plant extracts

Lemon fruit extracts were prepared according to the method described by Do *et al. (*2014) with some modifications. Three plant samples of equal weight (100g) were macerated in different solvents (MeOH, EtOH and Me_2CO) at a sample to solvent ratio of 1: 5 (w/v) for 60 h at room temperature. The extracts were then filtered using Whattman filter paper No. 42, concentrated at 60°C using a rotary evaporator. All dried extracts were stored at 4°C prior to further analyses. All analyses were carried out in triplicate.

Quantitative determinations of phytochemicals

Flavonoids, alkaloids, saponins and steroids were determined using the method of Harborne (1973), terpenoids and phenols with the method of Ferguson (1956) and McDonald *et al. (*2001) respectively.

Statistical analysis

The data obtained from the analysis of whole *C. limon* phytochemicals was expressed as mean ± standard error and they were further subjected to one-way analysis of variance (ANOVA) by the use of excel statistical package. Statistical differences were measured at $p < 0.05$.

Result and Discussion

Table 1: Phytochemical compositions of three solvents extracted lemon fruit

Phytochemicals	Methanol (%)	Ethanol (%)	Acetone (%)
Alkaloids	1.34 ± 0.04^{b}	1.30 ± 0.06^{c}	1.10 ± 0.06^{c}
Flavonoids	83.40 ± 0.35^{d}	62.37 ± 0.32^{d}	55.67 ± 0.33^{d}
Phenols	0.80 ± 0.01^{a}	0.79 ± 0.02^{b}	0.78 ± 0.03^{a}
Saponins	1.07 ± 0.01^{c}	1.06 ± 0.01^{c}	1.06 ± 0.01^{a}
Terpenoids	1.83 ± 0.03^{b}	1.59 ± 0.04^{b}	1.27 ± 0.07^{c}
Steroids	10.50 ± 0.06^{c}	10.20 ± 0.06^{c}	7.13 ± 3.07^{e}

All values are the mean ± Standard error (n=3). Means within a row with different letters significantly differ at $p < 0.05$.

Discussion

Table 1 showed the solvent effects on extraction of phytochemical components of whole lemon fruit as conducted. The quantitative phytochemical tested revealed the presence of components at various quantities on using different solvents (methanol, ethanol and acetone). This indicated that the three solvents were able to extract phytochemicals from lemon fruit. Methanol extracted the highest percentage of phytochemical components followed by ethanol and then acetone. This might be due to the fact that, extraction nature of solvents depends on their polarity according to Naczk and Shahidi (2006). This was in agreement with the research of Boeing *et al. (*2014) where methanol and water were the most efficient solvent in the extraction of phenolic compounds which responsible for the antioxidant properties of fruits and vegetables (Hervert-Hernández *et al.*, 2011). These activities of methanol could be traced to the better solvation of phytochemical compounds present in lemon fruits as a result of interactions (hydrogen bonds) between the polar sites of secondary metabolites the solvent. Ethanol was less efficient than methanol in the extraction. This may be due to the low solvation provided by ethanol and probably because of the presence of the ethyl radical that is longer than the methyl radical present in methanol, resulting in a lower solvation. Acetone gave the lowest extractant due to lower solvation activities because of its only proton acceptors while the other solvents, methanol and ethanol are also proton donors (Hervert-Hernández *et al.*, 2011)..

Flavonoids had the amount ranged from 55.67±0.33 to 83.40±0.35% for the three solvents which was significantly higher than the amount of other parameters. Steroids was the next in concentration at the range of 7.13±3.07 to 10.50±0.06%, followed by terpenoids, alkanoids, saponins and phenols ranged from 1.27±0.07 to 1.83±0.03%, 1.10±0.06 to 1.34±0.03%, 1.06±0.01 to 1.07±0.01% and 0.78±0.03 to 0.80±0.01% respectively.

Presence of phytochemical in the sample was in accordance with report of Yusuf *et al*. (2018) and Ngwoke *et al*. (2015). In addition, this result showed highest value for flavonoids in line with report of Uduenevwo *et al. (*2022) for *Xylopia aethiopica* fruit but

lower for the seed of *Piper guineense* and not the highest among other parameters for another *Xylopia aethiopica* fruit from another region as determined by Uhegbu *et al. (*2011) These variations may be due to method of analysis, harvesting time, climate conditions of growing area and variation in solvent for extraction. Flavonoids are known antioxidants in plants and humans, so lemon fruits may have a greater antioxidant potential.

Conclusion

Lemon fruit was found to contain a lot of bioactive phytochemical compounds in significant concentration. Phytochemicals like flavonids was extracted more in high polarity solvents; the phytochemicals extracted in polar solvents may be comparatively strong antioxidants (high flavonoid) with high antiradical capacity indicating that, lemon fruit is good source of antioxidants. The methanonic extract showed good phytochemical contents like flavonoids which are likely to show high scavenging capacity against free radicals.

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NUTRITIONAL COMPOSITION OF SOY-SORGHUM ENRICHED FORTIFIED WITH WATERMELON SEED FOR INFANT COMPLIMENTARY DIET

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Abstract
The nutritional composition of watermelon seed in the production of soy-sorghum for complementary diet was investigated in this study. Malnutrition in children is a major nutritional problem in African developing countries which leads to morbidity, mortality, retardation in physical growth and mental development, working capacity and increased risk of adult disease. This nutritional problem is due to the low nutritional value of traditional complementary foods, in appropriate complementary feeding practices and high cost of quality protein-based complementary foods. The complementary diet was done by using oven to dry the watermelon seed, soy bean and sorghum. They were grounded separately and sieved and was then mixed together and packaged. The sample was evaluated for its appearance, taste, colour, flavour and overall acceptability by using 20 taste panelists consisting of staff of Oyo State College of Agriculture and Technology, Igboora on the rating of 5 hedonic scales. It was also subjected to proximate analysis to determine its nutritional composition. The sensory evaluation result revealed that 75% of the respondents accepted the complementary diet. The nutritional composition include 23.5% of fat, 56.9% of protein, 16.4% of moisture content, 7.4% of fibre content, 10.8% of the ash content and 61.5% of the carbohydrate. It was concluded that enriching sorghum complementary blend fortified with watermelon seeds flour increases the protein, energy, fat, ash, and fibers, which significantly improve nutritional value of formulated foods. Infant feeds should contain watermelon seeds because it contains rich sources of fiber and minerals that are essential in the body system.
Keywords: Soybean; Sorghum; Complementary diet

Introduction

Cereals and legumes are main sources of nutrients for traditional complementary foods in developing countries. The major cereals such as sorghum rice, wheat and maize constitute about 85% of total global cereals production amounting to about 200 million tones of harvest of average of 10% protein content out annually, of which a sizeable proportion goes in to human consumption. Complementary foods play a vital role on child growth and development since it complements for both nutritional and developmental needs of the infant when breast milk alone is no longer sufficient, illustrated by Onabanjo, (2007).

Davidson (2002) presented that good quality wearing food must have high nutrient density, bulk density, low viscosity, appropriate texture along with high energy, protein, micro nutrient content and consistency that allow easy consumption. Most of the complementary foods consumed by the infants in many part of world are deficient in essential macronutrients and micronutrients leading to malnutrition, which is one of the serious public health problems in developing countries. Major forms of malnutrition known as protein energy malnutrition generally occur during the crucial transitional phase when children are weaning from liquid (breast milk) to semi solid or fully adult (Family) foods. In view of this nutritional problem, several strategies have been formulated through a combination of locally available foods materials that complement each other in such a way as to create a new pattern of amino acids that provide the recommended daily allowance for infants. One of the locally available oilseeds is watermelon seeds. India is the second largest producer of watermelon

fruit among the Asian countries producing 255,000 MT per year, generating 2550 MT of seeds per year, stated by FAOSTAT (2009). According to Chomicki, (2014), watermelon (*Citrullus lantus*) seeds are among the underutilized fruit by products. Watermelon (Citrullus lanatus) belongs to cucurbitaceous family. Existing evidences suggest that the watermelon seed proteins exhibit good in vitro digestibility with less of anti-nutritional factors, the seeds contain moderate quantity of minerals and possess good functionality. Their amino acid composition (high arginine content) is indicative of the possession of the medicinal benefits. They also contain high lipid level in five cucurbitaceous oil- seeds from different regions in Cameroon. Oil provides concentrated energy in diet and enhanced palatability. There are also prospects for use of the seeds in the improvement of infant nutrition in view of their high protein and fat content, as opined by Maynard, (2001). *Citrullus lanatus* is an antioxidant and has been shown to reduce oxidative stress, unfortunately the seeds are not generally given importance and hence the present investigation was conducted to assess the functional and nutritional value of the seeds and to develop a product from watermelon seeds. They have nutritive and calorific values which make them necessary in our diets, by Khaki *et al. (*2013).

Definition of Terms

- **Nutrition:** the process of eating or taking nourishment
- **Composition:** the way in which something is made up
- **Blend:** Mixture of two or more thing
- **Fortified:** to increase the effectiveness additional ingredients.

Methodology

Research Design

The study was designed to evaluate the nutritional composition of soy-sorghum enriched with water melon seed for infant complementary diet.

Area of the study

This research work was carried out at Department of Home and Rural Economics, Oyo State College of Agriculture and Technology, Igboora.

Population of the study

The total population of the study is made up of a twenty (20) taste panelists consisting of staff and students of the Department of Home and Rural Economics of Oyo State College of Agriculture and Technology, Igboora.

Sample Size and Techniques

Twenty (20) staff was randomly selected to assess the sensory attribute and acceptability complementary diet produced from watermelon seed and soy-sorghnum.

Materials and Method

Watermelon seed was purchased from Towobowo market in Igbo-ora the soy bean and sorghum were also purchased from Towobowo market in Igbo- ora , Oyo State.

Recipe for Baby Complementary Food

Ingredient	**Quality**
• Watermelon seed	2kg
• Sorghum	1kg
• Soybeans	1kg
• Water	10 liters

Equipment and Tools

- Oven
- Bowl
- Sieve
- Airtight Container
- Weighing Scale
- Cooking pot

Methods of Preparing Complementary Food

- Three kilograms (3kg) each of previously cleared soybean and sorghum and 6kg of previously washed water melon seed were weighed out
- The sorghum sample was parboiled (98^{o}c) for 30 minute, cooled, dehulled manually and rinsed out of fresh water.
- Dehulled soybeans seeds was fermented (18hrs) in 3times its volume of water at room temperature (27+2), and then washed three times with clean water and drained.
- It was oven dried (70^{o}c) for 48 hours, the dried seeds were milled into flour sieved through 160 pore sieve and stored in airtight container.
- The watermelon seeds was rinsed out three times with oven and then ovendried at 70^{0}c for 96 hours
- The water melon seeds was milled together in attrition mill sieved through 160 pore sieve and stored in an airtight container
- The powder was mixed together hygienically and it is ready for consumption.

Sensory Evaluation

A total of twenty 20 taste penelisis consisting of nursing mothers in Oyo State College of Agriculture and Technology, Igbo-ora were used to assess the sensory attributes and acceptability of the complementary diet samples. The complementary diet produced with soy-sorghum and water melon seeds were served to panelists for sensory evaluation.

Result and Discussion

The result and interpretation of laboratory and sensory analysis on nutritional composition of soy sorghums complementary blend fortified with watermelon seed for infant feeding was presented in the table and discuss below.

Table 1 Proximate Analysis of soy sorghums complementary blend fortified with watermelon seed for infant feeding.

Parameters	**%**	**Mean**
Fat	23.5	7.8
Protein	56.9	18.9
Moisture Content	16.4	5.5
Fibre Content	7.4	2.5
Aish	10.8	3.6
Carbohydrate	61.5	20.5

The proximate composition of soy sorghum complementary blend fortified with water melon seed for infant feeding is shown in Table 1. The crude fat (oil) content of the seed extracted had the third amount among the parameters analyzed for proximate composition of the samples.

The crude fat content was 23.5% which is very close to 27.83%, 26.83% and 26.50% for black diamond, charleston gray and crimon sweet as reported by Mabalaia et al, (2007). It is

important to note that soy sorghum and watermelon seeds could be exported for oil production. Mabalaha *et al. (*2007) also reported oil yields of seeds ranging from 248-30-0% in Citrillus Lanatus and C. colocynth species respectively, whereas Madan and Lai 1984 reported oil content value of 41.0- 56.6% in melon seeds. The percentage of fat extracted was 47.9% from watermelon seeds which is higher than the results obtained for this study that of Lakshmi and Kaul (2011). It also showed a fat content of 46.83% for the seed meal. Oil provides concentrate energy in diet and enhanced palatability. The protein content was found to be 56.9% which is higher than that report for three varieties which values of 16.33%, 17.75% and 17.09% respectively for black diamond, chartestion gray and crinson sweet (Willcox, 2006) problems especially since they are more expensive to produce than carbohydrate or lipids. In order to satisfy this steady grousing demand for protein in infant feeds, new protein sources must be explored will cox (2006). Previous works on varieties of Vulgar seed have shown that it has high protein value that makes the seed valuable as a good source of protein. It contains lipid carbohydrate and minerals, it is a complete food. The moisture content was 16.4% which is higher compared to 8.00% for black diamond, 7.87% for charleston gray and 7.40% for crimson sweets (FAO, 1982). The moisture content obtain in this study was formed to be higher as compared to 6.46% and 6.5% reported for cotton seeds and sunflower seeds. The fiber content was 7.4% comparable to 6.46% and 6.56% respectively for cotton seeds and sunflower seeds. The fiber in food is known to expand the inside walls of the colon, easing the passage of waste, thus making it effective against constipation It lower cholesterol level in the blood and reduces the risk of varieties of cancers. The ash content was 10.8% which is higher than that reported for watermelon seeds varieties 3.35- 4.89% (Elinge *et al.*, 2012), but 10g close to that reported for melon seeds, 8.84-9.88% by (Bankole *et al.,* 2005). The high ash content in the sample indicates the percentage of inorganic minerals elements presents in melon seeds. High mineral elements in food enhances growth and development, and also catalyses metabolic processes in human body. The carbohydrate value of the present work was found to be 61.5% which is comparable to other sources such as cereal which contain 65-75% carbohydrate.

Sensory Evaluation of Soy Sorghum Complementary Blend Fortified with Water melon Seed for Infant Feeding.

Table 2: Colour Assessment

RANKS	FREQUENCY	PERCENTAGE
Excellent	12	60.0
Very good	5	25.0
Good	3	15.0
Poor	-	-
Very poor	-	-
Total	20.0	100.0

Source: Field survey, 2023

Table 2 shows the result of sensory evaluation on infant feeding produced for color 60.0% the total respondents that examined the feed for color said it was excellent in term of color, 25.0% of the people that accessed the field for color said the product was very good in color while the remaining 15.0% of the total respondents interviewed said the feed produced was good in color. Thus, it shows that majority of the respondent that assessed the infant feeds in term of color said it was superb.

Table 3: infant feeding for Appearance

RANKS	FREQUENCY	PERCENTAGE
Excellent	16	80.0
Very good	2	10.0
Good	2	10.0
Poor	-	-
Very poor	-	-
Total	20.0	100.0

Source: Field survey, 2023

Table 3 shows the result of sensory evaluation on infant feeding produced for appearance, 80.0% of the total respondents that assessed the feed for appearance said it was excellent in appearance, 10.0% of the people that examined the product for appearance said it was very good while the remaining 10.0% of the total respondents said the feed produced was good in appearance. Thus, it shows that majority of the respondents that assessed the infant feeds in term of appearance said is was magnificent

Table 4 Infant feeding for Taste

RANKS	FREQUENCY	PERCENAGE
Excellence	14	70.0
Very good	2	10.0
Good	4	20.0
Poor	-	-
Very poor	-	-
Total	20.0	100.0

Source: Field survey, 2023

Table 4 Indicates the results of infant feeding for taste. 70% of the respondents that assessed the product said it was excellent in term of taste, 10.0% of the respondents that examine the feeding produced said it was very good white the remaining 20.0% of the respondents said the product was good thus, it shown that the higher percentage of the panelist that assessed that infant food produced in term of taste said it was excellent

Table 5 Infant Feed for flavour

RANKS	FREQUENCY	PERCENTAGE
Excellent	13	65.0
Very good	5	25.0
Good	2	10.0
Poor	-	-
Very poor	-	-
Total	20.0	100.0

Source: Field Survey, 2023

Table 5 Indicates the results of infant for 65.0 the respondents that assessed the product said it was excellent in term of smell, 25.0% of the peoples that examine the product said it was very good while the remaining 10.0% of the respondents said the product was good. thus, it shows that the highest percentage of the panelist that assessed that infant feed produced in term of smell said the products smell nicely.

Table 6 infant Feed for Overall Acceptability

RANKS	FREQUENCY	PERCENTAGE
Excellent	15	75.0
Very good	4	20.0
Good	1	5.0
Poor	-	-
Very poor	-	-
Total	20.0	100.0

Source: Field survey, 2023

Table 6 shows the result of sensory evaluation on infant feed for overall acceptability 75.0% of the total respondents that assessed the product said it was very excellent, 20.0% of the people that examined the product said it was very good while the remaining 5.0% of the total respondents said the infant food produces was good. Thus, it shows that majority of the respondent twenty taste panelist that assessed the baby food produced in term of overall Acceptability said it was magnificent.

Conclusion

Malnutrition in children is a major nutritional problem in African developing countries which leads to morbidity, mortality, retardation in physical growth and mental development, working capacity and increased risk of adult disease. This nutritional problem is due to the low nutritional value of traditional complementary foods, in appropriate complementary feeding practices and high cost of quality protein based complementary foods

This research shows that nutritious, acceptable and affordable complementary foods can be formulated using our locally available food items that can be better than traditional complementary foods. In the present work, it was concluded that enriching sorghum complementary blend fortified with watermelon melon seeds flour increase the protein, energy, fat, ash, Fibers, which significantly improves nutritional value of formulated foods

Recommendations

Based on the result of the findings, the following recommendations were made:

- Infant feeds should contain watermelon seeds because its rich sources of fiber and minerals are essential in the body system
- Jobless youth should have an employment through Infant feed Production
- There is need for proper documentation on the preparation of these complementary food to help the nursing mothers
- Watermelon seeds provide considerable medicinal health and economic benefits if freshly consumed utilized in food products, hence, it should be made use of effectively.
- Soy- Sorghum complementary blend fortified with watermelon seed for infant feedings should be researched on and popularized
- There is need to educate people on the preparation and nutritional benefits of locally produced infant feeding produce.

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APPENDIX

DEPARTMENT OF HOME AND RURAL ECONOMICS
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TITLE: NUTRITIONALCOMPOSITION OF SOY SORGHUM ENRICHED WITH WATER MELON SEED FOR INFANT COMPLEMENTARY DIET

Dear Sir/Ma,

You are provided with sample of complementary food for baby using watermelon seeds and soybean and sorghum. Rank the food product for its flavour, colour, appearance, taste and overall acceptability.

Sample	Flavour	Colour	Taste	Appearance	Overall Acceptability
Complementary Food					

Using a 5 point hedonic scale;

5 Excellent
4 Very good
3 Good
2 Poor
1 Very poor

EVALUATION OF EFFECTS OF HYDROTHERMAL TREATMENTS ON PROXIMATE COMPOSITION AND FUNCTIONAL PROPERTIES OF COCOA BEANS

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Abstract
This study was carried out to evaluate the effects of hydrothermal treatments on proximate composition and functional properties of cocoa beans. Air dried cocoa beans were divided into three; two portions hydrothermally treated at 50^0C and 100^0C respectively while the third portion left raw. Samples were ground into fine powder. Standard methods of analysis were used to determine the parameters. The results of the proximate compositions showed the values (in %) for raw and hydrothermally treated beans as follows: 100^0C had the highest ash content (5.665±0.005), fat (8.58±0.005), crude protein(13.45±0.005), crude fibre (8.32±0.02); the highest value for moisture content (17.43±0.00) and carbohydrate (50.445±0.005) were recorded for hydrothermally treated sample at 50^0C and the highest result for dry matter content was found in raw sample (83.255±0.005). The functional properties of raw and hydrothermally treated beans also showed that the raw sample had the highest value (in mg/100g) for Bulk density (0.507±0.001), foaming capacity (12.86±0.01), solubility capacity (4.105±0.0005), gelatinization (2.61±0.01), dextrose equivalent (8.14±0.02); the highest value for water absorption capacity (276.52±0.0015), oil absorption capacity (121.67±0.001) and swelling index (41.23±0.001) were obtained for beans hydrothermally treated. The results obtained showed that the hydrothermal treatments had a significant effect in the reduction of proximate composition in cocoa. Raw cocoa sample gave the best result in the improvement of nutritional quality of cocoa beans in terms of the functional properties. The methods adopted for cocoa processing, therefore, depends on the needs of individuals as a source of nutrients.
Keywords: Proximate composition, functional properties, raw, hydrothermally treated, *Theobroma cacao.*

Introduction

Cocoa (*Theobroma cacao*) is a perennial industrial plant suited to tropical climates (Everaert *et al.,* 2020). According to Dias *et al. (*2007), "cocoa beans are used as raw materials to create products, e.g., cocoa powder, chocolate, cocoa butter, etc." It had been described as a seed rich in polyphenols and contains nutrients, like carbohydrates, fats, proteins, vitamins and minerals (Sorrenti *et al.,* 2020; Manzano *et al.,* 2021). It helps to prevent intestinal diseases and reduce the risk of colon cancer (Martín *et al.,* 2016; Latif, 2013). Typically, the flavanols in cocoa and chocolate assist in increasing blood circulation as well as reducing the risk of cardiovascular disease (Vu-Thi *et al.,* 2022). The antioxidants in cocoa beans absorbed into the human body are consumed slowly, causing insulin to be secreted regularly to stabilize blood sugar level (Chen *et al.,* 2022). Some studies have shown that dark chocolate or cocoa could lower blood pressure and decrease fatigue (Darand *et al.,* 2021; Coe *et al.,* 2022). The quality of final cocoa beans is related to important factors, including varieties, cultivation, and especially processing techniques (fermentation and drying) (Perez *et al.,* 2021).

Different methods are used in the processing of food items with the sole aim of improving their nutrient qualities. Cocoa beans can be consumed raw, fermented, blanched or roasted. Some of these methods can lead to improvement in nutritional qualities of food or may end up in reducing the nutritional qualities. This study focuses on treating cocoa bean hydrothermally and thereafter evaluating the proximate composition and functional properties of the cocoa beans with the sole aim of investigating the effects this will have on the nutritional qualities of the cocoa seeds.

Materials and methods

Study area: The study was carried out at the Department of Science Laboratory Technology, Oyo State College of Agriculture and Technology, Igboora, Oyo State, Nigeria.Igboora is located in derived Savannah Zone of $7^{o}15'$ North and $3^{o}30'$East of the Equator with an average annual rainfall of 1278mm and an annual temperature of $27^{o}C$.

Samples and sample preparation: Ripe and freshly harvested cocoa pods were obtained from a cocoa farmer in Oyo Town, Oyo State, Nigeria**.** The cocoa pods were cut with a sharp knife to get the cocoa beans out. The cocoa beans were taken out, washed and air dry in the laboratory for two weeks About 500g of the air-dried cocoa were divided into three parts to serve as three treatments: Two portions were hydrothermally treated separately by blanching at temperatures of $50^{0}C$ and boiling at $100^{0}C$ respectively. The third portion was left untreated as raw and served as control. The hydrothermally treated and raw samples were air dried. Samples were ground into fine powder forms using the hammer mill, sieved with 2mm diameter wire gauze and stored in air tight containers until ready for analysis.

Determination of proximate composition: The recommended methods of Association of Official Analytical Chemist (AOAC, 2012) were employed in determining the moisture, crude protein, fat (ether extract), ash and crude fibre contents of raw and hydrothermally treated cashew kernel flour.

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Determination of functional properties

Water absorption capacity: Water absorption capacity of the samples was determined using Sosulski (1979) method.

Oil Absorption Capacity: The method of Lin *et al. (*1974) was used in the determination of fat absorption capacity.

Bulk Density: Bulk density was determined using the method of Narayana and Rao (1984).

Foam Capacity and Stability: Foam capacity and stability of the samples were determined using method of Coffman and Garcia (1977) with some modifications.

Statistical analysis

All data collected were presented as the mean ± standard deviation of replicate after analyses.

Results and discussion

Table1: Proximate composition of raw and hydrothermally treated of cocoa bean

Proximate composition	**Raw sample**	**Hydrothermally treated samples**	
(mg/100g)		**$50^{0}C$**	**$100^{0}C$**
Moisture content	16.82±0.02	17.43±0.00	16.34±0.005
Dry matter content	83.155±0.005	82.56±0.01	81.66±0.00
Fat content	8.35±0.01	7.45±0.005	8.585±0.005

Ash content	5.205±0.005	4.86±0.00	5.66±0.005
Crude fiber content	7.95±0.015	7.17±0.01	8.32±0.02
Crude protein content	12.93±0.01	12.65±0.005	13.45±0.005
Carbohydrate content	48.715±0.015	50.445±0.005	47.64±0.02

Values are expressed as mean ± standard deviation

Table 2: Functional properties of raw and hydrothermally treated cocoa beans

Functional properties (mg/100g)	**Raw sample**	**Hydrothermally treated samples**	
		50^{0}C	**100^{0}C**
BD	0.507±0.001	0.506±0.001	0.4875±0.0015
WAC	242.117±0.001	258.237±0.001	276.5195±0.0015
OAC	116.106±0.002	121.677±0.001	110.832±0.002
FC	12.86±0.01	12.02±0.01	12.25±0.02
SC	4.105±0.005	3.57±0.01	3.91±0.01
SI	40.825±0.005	38.9±0.01	41.23±0.01
GEL	2.61±0.01	2.27±0.01	2.505±0.005
DEXT	8.14±0.02	4.83±2.49	8.025±0.005

Values are expressed as mean ± standard deviation

Keys: BD – Bulk density, WAC -Water absorption capacity, OAC - Oil absorption capacity, FC- Foaming capacity, SC- Solubility capacity, SI - Swelling index, GEL - Gelatinization, DEXT - Dextrose equivalent.

Discussion

Proximate composition

Table 1 showed the results of the proximate composition of the raw and the hydrothermally treated beans. The cocoa beans treated at 100^{0}C had the highest values (in %) for ash (5.665±0.005), crude fats (8.585±0.005), crude proteins (13.445±0.005) and crude fibres (8.32±0.02); the moisture contents (17.43±0.00) and carbohydrates (50.44±0.005) were seen in sample hydrothermally treated at 50^{0}C and the highest for dry matter content was found in raw sample (83.255±0.005).

Moisture content is an important parameter for determining the shelf life of food; a sample with lower moisture contents tends to have longer shelf-life than that with higher moisture contents. It was found that sample treated at 100^0 C of cocoa beans had the lowest moisture contents (16.34) and thus will have longer shelf-life when compared with the raw (16.82) and 50^{0}C treated samples (17.43) respectively. The increase in moisture contents could be attributed to the inhibition of large quantity of water by the seeds during boiling during processing. The observation is in agreement with the report of Nsa and Ukachukwu (2009), who found that high moisture affects the storage stability of legume and other flour products. Dry matter content represents the amount of solid material remaining in a sample after all the water has been removed. From the result, dry matter content of the raw sample gave the highest value of (83.155%) compared with 50^0 C (82.56%) and 100^0 C (81.66%). The fat content of raw and hydrothermally treated samples are (8.35%), (7.45%) and (8.58%) respectively. Fat is important in human diets as a high energy-yielding nutrient. Legumes seeds are generally low in fats and oil (Okaka *et al.,* 2006). The ash content of 100^{o}C treated sample provided the highest value (5.65%), lower at raw (5.21%); 50 ^{0}C (4.86%). The ash content increased at 100^{0}C, indicating an accumulation of inorganic minerals during the hydrothermal process. The crude fibre content at 100^{o}C treated sample gave the highest value (8.22%) compared with the raw (7.95%) and 50^{o}C (7.17%). Fibre had been credited for promotion of increased excretion of bile acids, sterols and fats which had been implicated in the etiology of certain ailments in humans (Okaka *et al.,* 2006). Okon (1983) reported that a

diet low in fibre is undesirable as it could cause constipation and such diets have been associated with diseases of the colon like piles, appendicitis and cancer. Crude protein content of the sample treated at 100^{o}C was higher (13.44%) compared with raw (12.93%) and 50^{o}C treated sample (12.65%) respectively. The reduction in the protein content at 50^{o}C could be attributed to leaching of some soluble protein into the boiling water during processing (Obasi and Wogu, 2008). Dietary proteins are needed for the synthesis of new cells, enzymes and hormones required for the development of the body. Carbohydrate content of cocoa bean treated at 50^{0}C was 50.45% and higher compared with raw (48.72%) and 100^{0}C (47.64%).

Functional properties

The results of the functional properties of raw and hydrothermally treated cocoa beans are shown in Table 2. The results, in mg/100g, showed that the raw sample had the highest values for bulk density (0.507±0.001), foaming capacity (12.86±0.01), solubility capacity (4.105±0.0005), gelatinization (2.61±0.01), dextrose equivalent (8.14±0.02) while the highest value for water absorption capacity (276.5195±0.0015), oil absorption capacity (121.677±0.001), swelling index (41.23±0.001) were obtained from cocoa bean hydrothermally treated.

The functional properties of cocoa beans were affected by hydrothermal treatments. The treatments had positive impact on the solubility, water absorption capacity, and emulsifying properties of cocoa beans. Table 2 shows the highest levels of functional properties obtained in this study were in the sample hydrothermally treated at 100^{0}C, closely followed by sample treated at 50°C while the lowest values for functional properties were observed in the raw sample.

The porosity of food products is determined by the bulk density (BD). Bulk density plays an important role in packaging, transportation of food products and decreases porosity of materials due to surface properties (Milson and Kirk, 1980); it depends on the initial moisture content, particle size, and starch content of flour. The result gave higher value for raw (0.507) compared with 50^{0}C (0.507) and the sample treated at 100^{0}C (0.4875). Bulk density plays an important role in packaging, transportation of food products and decreases porosity of materials due to surface properties (Milson and Kirk, 1980).(Klang *et al*, 2020; Dereje *et al.*, 2020 and Anosike *et al.*, 2020) have mentioned that flours with BD lower than 1 g/mL can be used in manufacturing low-bulk weaning foods and high-energy foods. In addition,it facilitates easy storage, transport, and marketing due tolow volume of packaging material requirement to store the flours.

Water absorption capacity (WAC) is an index of the maximum of amount of water that a food product can absorb and hold, in this result the hydrothermally treated sample has the highest value (mg/100g) at 100^{0}C (276.5195), 50^{0}C (258.237) and lower at raw sample (242.117). These results were higher when compared to the values of water absorption capacities of soybean (130%) and cowpea (100%) as reported by Lin *et al. (*1974).

The value of Oil absorption capacity (OAC) of raw and hydrothermally treated cocoa beans are (116.106), 50^{0}C (121.677) and 100^{0}C (110.832), this means the value of hydrothermally treated at 50^{0}C is higher than raw and 100^{0} C treated samples. Oil absorption capacity had been attributed to the physical entrapment of oil (Hasmadi *et al.,* 2020). It is an indication of the rate at which the protein binds to fat in food formulations. Oil absorption capability required in most food applications, such as in bakery products, wherein required in flavour retention and improvement of palatability (Abu *et al.,* 2005). Soybean flour has the lowest oil absorption capacities (29.59%) compare to lara flour and barinas flour has a higher oil absorption capacity, 35.08 and 35.70%, respectively (Padilla *et al.,* 1995). This is important since fat acts as flavour retainer and increases the mouthfeel of food.

The foaming capacity (FC) gave highest value for raw sample (12.86) compared with 50^0 C (12.02) and 100^0 C (12.25). The decrease could be due to treatment effect. The values reported in this work are lower than those reported for most nuts and seeds; pumpkin seed 87%, wheat flour 84.2% and soy flour 84.4% (Olaofe *et al.*, 1994). The foaming capacity measures the amount of interfacial area created by protein during foaming (Zhu *et al.*, 2017). The foaming capacity is used as an index of the whipping characteristics of the flour. Flours can produce foams due to surface-active proteins (Adebowale and Lawal, 2003).
Solubility index (S.I) at 100^oC was higher (41.23) compared with raw (40.825) and 50^0C treated sample (38.9) respectively. Swelling capacity (SC) at raw sample gives the highest value of (4.105) compared with 50^0C (3.57) and 100^0C (3.91). The Gelatinization value of 50^0C treated sample gave the lowest value (2.25), followed by 100^0C (2.505) and higher at raw sample (2.61). Dextrose equivalent (DE) of the raw sample gave the highest value of 8.14mg/100g compared with 50^0C (4.83 mg/100g) and 100^0C (8.025mg/100g)

Conclusion

The study revealed the effects hydrothermal treatments had on the proximate composition and functional properties of cocoa beans. The results obtained provided valuable insights into the potential benefits and applications of the processing technique. The hydrothermal processes involved subjecting cocoa beans to controlled heat conditions, leading to changes in their chemical/proximate composition and functional characteristics. The results from this work showed that the hydrothermal treatments had effects in the reduction of proximate composition in cocoa bean with the percentage difference in the value of raw and hydrothermally treated samples. Raw sample showed increased in the functional properties, compared to the hydrothermally treated samples. From this study, it is recommended that hydrothermal treatment at 100^0C enhanced the improvement of nutritional qualities of cocoa beans and this is the ideal temperature for the utilization of cocoa bean as human food.

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APPLICATION OF ZACCHAEUS INTEGRAL TRANSFORM TO POPULATION GROWTH AND DECAY PROBLEM

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Abstract
This study introduced a novel integral transform called Zacchaeus Transform. The characteristic of Zacchaeus Transform are discussed. The Zacchaeus Transform of the elementary functions, and some of the derivatives of a function are obtained. The initial value problems in population growth and decay problem are analyzed by applying Zacchaeus Transform. It is revealed that by applying Zacchaeus Transform the initial value problems in population growth and decay are easily analyzed.
Keywords: *Zacchaeus Transform, population growth and decay, Initial value problem*

Introduction

There are severel integral transform such as: Laplace transform, Sumudu transform, Elzaki transform, Aboodh transform, Rohit transform, Mahgoub transform (Laplace-carson transform), Mohand transform, Dinesh transform, Gupta transform, Kamal transform, Sadik transform, Sawi transform, Tarig transform, Shehu transform, Natural transform, ZZ transform, G-transform, Pourreza, □-integral, Laplace transform, SEE transform source, and so on. They were used to solve series of differential equation. In this article Zacchaeus Transform will be used to solve differential equation with initial value problem.

Definition of Zacchaeus integral transform

Let (t) be a continuous function on any interval for t ≥ 0. The Zacchaeus transform of (t) is defined as

$$Z[f(t)] = v^4 \int_0^\infty e^{-vt} f(t)dt = Z(v),$$

Provided that the integral convergent is called Zacchaeus integral transform, where v may be a real or complex parameter and Z is the Zacchaeus Transform operator.

Zacchaeous transform of elementary function.

According to the definition of Zacchaeus Transform

$Z[f(t)] = v^4 \int_0^\infty e^{-vt} f(t)dt$

1. $Z[f(k)] = kv^3$
2a. $Z[f(t^n)] = \frac{n!v^3}{v^n}, n \geq 0$
2b. $Z[f(t^n)] = \frac{\Gamma(n+1)v^3}{v^n}, n > -1$
3. $Z[f(e^{kt})] = \frac{v^4}{v-k}, v > k$
4. $Z[f(sin\ sin\ kt)] = \frac{kv^4}{v^2+k^2}$

5. $Z[f(cos\ cos\ kt) = \frac{v^5}{v^2+k^2}$
6. $Z[f(sin\ sin\ hkt)] = \frac{kv^4}{v^2-k^2}$
7. $Z[f(cos\ cos\ hkt)] = \frac{v^5}{v^2-k^2}$

Proof:

1. $Z(k) = v^4 \int_0^\infty \quad e^{-vt} f(t)dt = v^4 \int_0^\infty \quad ke^{-vt}dt = v^4.k\left[\frac{e^{-vt}}{-v}\right]\frac{\infty}{0} = kv^3$
2. $Z(t^n) = v^4 \int_0^\infty \quad e^{-vt} f(t)dt$

   Putting $vt = x, or\ t = \frac{x}{v}\ or\ dt = \frac{dx}{v}$

Thus, we have $Z(t^n) = v^4 \int_0^\infty \quad e^{-x}(\frac{x}{v})^n \frac{dx}{v}$

Or $Z(t^n) = v^4.\frac{1}{v^{n+1}} \int_o^\infty \quad e^{-x}x^n dx$

$Z(t^n) = \frac{n!v^4}{v^{n+1}} = \frac{n!v^3}{v^n} = \frac{\Gamma(n+1)v^3}{v^n}$

Since $\Gamma(n+1) = \int_0^\infty \quad e^{-x}.x^n dx\ and\ \Gamma(n+1) = n!$

3. $Z(e^{kt}) = v^4 \int_0^\infty \quad e^{-vt}.e^{kt}dt = v^4 \int_0^\infty \quad e^{-(v-k)^t}dt = v^4 \left\{\left[\frac{e^{-(v-k)t}}{-(v-k)}\right]^\infty - \left[\frac{e^{-(v-k)t}}{-(v-k)}\right]^o\right\} \quad = v^4 \left\{\left[\frac{e^{-(v-k)\infty}}{-(v-k)}\right] - \left[\frac{e^{-(v-k)0}}{-(v-k)}\right]\right\} = v^4[\ 0 - \frac{e^o}{-(v-k)}] = v^4[\frac{1}{(v-k)}] = \frac{v^4}{(v-k)}$

4. $Z\left[sin\ sin\ (kt)\right] = Z[\frac{e^{ikt}-e^{-ikt}}{2i}] = \frac{1}{2i}\left[\frac{v^4}{v-ik} - \frac{v^4}{v+ik}\right] = \frac{kv^4}{v^2+k^2}$
5. $Z[kt)] = Z[\frac{e^{ikt}+e^{-ikt}}{2}] = \frac{1}{2}\left[\frac{v^4}{v-ik} - \frac{v^4}{v+ik}\right] = \frac{v^5}{v^2+k^2}$
6. $Z[kt)] = Z[\frac{e^{kt}-e^{-kt}}{2}] = \frac{1}{2}\left[\frac{v^4}{v-ik} - \frac{v^4}{v+ik}\right] = \frac{kv^4}{v^2-k^2}$
7. $Z[kt)] = Z[\frac{e^{ikt}-e^{-kt}}{2}] = \frac{1}{2}\left[\frac{v^4}{v-k} - \frac{v^4}{v+k}\right] = \frac{v^5}{v^2+k^2}$

Inverse Zacchaeus transform of elementary functions

1. $Z^{-1}(av^3) = a$
2. $Z^{-1}(v^2) = t$
3. $Z^{-1}(v) = \frac{t^2}{2!}$
4. $Z^{-1}(v^{3-n}) = \frac{t^n}{n!}$
5. $Z^{-1}(v^{3-n}) = \frac{t^n}{\Gamma(n+1)}$
6. $Z^{-1}\left(\frac{v^4}{v-k}\right) = e^{kt}$
7. $Z^{-1}\left(\frac{v^4}{v^2+k^2}\right) = \frac{Sinhkt}{k}$
8. $Z^{-1}\left(\frac{v^5}{v^2+k^2}\right) = cos\ cos\ kt$
9. $Z^{-1}\left(\frac{v^4}{v^2-k^2}\right) = \frac{sinsin\ hkt}{k}$
10. $Z^{-1}\left(\frac{v^5}{v^2-k^2}\right) = cos\ cos\ hkt$

Zacchaeus transform of derivative

Let $f(t)$ is continuous function and is piecewise continuous on any interval then the Zacchaeus Transform of first derivative of $f(t)$ i.e $Z[f'(t)]$ is given by

1. $Z[f'(t)] = v^4 \int_0^\infty \quad e^{-vt} f'(t)dt$ integrating by part we have

$Z[f'(t)] = v^4[e^{-vt}f(t)]\frac{\infty}{0} - \int_0^\infty \quad (-ve^{-vt})f(t)dt =$
$v^4[-f(0)] + v\int_0^\infty \quad e^{-vt}f(t)dt$

Where $[e^{-vt}f(t)] = 0$ when $t = \infty$ and –f(0) when t = 0

$-v^4f(0) + v\int_0^\infty \quad v^4e^{-vt}f(t)dt$

$-v^4f(0) + vz[f(t)] = vz[f(t)] - v^4f(0)$

2. $Z[f''(t)] = v^2z[f(t)] - v^5f(0) - v^4f'(0)$

Proof:

Recall that $Z[f'(t)] = vz[f(t)] - v^4f(0)$

Replacing $f(t)\ by\ f'(t), f'(t)\ by\ f''(t)$ and f(0) by $f'(0)$

$Z[f''(t)] = vz[f'(t) - v^4f(0)] - v^4f'(0) \qquad = v^2z[f(t)] - v^5f(0) - v^4f'(0)$

3. $Z[f'''(t)] = v^3z[f(t) - v^6f(0) - v^5f'(0) - v^4f''$

Proof

Recall that $Z[f''(t)] = vz[f'(t) - v^4f(0)] - v^4f'(0)$

Replacing $f(t)\ by\ f'(t), f'(t), f'(t) by\ f''(t) and\ f''(t) by\ f'''(t)$

$Z[f'''(t)] = v^2z[f'(t) - v^5f'(0) - v^4f''(0)$

$= v^2\{vz[f(t)] - v^5f'(0) - v^4f''(0) \qquad = v^3z[f(t)] - v^6f(0) - v^5f'(0) - v^4f''(0)$

4. $Z[f^{iv}(t)] = v^4z[f(t)] - v^7f(0) - v^6f'(0) - v^5f''(0) - v^5f'''(0)$

Proof:

Recall that $Z[f'''(t)] = v^3[f(t)] - v^6f(0) - v^5f'(0) - v^4f''(0)$

Replacing $f(t) by\ f'(t), f'(t) by\ f''(t), by\ f'''(t) and\ f'''(t)$

$Z[f^{iv}(t)] = v^3z[f'(t) - v^6f(0) - v^5f''(0) - v^4f'''(0)$

$= v^3[vzf(t) - v^4f(0)] - v^6f'(0) - v^5f''(0) - v^4f'''(0)$

$= v^4z[f(t) - v^7f(0) - v^6f'(0) - v^5f''(0) - v^4f''(0)$

In summary, [f(t)]

1. $Z[f'(t)] = vz(t) - v^4f(0)$
2. $Z[f''(t)] = v^2z[f(t)] - v^5f(0) - v^4f'(0)$
3. $Z[f^{f'''}(t)] = v^3z[f(t)] - v^6f(0) - v^5f'(0) - v^4f''(0)$
4. $Z[f'^v(t)] = v^4z[f(t)] - v^7f(0) - v^6f'(0) - v^5f''(0) - v^4f'''(0)$
5. $Z\left[f^{(n)}(t)\right] = v^nz[f(t)] - v^{(n+3)}f(0) - v^{(n+2)}f^I(0) - v^{(n+1)}f^{II}(0) - \cdots - v^nf^{(n-1)}(0)$

Applications of Zacchaeus transform

Let N(t) denote the amount of substance(or population) that is either growing or decaying. If we assume that

$\frac{dN}{dt} = kN \ \ or\ \frac{dN}{dt} - kN = 0 \ldots\ldots\ldots(1)$

Where k is the constant of proportionality. We are assuming that N(t) is differentiable and is a continuous, function of time (t). For population problem, when N(t) is actually discrete and has an integer, this assumption is incorrect. Nonetheless, (1) still provides a good approximation to the physical laws governing such a system.

Application (1) A bacteria culture is known to grow at a rate proportional to the amount present. After one hour, 1000 strands of the bacteria are observed in the culture; and after four hours, 3000 strands. Find

(a) An expression for the approximate number of strands of the bacteria present in the culture at any time t and

(b) The approximate number of strands of the bacteria originally in the culture.

Solution

Let N(t) denote the number of bacteria strands in the time t. From equation (1)
$\frac{dN}{dt}$ - KN = 0, which is both linear and separable.
Apply the zacchaeus Transform to equation (1)
Z($\frac{dN}{dt}$) – Z(KN) = 0
VZN(t) - V^4N(0) – KZ(N) = 0
Let N(0) = A
VZN(t) - AV^4 - KZ(N) = 0
(V - K) Z(N) = AV^4
Z(N) = $\frac{AV^4}{V-K}$
The inverse Zacchaeus Transform of this equation is simply obtained as:
N(t) = Ae^{kt} ……...1.1
At t = 1, N = 1000; hence,
1000 = Ae^k …….. 1.2
At t = 4, N = 3000; hence
3000 = Ae^{4k}……..1.3
From 1.2 A=1000÷ e^k……..1.4
Put (1.4) into (1.3)

$$1000e^{4k} \div e^k = 3000$$

$e^{4k-k} = \frac{3000}{1000} = 3$
$e^{3k} = 3$

$$Hence, K = 0.3662$$

From 1.4

$$A = 1000 \div e^k$$

$$A = 1000 \div e^{0.3662}$$

$$A = 1000 \div 1.442244$$

$$A = 693.3641 \cong 693$$

Substituting these values of k and A into 1.1

$$N(t) = 693e^{0.3662t} \ldots\ldots\ldots\ldots\ldots 1.5$$

(b) We require *N* at t=0 into 1.5
We obtain N(O)=693$e^{(0.3662)(0)}$= 693

Application (2); The population of a town grows at a rate proportional to the number of people presently living in the town. If after three years, the population has tripled, and after six years the population is 2700, then estimate the number of people initially living in the country.

The problem can be mathematically written as
$\frac{dN(t)}{dt}$ −KN(t)=0……..2.1

Where N denote the number of people living in the town at any time t and k is the constant of proportionality. consider N(0) as the number of people initially living in the town at t=0

Applying the zacchaeus transform to 2.1

$Z\left[dN\frac{(t)}{dt}\right]$-KZ$[N(t)]$=0

VZN(t) – V^4N(0)−KZN(t)=0

$(V-K)$ Z$[N(t)]$=V^4N$_0$

Z$[N(t)] = \frac{V^4 N_O}{V-K}$

Since at t=0, N=N$_0$

Z[N(t)]=$\frac{N_0 V^4}{v-k} = N_0(\frac{V^4}{v-k})$

The inverse Zacchaeus Transform of this equation is simply obtained as

N(t)=$N_0 e^{kt}$ … … … … … … … … … ….2.2

Now at t=3, N=3N_0, so using this in 2.2, we have

$3N_0 = N_0 e^{kt}$

$3e^{3k} = 3$

k=0.3662 ……. 2.3

Now using the condition at t=6

N= 27,000 in (2.2)

27,000=$N_0 e^{6k}$

Now substituting the value of k from (2.3)

27,000 = $N_0 e^{6\times 0.3662} = N_0 e^{2.1972}$

$$N_0 = 27{,}000 \div e^{2.1972}$$

$$N_0 = 3000.073731812082$$

$$N_0 \cong 3000$$

Application (3): A radioactive material is known to decay at a rate proportional to the amount present. If initial there is 100 milligrams of the radioactive material present and after 4 hour it is observed that the radioactive material has lost 25 percent of its original mass, find the half life of the radioactive material

This problem can be written in mathematics form as:

$$\frac{dN(t)}{dt} + kN(t) = 0 \text{ … … … … … …}.3.1$$

Where N denote the amount of radioactive material at time t and k is the constant of proportionality, consider N_0 as the initial amount of the radioactive material at t=0

Apply Zacchaeus Integral Transform to (3.1)

$Z\left[\frac{dN(t)}{dt}\right] + kZ[N(t)] = 0$

$VZ[N(t)] - V^4 N(0) + kZ[N(t)] = 0$

$(V+k)ZN(t) = V^4 N(0)$

$ZN(t) = \frac{V^4 N(0)}{V+k}$

Since at t=0, N=N=N(0)=100, so using this in 3.2

$ZN(t) = \frac{100V^4}{V+k}$

The inverse of Zacchaeus Transform of this equation is simply obtained as

N(t) = $100e^{-kt}$ 3.3
Now at t = 4, the radioactive material has lost 25% of its original mass 100mg so N = 100 – 25= 75, using this in 3.3
$75 = 100e^{-4k}$
k= 0.07193 …….. (3.4)
We required t when N = $\frac{N(0)}{2} = \frac{100}{2} = 50$ from 3.3, we have $50 = 100e^{-kt}$
Putting the value of k from (3.3) in (3.4) we have

$$50 = 100e^{-0.07193t}$$

$$t = 9.636290$$
$$t \cong 9.636\ hours$$

which is the required half- time of the radioactive material

Conclusion

In this paper a modified version of Laplace transform namely Zacchaeus transform have been introduced for solving problems in population growth and decay. Like other transforms, Zacchaeus Transform is discovered to be very effective method for solving initial value problem in population growth and decay.

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SENTIMENT ANALYSIS OF TWITTER DATA: DEVELOPMENT OF A MACHINE LEARNING BASED APPROACH TO ANALYSING BUSINESS TWEETS

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Abstract
The increasing amount of data available on social media platforms has presented businesses with a wealth of information that can be used to make informed decisions. This study aims to develop a machine learning based model for sentiment analysis of Twitter data on the telecommunication business domain. The proposed system will be more efficient and effective than the existing manual process of collecting and analyzing Twitter data, as it will automate the process and provide real-time insights for effective decision-making. The data used in this study was collected from Twitter using a web scraping framework (selenium, beautifulsoup, and tweepy). The sentiment analysis was performed on the Twitter data of Globacom Nigeria. The results show that the proposed system can help businesses extract valuable insights from social media data and make effective decisions that could make Globacom the Nigeria market leader.

Keywords: Machine learning, Sentiment Analysis, Twitter, Business Decisions, Data Scraping, Big Data

Introduction to the study

The increasing amount of data available on social media platforms has presented businesses with a wealth of information that can be used to make informed decisions. However, analyzing this data can be a daunting task due to its sheer volume, unstructured nature and diverse sources. One of the most popular social media platforms is Twitter, which has over 330 million active users generating over 500 million tweets per day. Analyzing this massive amount of data as it concerns a domain of business can provide valuable insights into their customers' opinions and preferences.

Undoubtedly, the twenty-first century technological revolution has brought with it an immense burst of data (Mohammad, 2019). This data, referred to as Big Data has a potential to improve business lots when they are appropriately harnessed. Though, it is a fact that companies have been engaging data for decision making from time immemorial, the depth of the insights gained has obviously been abysmal.

Presently, as a result of increase in computing power, companies are able to collect, store and process data at an unimaginable scale (Xichuan *et al.,* 2022). Information technology professionals are now equipped to retrieve these Big Data with their technical skills, extract insights from these data with their statistical knowledge, and derive business value with their domain knowledge. As we look through this technology phase, we would like to put more study on engagement of twitter data (i.e followers, following and so on). Castro *et al. (*2017) affirmed that with Twitter, it is possible to get people's insight from their profiles in contrast to traditional ways of obtaining information about perceptions

The use of web scraping frameworks also provides businesses with a tool to automate the process of collecting large amounts of data from social media platforms. Web scraping involves the automated extraction of data from websites, allowing businesses to collect large amounts of data quickly and efficiently.

The use of sentiment analysis, which is a natural language processing technique that involves identifying and categorizing opinions expressed in a piece of text, has become increasingly popular in recent years. It allows businesses to extract valuable insights from social media data by identifying and categorizing opinions expressed in tweets. Also, sentiment analysis studies the subjective information in an expression, that is, the opinions, appraisals, emotions, or attitudes towards a topic, person or entity (Liu, 2010). There is a space for performing challenging research in broad areas by computationally analyzing opinions and sentiments (Jagdale *et al.,* 2017) Expressions can be classified as positive, negative or neutral. Sentiment analysis is often performed on textual data to help businesses monitor brand and product sentiment in customer feedback, and to understand customer needs.

The blend of these technological tools will go a long way in advancing business fortunes in the telecommunication domain as brands will be able to get a definite feel of how consumers perceive their products and services.

The telecommunication industry is a broad sector that encompasses various activities related to the transmission, exchange, and communication of information using various technologies. It involves the provision of voice, data, and multimedia services to individuals, businesses, and governments. The industry plays a critical role in enabling global communication, connecting people, facilitating economic activities, and driving technological advancements. Nigeria's telecommunication market is highly competitive, with several major players, including MTN Nigeria, Airtel Nigeria, Globacom, and 9mobile (formerly Etisalat Nigeria). Globacom and MTN Nigeria are the most popular.

Globacom, also known as Glo, is the second major telecommunications company in Nigeria (Adebayo and Olokundun, 2017). The company offers a wide range of telecommunications services, including voice calls, data services, internet connectivity, and value-added services. One of the notable strengths of Globacom is its extensive network infrastructure, which includes a robust fiber optic cable network and a range of network technologies like 2G, 3G, and 4G LTE (Adeoti, 2019). This infrastructure investment allows Glo to provide reliable and high-speed connectivity to its customers. Glo is reputable for its competitive pricing strategies (Adebayo and Olokundun, 2017). It is however worrisome that despite all these innovations and massive investments, it has not been able to match up with MTN in terms of market penetration, profitability and acceptance.

MTN Nigeria, the Nigerian subsidiary of MTN Group Limited, was established in 2001 and has grown to become the largest telecommunications operator in Nigeria in terms of subscriber base and market share.

In this study, Globacom Nigeria will be used for the research to evaluate its status and prospects. This will be achieved by scraping a good number of their customer comments on a particular keyword; an extensive information of new data feed from twitter users will be obtained from here and sentiment analysis performed on them. The output of this research is expected to highlight the weaknesses of Globacom in recent times and thereafter offer suggestion on how to improve on their service so as to break the dominance of MTN and make the company the foremost telecommunication company in the country.

This study will explore the application of scraping frameworks and sentiment analysis of Twitter data for effective business decision-making. It seeks to demonstrate how businesses can use these techniques to extract valuable insights from social media data and make informed decisions.

Several studies have applied machine learning data analytics to various aspects of business decision making, including customer segmentation, pricing optimization, and supply chain management. Andrea *et al. (*2022) used machine learning to optimize pricing strategies for online retailers based on customer behaviour and market trends. A study by Ivanov *et al.*

*(*2023) applied data analytics to supply chain management for decision making in the context of the COVID-19 pandemic.

Existing literatures showed application of various machine learning based sentiment analysis in diverse domains, this analysis has however not been performed in Nigeria's telecommunication industry for the purpose of guidance in critical business decisions, hence this study.

This study aims to develop a machine learning based model for sentiment analysis of twitter data on the telecommunication business domain

The specific objectives are as follows:

i. Collect data from twitter
ii. Formulate and design a sentiment analysis model for the twitter data in (i)
iii. Analyse the twitter data using (ii)
iv. Visualise the results of the analysis in (iii)

Materials and methods

This section describes the tasks involved in achieving the set objectives and the algorithms explored.

Python libraries used in the study

a. BeautifulSoup

Beautiful Soup is a Python library designed to extract data from (Hypertext Markup Language)HTML and (Extended Markup Language)XML files. It allows programmers to easily parse HTML and XML documents, navigate their tree-like structure, and extract specific pieces of data based on tags, attributes, and other elements.

b. Selenium

Selenium is an open-source web-based automation tool that provides a way to automate the testing of web applications. It allows users to write scripts in various programming languages like Python, Java, and Ruby to automate browser actions such as clicking buttons, filling forms, and navigating through web pages. Selenium can be used to automate tasks that require user interaction, such as web scraping, testing, and web application monitoring.

c. Snscrape

snscrape is a Python library and command-line tool that allows you to scrape social media data from various platforms. It provides a convenient way to extract information such as posts, comments, likes, and other metadata from social media platforms like Twitter, Reddit, Instagram, and YouTube. With snscrape, it is possible to retrieve data by specifying search queries, usernames, or specific URLs. It supports both historical and real-time data retrieval, allowing you to access past posts as well as monitor ongoing social media activity.

System components

The system is made up of two (2) main components: the data scraping module and the sentiment analysis module. The data scraping module is responsible for collecting data from Twitter using the Tweepy library, filtering the data based on specified keywords or hashtags, and storing the data in a database while the sentiment analysis module utilizes the TextBlob model to analyze the collected data and determine the sentiment of each tweet, from strong very strong, strong, neutral, weak, very weak. The proposed system will be more efficient and effective than the existing manual process of collecting and analyzing Twitter data, as it will automate the process and provide real-time insights for effective decision-making.

a. Scraping Module

The data used in this study was collected from Twitter using a web scraping framework (selenium, beautifulsoup and snscrape). The data collection process starts from obtaining

streams of Globacom twitter user followers after tweets were collected using specific keywords related to the business under study. The collected data was stored in a CSV file for analysis.

In the process of scrapping Glo twitter user followers, twitter platform was accessed. We were able to automatically log-in through a web automation framework called selenium. Selenium was used to access twitter, the corresponding twitter javascript request was thereafter converted into an html page for beautifulsoup to track relevant features. BeautifulSoup has the capability to scrape data when it is authorized to; it was used to scrape the Glo twitter followers data bios as shown in fig. 1. It is also capable of scraping tweets made by the followers for the purpose of sentiment analysis.

The system will utilize Python programming language and various libraries such as BeautifulSoup, Tweepy, and TextBlob to scrape data from Twitter and analyze it for its sentiments using natural language processing techniques.

	Full Name	Username	profile Link	Description	Location
0	Abimbola	@Ola_Abimbola	https://twitter.com/Ola_Abimbola	Hard work spotlights the character of people: some turn up their sleeves, some turn up their	
1	LERRYCUT MOBILE BARBER	@Lerry_sax	https://twitter.com/Lerry_sax	BARBER	
2	Uriah of Beth-Zahab	@Mopheth_Ariel	https://twitter.com/Mopheth_Ariel	All about Art from my perspectiveâ€"my signature. Also here for the $ too.	
4	Tony Don-keke	@yadon3139	https://twitter.com/yadon3139	I'm honestly and simple in nature.	
5	Victory Ihezie-Emmanuel C	@IhezieVictory	https://twitter.com/IhezieVictory	A Lawyer, Jesus Lover, a Friend and more.	
6	Albert Sochima	@SochimaAlbert	https://twitter.com/SochimaAlbert	Social and clingy...more like a stalker	
7	benson Ilesanmi	@HelenDrayton3	https://twitter.com/HelenDrayton3	caring and loving	
8	Joseph Chidobem	@joseph_jo5473	https://twitter.com/joseph_jo5473	To train, educate the Nigerians in area of Tertiary education and to give hope to the hopeless under sound	
9	INFINIT	@infinitybwebies	https://twitter.com/infinitybwebies	I design, I print, I publish, etc	
10	@adepamothercare	@adepamothercare	https://twitter.com/adepamothercare	baby and mama's comfort (I got Jesus)	
11	Jibril	@UmarBuba711446	https://twitter.com/UmarBuba711446	Abide by the law and constitution of Nigeria	
12	Timmy	@Tim_Fashman	https://twitter.com/Tim_Fashman	Zich global ventures Ltd	
13	Benjamin Godwin Unekwuojo	@Unekwuojo8	https://twitter.com/Unekwuojo8	Worshiper, i love jesus	
15	Saheed â€˜Saheeto1â€™ Adeyi	@edatwhyte	https://twitter.com/edatwhyte	A Natural and Built Environment Infrastructure Development, Engineering & Construction, Concessions & (	
16	Olajide Segun	@GemHolla	https://twitter.com/GemHolla	Co-founder of Swipe wires | Co - founder Future tech | Affiliate Marketer | Artist | Real Estate Agent | IT F	
17	Karimara Hothyal	@KHothyal	https://twitter.com/KHothyal	Sweet kindNiceGentle caring and helovel's music	
18	Ike juliet	@Ikejuliet14	https://twitter.com/Ikejuliet14	Mumâ€™s Favorite Daughter	
19	Muhammad Swallow	@Show_killer65	https://twitter.com/Show_killer65	MUM&DADFOOTBALL GAMERDEVELOPERLAW STUDENT CELESTIAL BEING PROUDLY BADEMY LOVELY SISTER	
20	Jiao Delicata	@Victor80370090	https://twitter.com/Victor80370090	Victor	
21	Salisu Kabir maska	@salisu_maska	https://twitter.com/salisu_maska	Smiling face..	
22	Megamind	@VAnyipa	https://twitter.com/VAnyipa	Enthusiast	
23	Ahmat Hassan Kanga	@ah_kanga	https://twitter.com/ah_kanga	Am a footballer,an also a Christian and love adventure,i Love music,i love meetings people and i love mad	

Fig 1. Screenshot of Data obtained From Glo Twitter Followers

b. **The Sentiment Analysis**

Sentiment analysis using python programming language begins with importing the requisite libraries and then loading of the scraped data as shown in figure 2. The subjectivity and polarity were thereafter obtained as shown in figure 3. The values of the polarity helps to categorize the tweet into segments such as very strong, strong, neutral, weak and very weak as shown in figure 4. Polarity within the range of > 0.7 denotes very strong, and strong weak is <-0.7. A value within 0.7 and 0 is strong, meaning it is positive; and between 0 and -0.7 implies it is weak. Zero polarity is categorized as neutral.

	Full Name	Username	profile Link	Description	Location
0	Itoro Bassey	@Itorobassey777	https://twitter.com/Itorobassey777	With God All Things Are Possible	NaN
1	Leo Jay	@LeoJay18339669	https://twitter.com/LeoJay18339669	Amazing	NaN
2	BARIKPEMOM OMEGA. Avive Citizen	@megstar001	https://twitter.com/megstar001	https://twitter.com/Avive_World\r\n\r\ni am an...	NaN
3	king karlly	@CAnisionu	https://twitter.com/CAnisionu	Zich global ventures Ltd	NaN
4	PAULINO	@AYODELE_PAULINO	https://twitter.com/AYODELE_PAULINO	Website Management Strictly to business Ea...	NaN

Fig 2: Screenshot of the data that was scraped

	Full Name	Username	profile Link	Description	Location	Subjectivity	Polarity
0	Itoro Bassey	Itorobassey777	twitter.com/Itorobassey777	With God All Things Are Possible	NaN	1.000000	0.000000
1	Leo Jay	LeoJay18339669	twitter.com/LeoJay18339669	Amazing	NaN	0.900000	0.600000
2	BARIKPEMOM OMEGA. Avive Citizen	megstar001	twitter.com/megstar001	twitter.com/Avive_Worldi am an Avive Citizen	NaN	0.000000	0.000000

Fig 3: Screenshot of the data that was scraped with polarity scores

	Full Name	Username	profile Link	Description	Location	Subjectivity	Polarity	Analysis
0	Abimbola	Ola_abimbola	Twittercomola_abimbola	Hard work spotlights the character of people s...	NaN	0.541667	-0.291667	Weak
1	LERRYCUT MOBILE BARBER	Lerry_sax	Twittercomlerry_sax	Barber saxophonist musician customer relations...	NaN	0.000000	0.000000	Neutral
2	Uriah of Beth-Zahab	Mopheth_ariel	Twittercommopheth_ariel	All about art from my perspectivemy signature ...	NaN	0.000000	0.000000	Neutral
3	Tony Don-keke	Yadon3139	Twittercomyadon3139	Im honestly and simple in nature	NaN	0.628571	0.300000	Strong
4	Victory Ihezie-Emmanuel C	Ihezievictory	Twittercomihezievictory	A lawyer jesus lover a friend and more	NaN	0.500000	0.500000	Strong

Fig 4: Screenshot of the data that was scraped

Flow Chart

A flowchart is a visual representation of a process or algorithm that uses symbols to represent different steps or actions. It is a graphical tool that helps to illustrate the sequence of steps involved in a complex process or system. Flowcharts can be used in a variety of fields, such as computer programming, engineering, business, and education, to help visualize and communicate the flow of information or tasks. They are often used to identify bottlenecks, redundancies, and inefficiencies in a process and to help streamline operations.

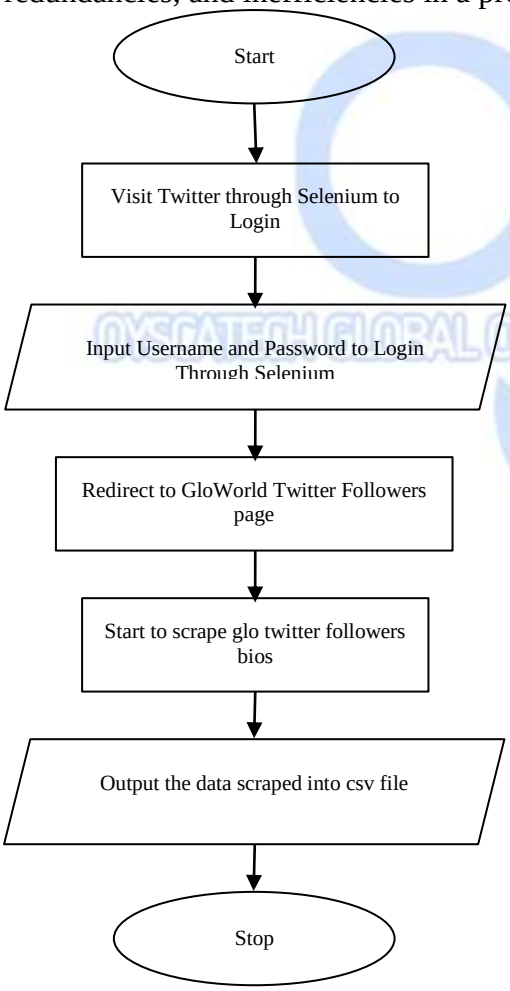

Fig 5: Data Scraping FlowChart

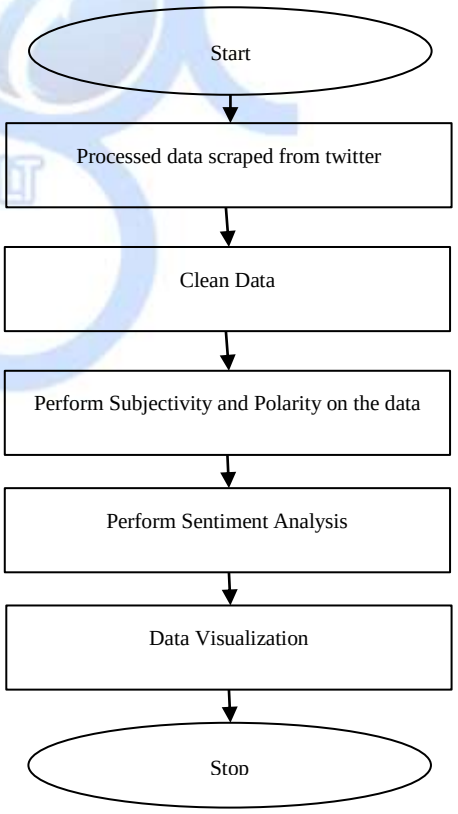

Fig 6: Sentiment Analysis of the extracted Data

Results and discussion

The collected data was analyzed using a Python library for sentiment analysis called TextBlob. The library is capable of classifying text as very weak, weak, neutral, strong, very strong. The sentiment analysis was carried out on the collected Glo user follower comment tweets based on a specific keyword to determine the overall sentiment of the tweets.

The implementation of the sentiment analysis carried out on the collected data using tarrif plan and data plan keywords respectively are shown in fig 7 and 8. The result obtained in fig 4 denotes that just 6.2% of the tweets show a convincing approval to the pattern of the tarrif plan, 54% denote a level of positivity while 23.9% are indifferent about the appropriateness of the tarrif plan. 15.9% are of the view that the tarrif plans are bad. Efforts should be geared towards reducing the negative perspective figures and also to reduce the 23.9% that are indifferent. Their indifference show that they can be churned at any given opportunity. These focused drive will help to improve the productivity of Globacom Nigeria.

The result in fig 8 proves that just 5.6% are excitedly appreciative of the data plan, this value is very low for a brand that wants to rule the telecommunication industry. The company is at risk of losing 31.4% customers at the moment, this is not good for the company. 29.3% of the current customers already have ill feelings about this data plan, this points to the fact there is a need for a review of this plan. The Quality of Service(QoS) examination shown in fig 9 expresses that 58.2% are of the view that the QoS are weak, 24% are neutral to the services offered while just 17.5% believe that the services provided are satisfactory. The available harvested comments also prove that 47.5% of participants are satisfied with the customer service while 2.3% are extremely proud of the company's customer service as presented in fig 10. 20.1% are not convinced that Glo QoS is good enough, the customers can be changed over to other company at any time which is not safe for Glo. 30.1% are totally enraged at the type of QoS being offered.

Conclusion

It is obvious that Glo can become the telecom market leader if they pay attention to the indices provided by the scraping and sentiment analysis platform. This shows that company managers who desire a leap in their earnings need more of data scientists in situating the need of the company and analyzing it using machine learning tools.

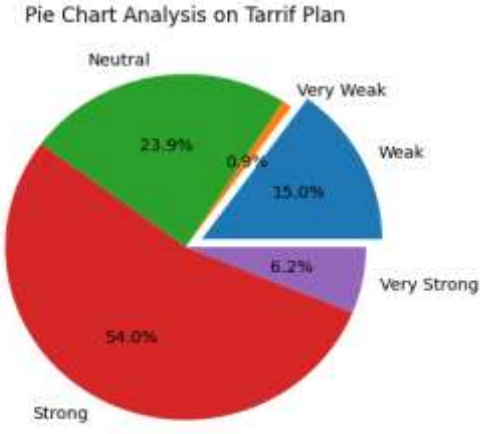

Fig 7: Pie Chart Data Visualization for Sentiment Analysis on Tarrif Plan

Fig 8: Pie Chart Data Visualization for Sentiment Analysis on Data Plan

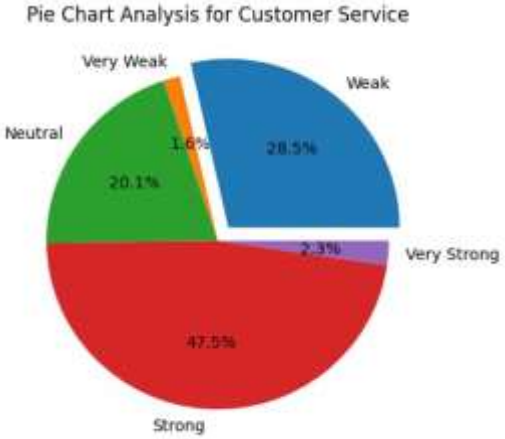

Fig 9: Pie Chart Data Visualization for Sentiment Analysis on Customer Service

Fig 10: Pie Chart Data Visualization for Sentiment Analysis on Quality of Service

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COMPARATIVE ANALYSIS OF PREDICTIVE MACHINE LEARNING MODELS FOR HOUSE RENTS

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Abstract
The prediction of house prices is a complex task due to the numerous variables that influence property values. Machine learning has emerged as a powerful tool for predicting house prices based on the number of room, toilets and neighbourhood. This study aims to compare the performance measures of machine learning based house price prediction system algorithms such as Light GBM, Gradient Boosting, Random Forest, and Linear Regression. The proposed system will consider a wide range of features and their interactions to improve the accuracy of predictions. The data collection process involved gathering a comprehensive dataset comprising historical housing prices and relevant features. The dataset was modelled with a number of machine learning-based algorithms to discover which model has the better results from the various performance metrics evaluation. An exploratory analysis of the results reveals that certain features have a significant impact on house prices, enabling it to provide valuable insights to real estate professionals, property buyers and sellers, and financial institutions. Through careful selection of relevant features and model evaluation, this study demonstrates these Machine Learning algorithms have varied strength in the modelling outcomes in predicting home prices. Linear regression had the highest R2 score of 73.31% which outperformed all other models and the least mean squared error of 26.9% which establishes the reliability of the model against all other models that were compared.

Keywords: Machine Learning, House Rent Prediction, Exploratory data Analysis, Model Evaluation

Introduction

The real estate market is a crucial sector of the economy in this 21st century. A near accurate prediction of house prices has significant implications for both buyers and sellers. Traditionally, real estate professionals rely on their experience and market knowledge to estimate property values (Elli *et al.,* 2003). However, with the rapid advancements in technology, machine learning has emerged as a powerful tool for predicting house prices based on various factors (Quang *et al.,* 2020).

The prediction of house prices is a complex task due to the numerous variables that influence property values. Factors such as location, size, number of rooms, proximity to amenities, economic indicators, and historical sales data all play a crucial role in determining the price of a house (Chau *et al.,* 2007). Analyzing these variables manually can be time-consuming and prone to errors. Therefore, leveraging machine learning algorithms to automate the process and improve accuracy is a promising approach.

Murdoch *et al. (*2019) affirmed that Machine learning algorithms have the ability to learn patterns and relationships from large datasets, enabling them to make predictions based on the learned patterns. By training a machine learning model on historical housing data, it can learn the underlying trends and factors that affect property prices. This trained model can then be used to predict the prices of new or unseen houses.

The availability of comprehensive datasets containing historical housing prices, along with associated features, has facilitated the development of robust machine learning models. Such datasets often include information about the property's location, size, number of rooms, and other important factors.
The aim of this study is to compare multiple machine learning-based system for predicting house prices accurately using R2 score, mean squared error mean absolute error and root mean square as performance measures. By leveraging historical housing data and evaluating various machine learning algorithms, we purpose to create a model that can effectively estimate property values. The proposed system will consider a wide range of features and their interactions to improve the accuracy of predictions.
Homebuyers can benefit from more accurate price estimates, allowing them to make informed decisions and negotiate better deals. Real estate agents and property developers can also leverage this predictive system to optimize pricing strategies and identify potential investment opportunities.

There are lots of works that have focused on training models to predict the house prices or value over time. Lu *et al. (*2017) proposed a hybrid lasso and Gradient boosting regression model which they analysed with different sizes of dataset. Higher dataset had a better accuracy than the lower dataset. On the average, gradient boosting was 2% enhanced in accuracy than lasso regression.
Li *et al. (*2019) built different prediction models based on deep learning to predict housing prices. Their proposed prediction model included two categories; the first was based on multiple characteristic factors of the real estate and second on time series model. In the implementation of prediction models, they built different kinds of models; Logistic Regression, Convolutional Neural Network (CNN) and Long Short-Term Memory (LSTM) to predict according to a variety characteristics of the real estate.
Durganjali and Pujitha (2019) developed a house resales price prediction using classification algorithms. Different classifications algorithms like Linear Regression (LR), Decision Tree, K-Means and Random Forest were used. They focused on Root Mean Squared Error as the performance matrix in predicting which model has the better accuracy result. Linear regression outperformed other models with an accuracy of 72% with Random forest trailing it with 70% accuracy. K-mean square was the worse performing model with 60% accuracy.
Existing literatures show that comparative analysis on machine learning models have been developed severally to predict house rent with focus usually on Root mean squared error. The results obtained however reveal that a stream of performance measures such as R2 score and Mean squared error were not considered in the course of model evaluations, hence this study.

Methodology

Method of data collection

The data collection process involved gathering a comprehensive dataset comprising historical housing prices and relevant features. The dataset includes information such as location, size, number of rooms, amenities, economic indicators, and other variables that influence house prices. The data is collected from diverse geographical areas and covers a wide range of housing types. Care is taken to ensure the dataset represents various market conditions and reflects the variability seen in real-world scenarios. The datasets used in achieving this project were collected from Kaggle repository. A total of 8,831 entries and 9 different features were captured. The features include prices, property name, address, neighborhood, house type, bathrooms and toilets. Fig 1 shows a sample of the obtained data. Python programming language was used to extract the data as seen in fig 2.

Price	Pid	Property_name	Address	Neighboorhood
400000	H1190	1 bedroom mini flat Flat / Apartment for rent Abijo Ajah Lagos	Fidiso Estate Abijo Ajah Lagos	Ajah
14000000	G7398	3 bedroom Flat / Apartment for rent Gerrard Gerard road Ikoyi Lagos	Gerrard Gerrard Gerard Road Ikoyi Lagos	Ikoyi
200000	H5843	1 bedroom mini flat Flat / Apartment for rent Akoka Yaba Lagos	Obadia Akoka Yaba Lagos	Yaba
800000	H1194	2 bedroom Flat / Apartment for rent Iju Ishaga Road Gbaja Surulere Lagos	surulere Iju Ishaga Road Gbaja Surulere Lagos	Surulere
300000	H5842	1 bedroom mini flat Flat / Apartment for rent Abule-Oja Yaba Lagos	Close to Unilag Abule Oja Yaba Lagos	Yaba
300000	H5839	1 bedroom mini flat Flat / Apartment for rent Alagomeji Yaba Lagos	Alagomeji Alagomeji Yaba Lagos	Yaba
300000	H5142	Self Contain for rent Akoka Abule-Oja Yaba Lagos	Yaba Akoka Abule Oja Yaba Lagos	Yaba
600000	H5838	2 bedroom Flat / Apartment for rent Akoka Yaba Lagos	Akoka Extension Akoka Yaba Lagos	Yaba

Fig. 1 Screenshot of Housing features dataset

Models adopted

The dataset was modelled with a number of machine learning algorithms to discover which model has the better results from the various performance metrics evaluation. In all the algorithms, 80% of the dataset was used for training while 20% was used for testing. Price, Number of bedrooms, number of toilets and neighborhood seen in fig 2 are the critical features upon which the modelling was based. Property name and address are considered unnecessary features, and so they were discarded.

```
[ ] data.head(5)
```

	Price	Pid	Property_name	Address	Neighboorhood	House_type	Bedroom	Bathroom	Toilet
0	400000	H1190	1 bedroom mini flat / apartment for rent abijo...	fidiso estate abijo ajah lagos	Ajah	1 bedroom mini flat	1	1	1
1	14000000	G7398	3 bedroom flat / apartment for rent gerrard ge...	gerrard gerard road ikoyi lagos	Ikoyi	3 bedroom flat	3	3	3
2	200000	H5843	1 bedroom mini flat / apartment for rent akoka...	obadia akoka yaba lagos	Yaba	1 bedroom mini flat	1	1	1
3	800000	H1194	2 bedroom flat / apartment for rent iju ishaga...	surulere iju ishaga road gbaja lagos	Surulere	2 bedroom flat	2	2	2
4	300000	H5842	1 bedroom mini flat / apartment for rent abule...	close to unilag abule oja yaba lagos	Yaba	1 bedroom mini flat	1	1	1

Fig 2: Screen shot showing the extracted data in python

The stepwise activities in achieving the set objectives is hereby summarized in fig. 3. Each of the machine learning model used in this study followed exactly the same process shown in fig 3. The .csv data format was imported into the python environment using the pandas library. Null and duplicate data were replaced accordingly and redundant features dropped. The data was clearly explored to derive insights from its pattern before it trained and tested with various algorithms.

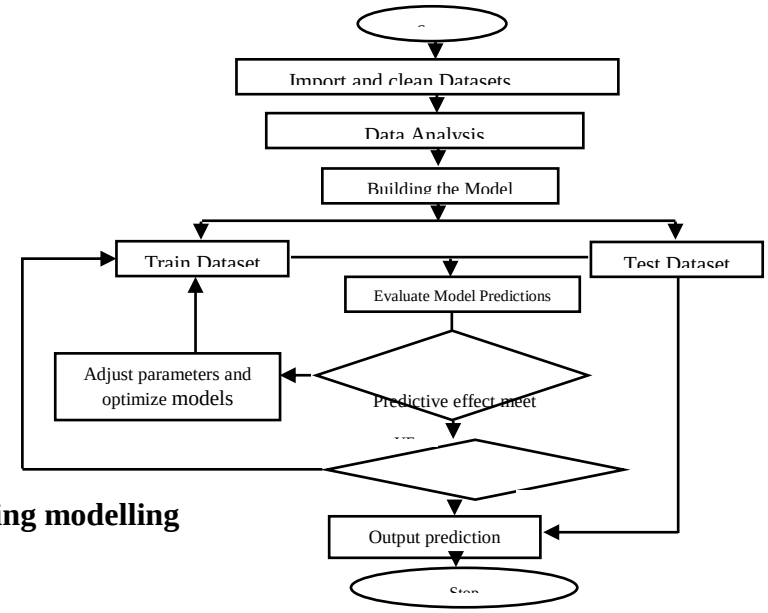


Fig 3: Flowchart of the machine learning modelling

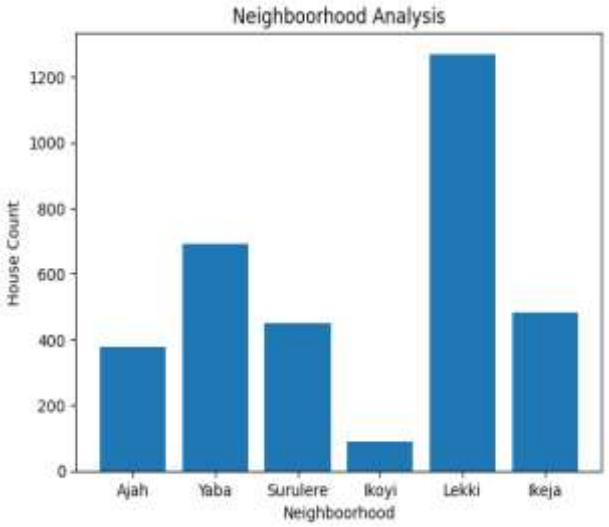
The Dataset was modelled with the following Algorithms:

a. LightGBM: It is a gradient boosting framework based on decision trees to increase the efficiency of the model and reduces memory usage.
b. Random Forest: It is a powerful machine learning algorithm that is widely used for both classification and regression tasks. It is an ensemble learning method that combines multiple decision trees to make predictions.
c. Decision Trees: They are a popular machine learning algorithm used for both classification and regression tasks. They provide a simple yet effective way to make predictions by creating a tree-like model of decisions and their possible consequences.
d. Gradient Boosting: it is a machine learning technique that combines weak learners, typically decision trees, to create a strong predictive model. It is an ensemble method that iteratively builds a sequence of models, where each subsequent model is trained to correct the errors of the previous model.
e. Linear Regression**:** It is a statistical modeling technique used to establish a relationship between a dependent variable and one or more independent variables. It assumes a linear relationship between the variables, where changes in the independent variables are associated with proportional changes in the dependent variable.

Exploratory data analysis of the dataset

Victoria Island and Ikoyi trail themselves in a class of the most expensive neighbourhood among the list of locations in Lagos. They both surpass the brand of N2.7 million. Ipaja and Okota are on the bottom of the list with an average rent of N500,000. This establishes a relationship between locations and prices. A random evaluation of six (6) locations among the most expensive location show that Lekki metropolis constitute 37.8% while Ikoyi captures 2.7%. This proves that a sizeable number of people are financially buoyant to rent houses within the range of N2.2million and N2.7million. Reasons for this might not be unconnected to the fact that company's headquarters are situated around this axis. Surulere and Yaba also constitutes 13.4% and 20.6% respectively with a rent of around N1.2million; this location, though also very conducive is already a distant from the center of high-class business activities.

Fig 3: **Histogram showing a list of the 20 most expensive neighbourhoods to rent**



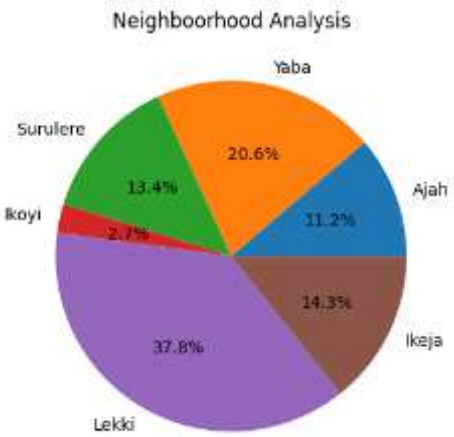


Fig 4: Histogram of six random locations **Fig 5: Pie Chart of six random locations**

Results and discussion

Linear Regression algorithm obtained the highest R-squared (R^2) score of 73.31 which implied it was the best performing model for this dataset while LightGBM was the lowest R^2 with a score of 65.17 which means there was a wide difference between the observed data and the fitted values, thereby making it the worst performing model. Table 1 shows the scores recorded for Random Forest, Decision Trees and Gradient Boosting models. In the same vein, Linear regression proved it trained well with a Mean Squared Error (MSE) of 26.9 while LightGBM recorded 35.1 meaning it trained poorly. Random Forest algorithm had the least Mean Absolute Error, this implied it had a reduced error which is good. This makes the model to be likewise reliable. Gradient boosting had the highest error of 560077, which is very bad. The model should does not train well with this dataset. Root Mean Squared Error (RMSE) measures the average difference between a predicted value and actual values. 592631.90 score shows that LightGBM model had the worst performance while the Decision Tree had the lowest error, thereby making it to be the best on this evaluation.

Table 1 Model Evaluation Metrics Performance

Model Used	R2 Score	Mean Squared Error	Root Mean Squared Error	Mean Absolute Error
Random Forest	71.75	284783919673.64	533651.49	342124.94
Decision Trees	67.39	328782284008.97	361032.80	361032.80
Linear Regression	73.31	269097465380.67	573395.39	349570.42
LightGBM	65.17	351212579560.01	592631.90	435505.25
Gradient Boosting	68.89	313686917795.55	404902.66	560077.59

Conclusion

The development of a house price prediction system using machine learning algorithms provides an efficient and accurate way to predict property values. Through careful selection of relevant features and model evaluation, this study demonstrates that machine learning algorithms such as Light GBM, Gradient Boosting, Random Forest, and Linear Regression

can achieve a high level of accuracy in predicting house prices. An analysis of the evaluation results show the strength and weaknesses of each model. Linear Regression is seen as the best performing model from this comparative analysis which aligns with the work of Durganjali *et al. (*2019). Linear Regression is therefore recommended as the best algorithm for house price prediction.

This study further highlights the potential of machine learning to transform the real estate industry by providing more accurate and efficient property valuation, which can assist real estate agents, property buyers and sellers, and financial institutions in making informed decisions based on reliable and accurate predictions.

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SENSORY EVALUATION OF COWPEA (*Vigna unguiculata*) AND SOYBEAN (GLYCINE MAX) BLENDED FOR THE PRODUCTION OF MOI-MOI AND EKURU (STEAMED COWPEA PASTE).

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Abstract
Present study aimed to investigate the utilization of cowpea with soybean for the production of steamed cowpea paste (Moi-Moi and Ekuru). In the preparation, cowpea was used in different ratios with soybean. The objective is to produce staem food using cowpea and soy bean in production of ekuru and moi-moi. Sensory evaluation of Moi-Moi and Ekuru prepared in different proportions of pastes (0-100%) was carried out. Three formulations of steamed food were prepared from control 100% cowpea paste in the production of Moi-moi (sample A), Ekuru was also made from cowpea paste (100% cowpea paste) was produced in sample B, production of Moi-moi (100% soybean paste) using soybean represent Sample C, while Ekuru was also made from cowpea paste and represent sample D. The steamed foods were evaluated for consumer acceptability by descriptive sensory analysis. Sensory evaluation established that product prepared from cowpea paste (Ekuru and Moi-moi) were more acceptable than steamed food prepared from soybean paste of 70%-30% respectively; Thus, it can be concluded that sample A and B can be substituted for beans paste to improve the nutritional quality without affecting the sensory acceptability of composite product. It is hereby recommended that food processors should steamed food using 100% of cowpea paste to maximize degree of likeness of consumers.
Keyword: Sensory, Evaluation, steamed food, cowpea paste, soybean paste

Introdution

Cowpea (*Vigna unguiculata*) is an important leguminous crop which is widely cultivated in tropical and sub-tropical countries (Kebede and Bekeko, 2020). It is a drought tolerant crop and considered second most important food grain legume constituting an inexpensive source of protein for humans and animals (Karunasena, 2001). Nutritionally, cowpea seeds contain 20-25% protein, 1.5-4% crude fiber, 1-2% fat, 3-4% ash and 55-68% carbohydrate in addition to vitamins and beneficial phytochemicals (Frank- *et al.,* 2002). Cowpea seeds can be cooked in dried form, sprouted or ground into flour. They can also be boiled with condiments and eaten singly with stew or combined with cereals (Otunola andAfolayan, 2018).

Ekuru is another cowpea based staple food in Nigeria and some other West African countries. It is popular food in Southern andWestern parts of Nigeria where it used as a culture and traditional food. It serves is a nutritional food in cultural, traditional and religious functions especially among the Yoruba's. Although a steamed cowpea paste product like moi-moi is different in composition, preparation and exhibit distinctive rheological properties (Adedokun *et al.,* 2014). The incorporation of air into the paste through whipping during its processing is an important operation that confers the unique fluffiness of the paste and considered it an as an important characteristic of the product. Ekuru can be eaten with prepared sauce made of spices and seasoning or vegetable soup. However, most people prefer consuming it with Eko or Agidi which are also cereal based foods. (Ogundele *et al.,* 2014).

Moi-moi is a gel made from dehulled, wet-milled cowpea (*Vignaunguiculata* Walp) paste with added ingredients such as vegetable oil, spices etc. and the subsequently steamed to a soft gel which further solidifies on cooling. Cowpea is the foremost grain legume in Nigeria and other West African countries, consumed in different forms: processed mainly and eaten

as moi-moi, akara, danwake etc. or cooked together with a cereal grain usually rice, or with a root or tuber such as yam, cocoyam, potatoes etc. These cowpea-containing meals are the major source of protein to Nigerians with low income group.

Methodology

Study area

This study was carried out at the home and rural economics department, food science laboratory, Oyo this research work was targeted from the population of both staff and students of Oyo State College of Agriculture and Technology Igboora.

Sampling techniques and size

For the purpose of this study, random sampling method was used to select the respondents this work since the research is not restricted to a particular group of people

Method of data collection

Primary data was used to realize the objectives of the study. Questionnaire will be structured to cover the sensory evaluation of thes sample produced.

Method of data analysis

For the purpose of this study, data was analyzed using SPSS15.0.

Material Source

Cowpea and soya beans were purchased from a retail outlet at Towobowo market Iberekodo, Igboora Oyo state, Nigeria. Ingredient such as oil, palm oil, salt seasoning agents, crayfish, and peeper was obtained from the same source.

Materials	Quantity
Big stainless pot	1
Blender	1
Spatula	1
Bowl	3
Turning sticks	1
Table	1
Cups	12
Measuring spoons	4

Ingredients for moi-moi using cowpea and soy bean

Ingredient	Quantity
Cowpea	400g
Soybeans	400g
Fresh Pepper	2 Soup Spoon
Onion	2 balls
Vegetable oil	1/3 bottle
Salt	to taste
Seasoning	1 table spoonful
Fish	2 pieces
Crayfish	1 pack
Water	2 litters

Methods of preparation

Preparation of cowpea into paste

The beans were cleaned to removed dirt's, stones, and metals were soaked for 30 minutes after which they were dehulled by rubbing with hands until the seed coat loosened. The loosed coats were floated off in water while the dehulled cotyledons were drained properly. The beans were milled in an attrition mill and then packaged in high density bowl and tightly covered until needed.

Preparation of soybean into paste

Properly cleaned soybeans were boiled for 20 minutes to remove the beany flavour and enhance easy dehulling. The boiled beans were cooled, dehulled, drained and the beans were milled in an attrition mill and packed in a bowl tightly covered until needed.

Method of preparation of steamed pudding (moi-moi)

- Get all the materials and ingredients to be use
- The cowpea and pigeon pea flour were soaked for 10minutes to softening them
- Blend the pepper and onions
- Pour in the blended pepper into the flours, add bouillon cubes and other ingredients.
- Add a cup of water to blend
- Turn the batter into a bowl and add vegetable oil.
- Add fish chunks and mix thoroughly
- Prepare the cups to use for steamed pudding (moi-moi)
- Portion the batter to the cups
- Place the desired pot on fire with a cup of water.
- Arrange the moi-moi in the pot and cover allow to steam for like 30minutes

Note: when the water in the pot has dried up, carefully add more water.

- Remove the steamed pudding (moi-moi) from the cups carefully and enjoy.

Ingredients for ekuru (white moi-moi) using cowpea and soy bean

Ingredient	**Quantity**
Cowpea	400g
Soybean	400g
Onion	2 balls
Salt	to taste
Seasoning	1 table spoonful
Fish	2 pieces
Crayfish	1 pack
Water	2 litters

Method of preparation of (ekuru) using cowpea and soybean

- Blend the cowpea and soy bean only. Please note that the total quantity of water to be used (for blending and mixing) should be 600 mls.
- Slowly add the remaining water and stir the mixture at the same time till a good mix of all the ingredients occurs.
- Set some water in a pot to boil. The water should be about 1 cm deep.
- When the water boils, add some padding that will be a base for the Moi Moi wraps.
- Scoop the paste mix into your container of choice and gently place in the pot of boiling water.
- When done, cover the wraps with some leaves or a plastic bag to keep the heat in.
- Cover the pot and start cooking on medium heat.
- Check from time to time and add small quantities of water at a time when necessary.

- If you are cooking few wraps of Moi Moi in a small pot on high heat, then it will take about 45 minutes to get done while when cooking a large pot of Moi Moi, it will definitely take more than one hour.

Formulation of composite paste
The paste was thoroughly mixed to obtain homogeneous mixture. Samples were stored in an air tight container at temperature until ready for use. Samples of cowpea and soybean paste were mixed at various proportions.

Method of Analysis
The data obtained from the sensory evaluation were analyzed with the use of statistical tools consisting of frequency and percentage in terms of colour, taste, texture, aroma, and overall acceptability.

Sensory Evaluation of the Moi-moi and Ekuru
The evaluation of the product was performed by trained panelists from Oyo State College of Agriculture and Technology Igboora. The evaluation was conducted using the 6-points hedonic scale. The randomized order of the sample was presented once at a time to each panelist. Panelists were asked to evaluate the coded samples for each sensorial parameter including color, aroma, texture, flavor, and overall acceptability based on their degree of liking (from excellent (6) to poor (1).

Preparation of paste
Each sample was soaked separately in a one liter of cold water for 1hr in order to soften the seed coats. Thereafter, the seed coats were removed manually and the seeds rinsed in water until clean and free from impurities. The samples were blended separately with 200ml of water using blender until a fine paste was obtained. Each paste was transfer into a clean bowl and label accordingly.

Result and Discussion
The result obtain in the qualities of paste product (Moi-moi and Ekuru) are presented in four (4) tables with their frequencies.

Sample A1 (Production of Moi-Moi using cowpea paste)

Parameter	Score	Taste	Colour	Appearance	Texture	Overall Acceptability
Excellent	6	14(46.7)	4(13.3)	6(20.0)	4(13.3)	10(33.3)
Very good	5	4(13.3)	12(40.0)	10(33.3)	8(26.7)	8(26.7)
Good	4	10(33.3)	4(13.3)	4(13.3)	8(26.7)	4(13.3)
Average	3	2(6.7)	8(26.7)	4(13,3)	2(6.7)	8(26.7)
Fair	2	__	2(6.7)	6(20.0)	8(26.7)	__
Poor	1	__	__	__	__	__
Total		30(100.0)	30(100.0)	30(100.0)	30(100.0)	30(100.0)

Sample A2 (Production of Ekuru using cowpea paste)

Parameter	Score	Taste	Colour	Appearance	Texture	Overall Acceptability
Excellent	6	18(60.0)	6(20.0)	12(40.0)	8(26.7)	8(26.7)
Very good	5	10(33.3)	10(33.3)	12(40.0)	10(33.3)	18(60.0)
Good	4	__	12(40.0)	2(6.7)	10(33.3)	4(13.3)
Average	3	2(6.7)	2(6.7)	2(6.7)	__	__

Fair	2	__	__	__	__	__
Poor	1	__	__	2 (6.7)	2 (6.7)	__
Total		30(100.0)	30(100.0)	30(100.0)	30(100.0)	30(100.0)

Sample B1 (Production of Moi-Moi using soybean paste)

Parameter	**Score**	**Taste**	**Colour**	**Appearance**	**Texture**	**Overall Acceptability**
Excellent	6	6(20.0)	6(20.0)	8(26.7)	6(20.0)	6(20.0)
Very good	5	12(40.0)	20(66.6)	16(53.3)	10(33.3)	18(60.0)
Good	4	12(40.0)	2(6.7)	4(13.8)	14(46.7)	6(20.0)
Average	3	__	2(6.7)	__	__	__
Fair	2	__	__	2(6.7)	__	__
Poor	1	__	__	__	__	__
Total		30(100.0)	30(100.0)	30(100.0)	30(100.0)	30(100.0)

Sample B2 (Production of Ekuru using soybean paste)

Parameter	**Score**	**Taste**	**Colour**	**Appearance**	**Texture**	**Overal Acceptability**
Excellent	6	16(53.3)	16(53.3)	2(6.7)	10(33.3)	4(46.7)
Very good	5	8(26.7)	6(20.0)	20(33.3)	14(46.7)	10(33.3)
Good	4	2(6.7)	6(20.0)	8(26.7)	4(13.3)	6(20.0)
Average	3	2(6.7)	2(6.7)	__	2(6.7)	__
Fair	2	2(6.7)	__	__	__	__
Poor	1	__	__	__	__	__
Total		30(100.0)	30(100.0)	30(100.0)	30(100.0)	30(100.0)

Discussion

Taste:

The taste scores of produced from cowpea and soybean in 100% without fortification ranges higher taste scores of 60.0, 53.3, 53.3, and 46.7 were obtained in the production of moi-moi and ekuru using 100% cowpea paste, moi-moi and ekuru with 100% soybean respectively. Generally, the moi-moi and ekuru production with 100% cowpea paste gave higher taste value than moi-moi and ekuru with 100% soybean paste. The implication of this finding is that moi-moi and ekuru with 100% cowpea paste had higher taste preference than any other steam food produced.

Colour

The data obtained from the colour of steamed food (moi-moi and ekuru) from this study showed non-significant (P>0.005) difference across the mean values. The scores obtained in

the colour of the steamed food samples ranges from 66.7, 60.0, and 53.3 were obtained in the steamed food so therefore, moi-moi and ekuru with 100% cowpea paste is higher and moi-moi and ekuru with 100% soybean have the to the cowpea paste production respectively.

Appearance:
Data obtained from the appearance of steamed food samples in this study showed non-significant difference (P>0.002) difference across the mean value, the ekuru and moi-moi of 100% cowpea paste had highest degree of likeness (66.7 and 53.3 respectively) in term of appearance when compared with other steamed food (soybean paste). Generally, the likeness scores obtained for ekuru and moi-moi cowpea paste were higher (although not significantly different) across the steamed food except for ekuru respectively.

Texture
Similarly, texture was significantly different (P<0.05) across the steam samples. Beside, the texture of the food ranges between 60.0, 53.3, 46.7 and 46.7 with ekuru and moi-moi produced from cowpea paste given higher result than other steam foods in terms of texture appeal respectively.

Overall acceptability
In all taste, colour, appearance, and texture of the steam food production with the use of 100:100, percentages, the overall acceptability of the steam food was not significantly (P>0.05) different across the snacks sampled. However, ekuru and moi-moi with 100% cowpea paste had the highest acceptability scores (66.7). The non-significance of the difference overall acceptability of the steam food as well as minimum overall acceptability score of the steam food, which exceeded 13.3 in a 6-point hedonic scales (likeness) scale, indicated that the sensory qualities of steamed food production are not generally acceptable to the consumer due to the texture, colour and taste of the other steam food produced with 100% soybean respectively.

Conclusions
From the results obtained, it can be concluded that ekuru 100% and moi-moi 100% cowpea paste are very rich and solid. Also, there were marginal but in significant (P<0.05) differences in the degree likeness between 100%:100% ekuru and 100%100% in moi-moi. These were not repeated in the acceptability.

Recommendations
It is hereby recommended that food processors should steamed food using 100% of cowpea paste to maximize degree of likeness of consumers. Besides steamed food can be recommended for consumption because of its richness in protein and vitamin

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OYSCATECH GLOBAL CONSULT

GENOTOXICITY MONITORING OF LOCAL LIQUID SOAP WASTES USING PLANT BIOASSAYS

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Abstract
The genotoxicity monitoring of local liquid soap wastes using plant bioassays was investigated. In this study, chromosomal aberration assays were used to determine the mitotic index and chromosome aberration rate. The Allium cepa roots were exposed to different concentrations of the local liquid soap wastes; 0.5, 1.0, 1.5, 2.0 and 2.5%. Dechlorinated tap water was used as control (0%). After 48 hours of exposure, the local liquid soap wastes, the result showed that local liquid soap waste induced chromosomal aberrations in root tip cells of Allium cepa with binucleus, sticky telophase, bridged and fragmented anaphase were the most common aberrations. However, no chromosomal aberration was recorded in control. However, positive results in Allium test should be considered a signal of warning as this may constitutes risk to environment and human health. Therefore, there is need for a close look at the genotoxicological effects of local liquid soap wastes in animal system (such as mice and rats) for human welfare as local liquid soap waste has been released to the environment.
Key word: Genotoxicity, Industrial effluents, *Allium cepa*.

Introduction

Environmental pollution is a major problem in many developed and developing countries around the world. Although pollution has been in existence for a long time, it was not until the development of industries and rapid organization around the 19th century that it really became a global problem (Grover and Kaur, 1999). Environmental pollution in summary occurs when the environment cannot process and neutralize harmful by-products of human or industrial activities. Pollution reaches its most serious proportions in the densely settled urban-industrial centers of the more developed countries (Kong and Ma, 1999). Pollution must be taken very seriously as it affects natural resources that are needed for life to exist on earth. Many pollutants such as pesticides, oil, hydrocarbons, heavy metals as well as thermal and radioactive pollutants can get into the environment through direct or indirect release from industries, agriculture and households (Fathi *et al.*, 2008). The excessive levels of these pollutants in the environment are causing lot damages to human and animal health, plants and trees including tropical rainforest. The release of industrial effluents or wastewater into surrounding terrestrial or aquatic habitat has been implicated as one of the major sources of environmental pollution as industrial effluents are one of the by-products of human or industrial activities. Heavy metals and organic wastes produced in industrial sludges can induce genotoxic effects and are thus harmful to human beings and crops (Sartaji *et al.*, 2017). Presently in most developing countries, raw and sludge are either incinerated or dumped unscientifically in open places and landfills, which disturbs the geochemical cycles and natural environment (Sen and Chandra, 2007). The application of industrial wastes or sludges directly as a fertilizer on agricultural fields can also potentially harm humans and useful organisms in the ecosystem (Sangwan *et al.*, 2001).

However, the need for soap, a cleaning agent, is of high priority provided man understands the necessity to continually keep its environment clean. Soap was invented not only for the purpose of personal hygiene but also to solve other purposes. It has numerous applications in our daily life one of which is to keep our household and workplace better place to live and work. Hence, it is an essential commodity in the modern civilized world. Soap is a combination of fatty acids and alkaline obtained by reacting various animal and vegetable fats and oils with caustic soda or potash. It is produced by a saponification or basic hydrolysis reaction of fat or oil. The final product is achieved through a series of steps with value addition at each step to fulfill and satisfy the expectations of the manufacturer or end users. Soap can exist in three forms namely; bar, powder and liquid. Liquid soap is the cleaning agent made available in liquid form. Until recently its production remained a primitive art due to the traditional means of mixing or stirring the chemical ingredients together, a process which is the same whether the production is done in a backyard or in a factory using manual approach or a dedicated machine. The simplicity of the process, particularly the fact that it can be achieved manually, has led to its general acceptance and practice as a small business operation. Mixing is used to produce a more uniform mixture of the soap ingredients. In the local soap industry, production is carried out through manual mixing. This conventional manual approach to liquid soap production demands hours of stirring by hand, hence it involves strenuous human efforts as it requires a lot of energy. Also, it requires a lot of time input by the soap producer. The manual mixing of the soap ingredients is usually accomplished with a stick or wooden ladle. The final product is usually not uniformly mixed due to fatigue usually suffered by the operator (Warra, 2013).

Plants comprise a large portion of the biosphere and constitute a vital link in the food chain. Due to the highly conserved structure of their genetic material, it is possible to use a board variety of species in genotoxicity tests. Several higher plant bioassays for screening environmental mutagens have been established (Maluszynaska and Juchimiuk, 2005). The common onion, *Allium cepa* makes a convenient test system for estimating harmful effects of chemical or biological materials (Rank and Nielsen, 1993). The *Allium* genetic material has been widely exploited for such purposes, plant roots are very useful in this testing because the root tips are often the first to be exposed to chemicals in the soil and water (Odeigah *et al.*, 1997). Many new mutagenicity assays using other systems such as microorganisms, mammalian cells and other biological systems have been developed but plant tests which have high correlation with other test systems are used routinely for genotoxicity testing all over the world (Grant, 1982). Morover, population, poverty and pollution are the three major problems of developing countries (Grover and Kaur, 1999). Industrial effluents are a main source of direct and often continuous input of pollutants or toxicants into aquatic ecosystems with long-term implications on ecosystem functioning. Hence, this study is aimed to investigate the genotoxicity monitoring of local liquid soap wastes using plant bioassays.

Materials and method

Assay procedure

The assay was carried out using 100ml beakers in a dark cupboard. Dechlorinated tap water was used as control and for dilution of wastes. The yellow shallows and dry bottom plate inside the root primordial of *Allium cepa* were carefully removed prior to the test.

Genotoxicity assay

The genotoxicity assay was carried out with four waste concentrations. At 48h, one root tip from each bulb was harvested for cytological study. The root tips were fixed and macerated in 45% acetic acid-IN HCl (9:1) solution and heated for 5 min at 50°C (Odeigah *et al.*, 1997). Subsequently, the roots were placed on a slide and the terminal root tips (1-2 mm) were cut off and used for further preparation. The rest of the material was removed from the slide and

the excess liquid was sucked up with a piece of blotting paper. Two drops of fresh filtrated 2% orcein solution was added and mixed with the root tips by stirring and knocking with a blunt stick of stainless steel. A cover slip was placed on the root cells and allowed to absorb stain for 5 - 1 0 min afterwards, the cells were squashed by placing layers of blotting paper on the cover slip and pressing slightly down with the thumb. The cover slip was fixed carefully to the slide with nail cortex.

Laboratory Analysis

Analysis of Physicochemical Properties of Soap Industry Effluents.

Analysis of samples was carried out at Research laboratory, Oyo State College of Agriculture and Technology, Igboora. The following parameters were determined: pH, Total dissolved solids (TDS), alkalinity, acidity, Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), Temperature, Electrical conductivity, Chloride and Sulphide using standard methods for evaluation of water and waste waters, prescribed by American Public Health Association (APHA, 2005).

Statistical Analysis

Data were expressed as Mean ± Standard Error of Mean (SEM). Differences between the control and different concentration of the effluents were analyzed using the Student's unpaired t-test. All statistical analyses were carried out using SPSS®14.0 statistical package.

Results and Discussion

Table 1: Genotoxic Effects on Treatment with Different Concentrations of Local liquid Soap Wastes

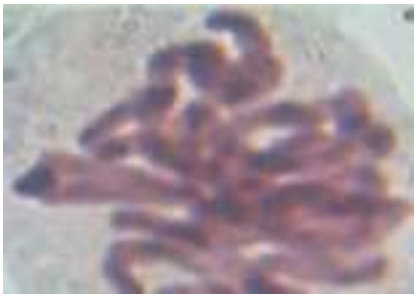
Conc. (%)	Miotic Index	Number of cells	Dividing cell	Binucleus	Sticky Telophase	Bridge and Fragmented	Vagrant Metaphase
0	10.8	500	54	-	-	-	-
0.5	9.25	400	37	-	-	5	-
1.0	8.65	312	27	-	2	-	-
1.5	7.57	198	15	1	1	-	2
2.0	NG	-	-	-	-	-	-
2.5	NG	-	-	-	-	-	-

Key: NG means no growth

A **Binucleus**

B **Sticky telophase**

C **Bridged and fragment anaphase**



D **Vagrant metaphase**

Plate 1: Common chromosomal aberrations induced by local liquid soap wastes

Table 2: Mean Values of Water Quality Parameters of Local Liquid Soap Wastes in Igboora at Discharge Point

Parameter		FEPA[a]	USEPA[b]	WHO[c]
Temperature	30	40	NS	NS
PH	8.5	6-9	6.5-8.5	6.5-9.5
Turbidity (FTY)	40	NS	NS	5
BODS @ 20°c	0.09	50	NS	NS
DO	2.62	NS	NS	NS
Total solids	2.67	NS	NS	NS
Nitrates	30	20	10	50
Sulphates	0.1	500	250	500
Phosphate	4.41	5	NS	NS
Calcium	4.6	200	NS	NS

Key: NS mean not stated

Discussion

The cytogenetic effects of local liquid soap wastes treatment on mitotic division in the root tips cells of *Allium cepa* were shown in table 1. The mitotic index (MI) except in the control experiment decreased with increasing concentrations of local liquid soap wastes. However, similar results were obtained after treating *Allium cepa* root cells with leachates from solid industrial waste, sodium metabisulphite and oil field waste water (Odeigah *et al.*,1997). Inhibitions of mitotic activities are often used for tracing cytotoxic substance. The local liquid soap wastes studied induced chromosomal aberrations in root tip cells of *Allium cepa* with vagrant phase, bridges and fragments anaphase, binucleus and sticky telophase. This suggests the presence of certain genotoxicity substances in the local liquid soap wastes. However, vagrant metaphase have been described as a weak mitotic effects indicating risk of aneuploidy while sticky chomosomes indicate a highly toxic, irreversible effects probably leading to cell death (Fiskesjo, 1988). According to Kong and Ma (1999), there is a hypothesis that stickiness of chromosomes may cause incomplete separation of daughter chromosomes as a result of cross-linkage chromoproteins. No aberration was observed in the *Allium cepa* exposed to the control (0%). The variation in the number of chromosomal aberrations as observed in this study was not dose dependent. This is in disagreement with Qian (2004) which reported that aberrant rate goes up with this concentration. According to Odeigah *et al. (*1997), a possible explanation for this is that, with increasing concentration and consequently, increasing toxicity, there was an inhibitory effect on cell division. This might occur in pre-prophase, where cells are prevented from entering prophase or there may be prophase arrest where cells enter into mitosis but are arrested during prophase resulting in a high frequency of prophase cells. It is suggested that prophase arrest is the most likely explain the decline in chromosome aberration, without any parallel decline in the mitotic index value. According to Odeigah *et al. (*1997), the impact of genotoxic waste water on the environment and the significance to human health are difficult to predict, because waste water are complex mixture of chemical substance. This study has shown that the genotoxic potential of local liquid soap wastes can easily be detected using the *Allium cepa* chromosomal aberration assay. It would be beneficial to apply *Allium cepa* chromosomal assay as a tool for monitoring the genotoxic effect of industrial effluents and waste water thereby providing information on the need for environmental manager to further subject treated industrial effluents to toxicity identification evaluation (TIE) and toxicity reduction evaluation (TRE) before they are finally discharged. This will enable proper chemical

analysis of industrial effluents in order to identify the constituent that is really genotoxic and its prompt removal from the effluents before discharge.

Conclusion and recommendations

The result obtained in this study showed that local liquid soap wastes induced chromosomal aberration through interactions with DNA and proteins leading to binuleus, sticky telophase, bridged and fragmented anaphase, vagrant metaphase and cell damage. However, positive results in *Allium* test should be considered a signal of warning as this may constitutes risk to environment and human health. Therefore, there is need for a close look at the genotoxicological effects of local liquid soap wastes in animal system (such as mice and rats) for human welfare as local liquid soap waste has been released to the environment.

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TIME SERIES ANALYSIS OF MONTHLY RAINFALL IN IBADAN, OYO STATE

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Abstract
Rainfall is an important factor in both natural and human systems, ranging from the water cycle to agricultural production. This paper is centered on time series forecasting techniques to model Ibadan rainfall based on the secondary monthly data made available from 1969 to 2019. The study used Box-Jenkins methodology to model monthly rainfall data and also determined the best models for the data. Model diagnostics based on residual analysis was performed to assess the adequacy of the identified models. It was discovered that the mean annual rainfall is 123.99mm and median is 108.70mm. From the test, it was noticed that the data used in this study contains a unit root at level of significance of 0.05. After differencing, the ACF and PACF were plotted and the correlogram were notice to taper off quickly, an indication that the data are now stationary for accurate analysis. The result shows that the dataset is now stationary since p. value (0.01) is smaller than the printed p-value (0.05), then the null hypothesis is rejected and accept alternative hypothesis (stationary). ARIMA (1, 1, 2) with smallest AIC (600.48) was developed. This model was used to forecast monthly rainfall for the upcoming 20 years to help decision makers establish priorities in terms of water demand management, transportation planning and management and agriculture. Thus, ARIMA (1, 1, 2) provides a good fit for the rainfall data of Ibadan and is appropriate for short term forecast.
Keywords*:* Time Series, Rainfall Model, Forecasting, ARIMA.

Introduction

Rainfall is among the sophisticated and challenging components of the hydrological cycle to model and forecast because of various dynamic and environmental factors and random variations both spatially and temporally (Htike and Khalifa, 2010). Climate change seems to be the foremost global challenge facing humans at the moment, even though it seems that not all places on the globe are affected. World leaders, union leaders, pressure groups and others who have shown concern have been meeting to find a lasting solution to the 'acclaimed' dilemma. The scientific community has not been left out as causes and solutions are being proffered and it is expected to linger on for a long time. The surface water, in form of lakes and river discharge (runoff) is obtained from rainfall after being generated by the rainfall runoff processes.

The Nigeria climate is humid in the south with annual rainfall over 2000mm and semi-arid in the north with annual rainfall less than 600mm. Generally speaking, there are three climatic zones which cover the North, middle and southern areas of the country: Sahel, Savanna and the Guinea zones. Rainfall commences in approximately March/April in the southern coastal zones, spread through the middle zone in May/June and reaches the northern zone in June/July, reaching its peak over middle and northern zones between July and September (Babatunde *et al*, 2011).

Time series can be defined as an ordered sequence of values at equally spaced time intervals (Box et al, 2008). Time series models are mathematical representation of the time series. Time series models have been the basis for the study of behaviour of a process over a period of time. The application of time series models are manifold, including sales forecasting, weather forecasting, and inventory studies etc.

Methodology

The researcher collected secondary data of about 50 years (1969-2019) from Moor plantation Meteorological Service, Ibadan who used standard rain gauges in millimetres according to the World Meteorological Organization (WMO) standards (WMO, 2015). Descriptive summary statistics in the form of measures of centrality and dispersion, time series plots, and autocorrelation functions was generated using R time series statistical software. The Box Jenkin's ARIMA modelling procedure that is model identification, model estimation, model validation was used to determine the best models for the data. Model diagnostics based on residual analysis was performed to assess the adequacy of the identified models. The final model was used to forecast monthly rainfall for Ibadan up to year 2040. The Augmented Dickey-Fuller (ADF) test was employed to check for presence of a unit root (stationary and non-stationary), through the use of correlogram: Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF) graphs at various lags.

Results and Discussion

The summary of the annual rainfall data is presented in Table 1below. It was discovered that the mean annual rainfall is 123.99mm and median is 108.70mm. This indicates that the annual rainfall values are right skewed.

Table 1: Summary of the annual rainfall

Min	Max	Quarter		Median	Mean
		1st	3rd		
18.65	723.55	94.47	723.55	108.70	123.99

The plot of the original data, as shown in Figure 1, shows seasonal variation since the data is the annual rainfall total therefore there is need to find its differencing. When the mean and variance are time-variant, the series is considered non-stationary (unit root) from the graph the data is not stationary therefore the best model to fit is ARIMA.

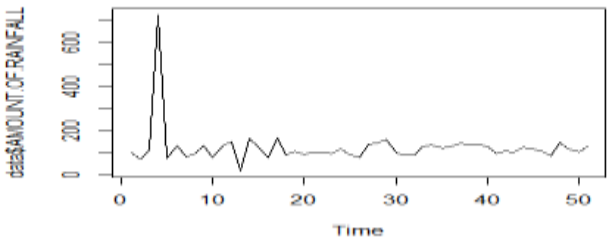

Fig 1: shows the time series plot for rainfall

Fig 2 revealed Time series plot after differencing that is stationarity. For a stationary time series data, there are conditions that must be stratified: Mean must be zero and variance also be zero.

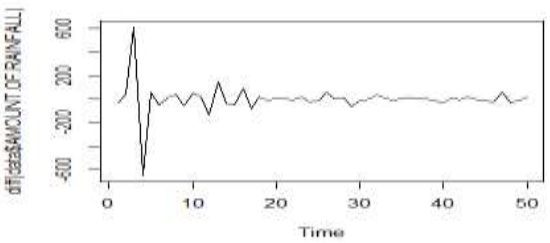

Fig 2: Time series plot after differencing

Table 2 ADF test, revealed that the dataset is now stationary since p.value is smaller than the printed p-value (0.05), then the null hypothesis is rejected and accept alternative hypothesis (stationary).

Table 2: Augmented Dickey-Fuller Test

Dickey-Fuller	Lag order	p-value
-6.8888	3	0.01

It was observed in Fig 3 that the moving average process of the order 2 (q=2). From Figure4, it can be observed that there is only one significant pike in the PACF plot. This indicates that the auto regressive process would be of the order 1 (p=1) and therefore, the appropriate ARIMA model to fit the annual rainfall data would be an ARIMA (1, 1, 2) model.

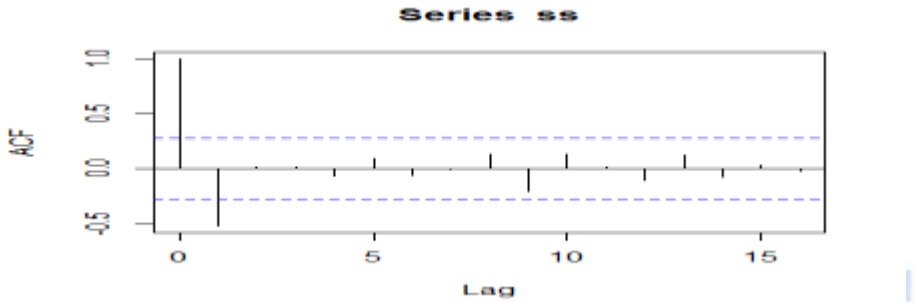

Fig 3: Autocorrelation function (ACF)

Fig 4: Partial Autocorrelation Function

ARIMA (112) is the best model that fit the data with smallest AIC (600.48)

To select the best model, ARIMA (111), ARIMA (112) and ARIMA (110) were applied, then the model with smallest AIC was chosen which is ARIMA (112) as shown in Table 3.

Table 3: Model selection

S/N	Model	AIC	S.E	VARIANCE	LOG LIKELIHOOD
1	ARIMA (111)	615.22	0.1206	13269	-304.61
2.	ARIMA (112)	600.48	0.1461	8529	-296.24
3.	ARIMA (110)	648.64	0.1027	29915	-322.32

Conclusion

Among the series of ARIMA models tested, it was discovered that ARIMA (1, 1, 2) is the only fit of this index. The following conclusions were drawn from the study:

1. Model identification indicated that ARIMA (1, 1, 2) is the only one that fit this data.

2. Since the data used in this study contains a unit root at level of significance of 0.05, there is need for differencing. After differencing it once, the ARIMA models with d = 1 are suitable for the series.
3. The study shows the 20 years forecast for monthly rainfall in Ibadan.

Recommendations

The model (ARIMA 1,1,2) is therefore adequate and appropriate for the forecast of future annual rainfall values in the catchment which can help decision makers establish priorities in terms of water demand management and Agricultural practice

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STATISTICAL ANALYSIS OF PREVALENCE OF DRUG ABUSE AMONG YOUTH IN IBARAPA CENTRAL LOCAL GOVERNMENT AREA OF OYO STATE

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Abstract
Drug abuse is a substance that alters or changes biopsychosocial functioning of the body when taken. The study involved using statistical tools to analyze the prevalence of drug abuse in Ibarapa Central Local Government Area of Oyo State, Nigeria (from 2006 - 2015). The particular interest is in the three highly abuse drugs/substances namely: Cannabis sativa, heroine and cocaine. The data used were obtained from the security department of the National Drug Law Enforcement Agency (NDLEA). The statistical technique used in analyzing the data was time series, to achieve the objective of the study. The result shows that males abuse drugs more than females, it also shows that Cannabis sativa is the most frequently abused substance by youth of ages 21-25. The study shows that drug abuse is independence on the age of the abusers.
Keywords: *Drug abuse, cannabis sativa, heroine, cocaine, seasonal variation*.

Introduction

According to world health organization (WHO), drug abuse refers to as a state of periodic or chronic intoxication, detrimental to the individual and to the society, produced by the repeated consumption of a drug (natural or synthetic) (WHO, 2006). A report released by United Nations Drugs Control Programme (UNDCP, 2004) revealed that 4.8% of the global population consumes drugs, but the worrying fact is that according to, UNDCP executive director (2004) those hooked are the youth. A survey in the Czech Republic showed that 37% of new drug users were teenagers between 15-18 years old. In Pakistan it was reported that the share of those who started using heroine at 15-20 years has doubled. Africa's role in global drug supply chain is increasing. Already the continent is second largest region for cannabis production, trafficking and consumption accounting for 26% of global Seizures of this drug in 2001 UNDCP (2004).In Nigeria today, drug use has become more prevalent than at any other times, NAFDAC, (2013). Majority of the users are students in secondary schools and tertiary institution.. Drug abuse negatively affects people minds and thought processes, predisposing them to errant behavioural tendencies such as thuggery, hooliganism. It is also speculated that it affects youths' academics through events such as: missing of classes, truancy, gangsterism etc., possibly leading to occasional waves of school unrest.
This study is aimed at finding out the prevalence of drugs use and abuse in Ibarapa Local Government Area in Oyo State, The study focuses on the prevalence of cocaine, heroin and cannabis sativa in the area. The study involved using statistical tools to analyse the prevalence of drug abuse in Ibarapa Local Government Area in Oyo State (from 2006-2015).

Research Methodology

For this study, secondary data was adopted for the research purpose. Data was collected from the security department of National Drug Law Enforcement Agency (NDLEA) in Ibarapa Central Local Government Area of Oyo State. The analysis used for the research are both descriptive and analytical statistics.

Population of the Study: The population of this study consists of people within Ibarapa Central Local Government Area in Oyo State.

Research Instruments: The data was classified into three sections: Section A was the distribution of persons arrested for classified drugs offence between (2006–2015). Section B was the distribution of persons arrested according to sex between (2006–2015) while section C was the distribution of persons arrested for classified drug offence by age (2006–2015).

Results and discussion

Data Analysis and Testing of Hypotheses

Table 1 showed the distributions of people arrested for classified drugs offence, the study showed that cannabis sativa has the highest drugs offence followed by heroine while cocaine was the least in the distributions. Year 2010 was recorded as the year with the highest drugs offence.

Table 1: Distribution of persons Arrested for Classified Drug Offence (2006-2015).

Year	Cannabis Sativa	Heroine	Cocaine	Total
2006	17	2	3	22
2007	20	3	2	25
2008	25	2	1	28
2009	11	5	2	18
2010	35	7	2	44
2011	10	1	1	12
2012	19	4	2	25
2013	21	6	5	32
2014	8	2	2	12
2015	22	5	7	34
Total	**188**	**37**	**27**	**252**

Source: National Drug Law Enforcement Agency, Ibarapa L.G.A

Table 2 revealed that cannabis sativa was recorded as most commonly taken drugs among ages 21-25 followed by heroine was followed and cocaine recorded in the same ages 21-25. This showed that the ages 21-25 was recorded as the ages having the highest drug abuse cases.

Table 3: Distribution of Persons Arrested For Classified Drug Offence by Age

Year	Cannabis Sativa	Heroine	Cocaine	Total
11 – 15	14	2	2	18
16 – 20	21	5	3	29
21 – 25	35	8	7	50
26 – 30	32	6	5	43
31 – 35	29	4	2	35
36 – 40	20	3	3	26
41 – 45	17	4	2	23
46 – 50	10	3	1	14
51 and Above	10	2	2	14
Total	**188**	**37**	**27**	**252**

Source: National Drug Law Enforcement Agency, Ibarapa L.G.A

Hypothesis

H_0: Drug abuse is independent on the sex of the drug abuser.

H_1: Drug abuse is dependent on the sex of the drug abuser.

Test Statistic

$$\chi^2_{cal} = \frac{}{e_{ij}} \Sigma (O_{ij} - e_{ij})^2$$

Time Series Analysis Using Least Square

Least square method is used in fitting trend line to a time series data. The linear trend equation is given as y = a+bt

Also the formulae for the parameter estimation are:

$$b = \frac{}{n\Sigma t^2 - (\Sigma t)^2} \quad n\Sigma ty - \Sigma t\Sigma y$$

$$a = \frac{}{n} \frac{}{n} \quad \Sigma y - b\Sigma t$$

Table 4: Using Least Square Method to Obtain the Trend for Cannabis Sativa

	Yt	Ty	t^2	Trend Value
1	17	17	1	20.4364
2	20	40	4	20.0727
3	25	75	9	19.7091
4	11	44	16	19.3455
5	35	175	25	18.9818
6	10	60	36	28.6182
7	19	133	49	18.2545
8	21	168	64	17.8909
9	8	70	81	17.5273
10	22	220	100	17.1636
55	**188**	**1004**	**385**	**188**

$$b = \frac{n\Sigma ty - \Sigma t\Sigma y}{n\Sigma t^2 (\Sigma t)^2} = \frac{10(1004) - 55(188)}{10(385) (55)^2} = -0.363636$$

$$a = \frac{\Sigma y - b\Sigma t}{n \; n} = \frac{188 + (0.363636)(55)}{10 \; 10} = 20.80$$

Where the trend equation is given as

$$yt = a + bt$$

$$yt = 20.80 - 0.363636t$$

Estimation of Seasonal Variation

There are different methods for computing seasonal indexes, but the multiplication model was used. The formula is

$$S.V = \frac{\text{Actual Value (yt)}}{\text{Trend Value (trend)}} \times 100$$

Table 5: Using Least Square Method to Obtain the Trend for Heroine

Time (t)	Yt	Ty	t^2	Trend Value
1	2	2	1	2.858
2	3	6	4	3.046
3	2	6	9	3.234
4	5	20	16	3.422
5	7	35	25	3.610
6	1	6	36	3.798
7	4	28	49	3.986
8	6	48	64	4.174
9	2	18	81	4.362
10	5	50	100	4.550
Total =55	**37**	**219**	**385**	**37.04**

Table 6: Seasonal Variation Value for Heroine

Table 6: Using Least Square to Obtain the Trend for Cocaine

Time (t)	Yt	Ty	t^2	Trend Value
1	3	3	1	1.215
2	2	4	4	1.545
3	1	3	9	1.875
4	2	8	16	2.205
5	2	10	25	2.535
6	1	6	36	2.865
7	2	14	49	3.195
8	5	40	64	3.525
9	2	18	81	3.855
10	7	70	100	4.185
Total =55	**27**	**176**	**385**	**27**

$$b = \frac{n\Sigma ty - \Sigma t\Sigma y}{n\Sigma t^2 - (\Sigma t)^2} = \frac{10(176) - 55(27)}{10(385) - (55)^2} = 0.33$$

$$a = \frac{\Sigma y}{n} - \frac{b\Sigma t}{n} = \frac{27}{10} - \frac{0.33(55)}{10} = 0.885$$

yt = a + bt
yt = 0.885 + 0.33t

Conclusion

From the study, drug abuse is not the same over the years, 2010 recorded the highest abuse incidence with forty-four (44) people arrested for different drug related offences while 2011 and 2014 had the least. The study also shows that males abuse drugs more than females and that C*annabis sativa* has the highest drug abuse rate. From the study the ages 21-25, recorded

the highest drug abuse cases. This shows that youth within this age bracket are more involved in abusing drugs.

Recommendations:

1. The campaign against drug abuse should begin in our various homes, schools, religious leaders through their weekly sermon to warn people against drug abuse.
2. Pharmacies should be sensitive and more discreet in the choice of who they sell drugs to, as many people today especially the youths today purchase them for the purpose of abuse.
3. Effective education on drug abuse prevention programme should be carried out regularly and accommodate messages for kids and teens as well as adults.
4. The National Drug Law Enforcement Agency (NDLEA) in Ibarapa should increase its prosecution of offenders without bias.
5. Youth should be exposed to job opportunities to engage their minds in legitimate activities.

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BACTERIOLOGICAL ASSESSMENT OF SELECTED WELL WATER SOURCES IN IGBOORA, IBARAPA CENTRAL LOCAL GOVERNMENT AREA, OYO STATE, NIGERIA.

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Abstract
This study was conducted to access the microbial load, environmental health condition of selected well water sources and their effects on health of people in Igboora. Five well water samples with replicates were collected at random from five different locations in Igboora in a sterilized bottles were fitted with screw caps and properly labelled. The total coliform count in well with ring greater than Ten has the highest value of 11.16±7.30 while one with ring less than ten has the lowest value of 9.25±5.12. Eschrichia coli count in well with ring greater than ten is higher (8.00±6.72) than well with ring less than 10 (5.00±6.00), the value of bacteria present in well with ring greater than ten is not significantly difference at p<0.05. The levels of total coliforms among the ten well water samples was varied. This indicate that the levels of pollution also varied and also indicated that, though the well water sample contains significant amount of hardness, the overall physical and microbial quality of the water samples lies within maximum permissible limits of established standard WHO.
Keywords: Groundwater, Coliform count, *Escherichia coli*

Introduction

Groundwater makes up about 20% of the world's supply. Wells are one of the major sources of ground water. In many places wells provide a reliable and ample supply of water for drinking, irrigation, and industries (Nair *et al.*, 2013). During the last decade, it was observed that the ground water got polluted drastically because of increased human activities (Jameel, 1998). Sewage and wastewater could potentially contaminate wells and thus the drinking water. icrobiological water analysis is mainly based on the concept of faecal indicator bacteria (Gopinath *et al.*, 2012). The coli form test allows the use of coli forms as an indicator for routinely evaluating drinking water for the presence of pathogens. The coli form test first indicates either the presence or absence of total coli form. The principle bacterial pathogens that have been shown to cause human intestinal disease associated with drinking water are *Salmonella typhi*, *Salmonella paratyphi*-A, other *Salmonella* species, *Shigella* sp., *S. flexneri*, and *S. sonnei*, *Vibrio cholerae*, *Leptospira* sp., *Yersinia enterocolitica*, *Francisella tularensis*, *Escherichia coli* (specific strains) and *Pseudomonas aeruginosa*, etc. (National Research Council 1987; Chandran, 2014). Sanitation generally refers to the provision of improved facilities and services for the safe collection, storage, and appropriate disposal of wastes ranging from domestic, industrial, commercial, medical, and hazardous wastes. (Oke *et al.*, 2013). Ayeni (2014) reported that increasing population of urban centres has been a major contributor to unsanitary environment, continuous use of unimproved sources of water increased the risk of environmental health problems such as cholera incidence. Inadequate access to safe water and sanitation services, coupled with poor hygiene practices, kills and sickens thousands of children every day, and leads to impoverishment and diminished opportunities for thousands more (Allen *et al.*, 2006; WHO, 2009). In view of the importance of water in our daily life and state of sanitation of the sources of water supply, it is imperative to conduct thorough microbiological and physico-chemical examinations especially in low-income urban settlements such as Igboora in Ibarapa Central Local Government.

Material and Methods

Study Area

The Study was carried out at the Research Laboratory, Oyo State College of Agriculture and technology, Igboora, Oyo State. Igboora lies on latitude $7^0$15N and longitude $3^0$30E of the equator with annual rainfall of 150mm and temperature of 27^0c Oyo state (Sanusi,2011). The area falls within South West region of Oyo State and noted for both hot and cold weather conditions.

GSample collection and preparation

Five well water samples with a replicates were collected at random from five different areas in Igboora in a sterile bottle that was fitted with screw caps and properly labelled. The containers that were used for sample collection were properly washed, rinsed with distilled water, dry and sterilized in an oven at temperature of 170^0C for 1 hour.

Bacteriologcal analysis

Detection and Enumeration of the coliform oganisms

After the period of 24 hours, the incubator was opened to note which tubes showed growth. Tubes that showed turbidity and gas production (as been trapped in the inverted vial) were regarded as positive. The number of positive tubes were recorded at each dilution. Then the tubes were returned into the incubator and re-examined after a total of 48 hours of incubation. Then the pattern of positive results were compared with a most probable number table.

Detection and enumeration

At any time within the period of 24 to 48 hours of incubation, formation of gas in any amount in the inverted vial inside the brilliant green lactose bile broth fermentation tubes was regarded as positive confirmed test. The number of positive tubes for each sample dilution was recorded and the most probable number of coliform organism was estimated with the McGrandy's statistical table.

Statistical analysis

The results obtained were recorded in form of Mean±Standard deviation. Student t-test was used to test for the significance difference at $p<0.05$.

Results

Table: showed the relationship between the total coliform, microbial count and Total hardness of water sample

Properties	Yes (Mean±SD)	NO (Mean±SD)	T-test	P-value
Permanent Drawer				
Total hardness	4(83.00±41.71)	6 (76.67±16.18)	0.343	0.740
Total coliform count	4 (8.00±6.38)	6 (12.00±6.23)	-2.986	0.025
***E. coli* count**	4 (5.25±2.75)	6 (7.83±7.96)	-1.961	0.046
Age of well				
Total hardness	3(72.67±44.38)	7 (82.00±20.43)	-0.477	0.646
Total coliform count	3 (10.00±6.08)	7 (10.57±6.82)	-0.125	0.904
***E. coli* count**	3 (5.57±3.21)	7 (7.29±7.41)	0.355	0.732
Number of Rings				

Total hardness	4(86.50±23.17)(<10)	6(74.43±30.52)(≥10)	0.673	0.520
Total coliform count	4 (9.25±5.12)(<10)	6 (11.16±7.37)(≥10)	-0.452	0.663
***E. coli* count**	4 (5.00±6.00)(<10)	6 (8.00±6.72)(≥10)	0.719	0.492

Discussion

The viable bacterial count which is a measure of the microbial load of the water sample obtained in this study ranges from 5.00±6.00 - 8.00±6.72 exceeded the recommended limit of WHO This shows that the wells contain too high level of microbial contaminant that make water obtained from them a threat to public health.

The most predominant is the enteric coli form *Escherichia coli* (87.5%). This is a pathogenic organism mainly of faecal origin. Any water source used for drinking or cleaning purpose should not contain any organism of faecal origin (Adeyemo, 2002). Apart from environmental hygiene and population density, the presence of *Escherichia coli* in some of the uncovered wells in those areas may also be attributed to drainage and flooding from contaminated surface water into unprotected well shafts. This study corroborates earlier studies in Lagos and Ibadan where it was discovered that well water used as source of water for drinking and cleaning purposes were grossly contaminated with pathogenic organisms (Lamikanra, 1999). A situation where enteric pathogens are grossly isolated from sources of water consumed by humans is a serious problem which calls for vigilance on the part of the authorities as it signals possible future outbreak of water borne diseases. Such disease outbreak may spread widely within the country and even possibly extend to neighboring countries since Nigeria shares boundaries with many West African states.

Conclusion

The levels of total coliforms among the ten well water samples was varied. This indicate that the levels of pollution are also varied. The study also indicated that though the well water sample contains significant amount of hardness, the overall physical and microbial
quality of the water samples lies within maximum permissible limits of established standard of WHO.

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DETERMINATION OF SOME PHYTOCHEMICAL IN ORGANIC SOAP FROM BANANA STALKS AND PEELS.

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Abstract
This research work aimed at determining the composition of selected phytochemicals in organic soap produced from banana stalks and peel. Banana stocks and peels used in this study were collected from banana sellers in Towobowo market, Igboora. All method used in this study were of analytical standard. Findings from this result showed that the organic soap produced had 22.50% of flavonoid, 8.63% of alkaloids, 5.68% of tannins, 3.26% of saponins, 2.31% of glycosides, 0.82% of phytates, 0.73% of phenols and 0.69% of steroids. The high concentration of some of the phytochemicals in this study revealed the importance of banana stalk and peel as available raw materials for the production of organic soap. From the result, it can be concluded and recommended that the use of banana stalks and peels for the production of organic soap should be encouraged to reduce pollution from the waste and provide employment opportunity for the masses if the production is well accepted and adopted.
Keywords: Organic soap, Banana peel, Banana stalk, Phytochemical

Introduction

Banana, a wonderfully sweet fruit with firm and creamy flesh that come prepackaged in a yellow jacket, available for harvest throughout the year consists mainly of sugars and fibers which make it source of immediate and slightly prolonged energy (Idise *et al.*, 2011). India ranks first in production of banana and third in area among fruit crops (DAC, 2014). Phytochemicals are bioactive non-nutrient plant compounds in fruits, vegetables, grains and other plant foods linked in reducing the risk of major chronic diseases (Rui, 2013).

Soap is common cleansing agent known to everyone. Many authors defined soap indifferent ways, regarding it as cleaning agent, manufactured in granules, bars, flakes, or liquid form obtained from reacting salt of sodium or potassium of various fatty acids that are of natural origin (salt of non-volatile fatty acids). Soap can also be known as be any water-soluble salt of fatty acids containing eight or more carbon atoms. Soaps are produced for varieties of purpose ranging from washing, bathing, medication etc. The cleansing action of the soap is due to the negative ions on the hydrocarbon chain attached to the carboxylic group of the fatty acids. The affinity of the hydrocarbon chain to oil and grease, while carboxylic group to water is the main reason of using soap i mostly with water for cleaning purposes (Adaku and Melody, 2013).

Statement of the Problem

Plantain and Banana peels are agro-industrial by-products left behind after the edible portion had been processed into various food items by cooking, roasting or milling into flour. Locally, riped or unriped peels or wastes may be used to feed live stocks or in the production of local soaps, but in the areas where these are not feasible, these wastes end up polluting the environment (Bains, 2001).
The fundamental problem of this study is the continuous dumping of waste peels of plantain and banana. There is proper documentation of the reuse or recycle of the waste peels and this

is perhaps because there is little or no information on the use of peels for soap production. It has been reported that in Nigeria, especially in Oyo State, there is a large consumption of the plantain and banana fruits, eaten raw, cooked or milled into flour and local beer. Although various studies have been carried out on plantain and banana fruits (mesocarp), the purpose of this work is therefore the determination of some phytochemicals in organic soap produced from Banana stalks and peels.

Objectives of the Study

The specific objectives are to:

i. To produce organic soap using banana stalk and peel.
ii. To determine the phytochemical content of soap produced.

Materials and methods

Study Area

This research was carried out in Oyo State College of Agriculture and Technology, Igboora the headquarters of Ibarapa Central Local Government. It has an area of 440km^2 and a population of 102,979 at 2006 census. Igboora falls between latitude 7^0 15^2 and 7^0 55^1 north and latitude $3^0$30 east. This region is bounded in the north by Oke-Ogun area of Oyo State to the east, Ido local government area and to the west is Ogun State of Nigeria.

	Materials	**Quantity**
i.	Banana peel	4 bundles of sacks
ii.	Banana stalk	6 bundles of sacks
iii.	Local palm kernel oil	5 ½ litres
iv.	Chemical (aro made from banana ash)	2 ½ litres
v.	Water	25litres
vi.	Sleever	1
vii.	Thermometer for measurement	1
viii.	Cooking Pot	1
ix.	Packaging materials	15

The above listed materials were obtained from Towobowo market in Igboora, Oyo State

Method and Preparation of Organic Soap

1. The banana peel and stalk were burned to ashes
2. The ashes of banana peel and stalks were filtered for eight (8) hours
3. The filtrate was cooked for six hours to get the chemical (Aro)
4. Measured Palm kernel oil and chemical were added and boiled.
5. Stir continuously until the mixture is solidified
6. Spatula was used to pack after the soap has been formed into a sandy texture in a spot
7. Reduce the heat to allow the real organic soap come out
8. Pack in a tray and leave to dry and cool
9. Share in a soap case to give shape and size and used as cosmetic.

Determination of Phytochemical

Test for Saponins

The extract (1g) was marcarated with 10 ml of petroleum ether and decanted into a beaker. Another 10 ml of the petroleum ether was added into the beaker and the filtrate evaporated. The residue was dissolved in 6 ml of ethanol. The solution (2 ml) was put in a test tube and 2 ml of chromagen solution added. It was left to stand for 30 min and the absorbance read at 550 nm (Herbourne, 1989).

Test for Alkaloids

The extract (1g) was marcarated with 20 ml of ethanol and 20% H_2SO_4 (1:1 v/v). The filterate (1 ml) was added to 5 ml of 60% H_2SO_4. After 5 min, 5 ml of 0.5% formaldehyde in 60% H_2SO_4 was mixed with the mixture and allowed to stand for 3 hr. The absorbance was read at 565 nm (Herbourne, 1989).

Test for Tannins

The extract (1g) was marcarated with 50 ml of methanol and filtered. To the filterate (5 ml), 0.3 ml of 0.1N ferric chloride in 0.1N HCl and 0.3 ml of 0.0008 M of potassium ferricyanide were added and the absorbance read at 720 nm (Herbourne, 1989).

Test for Flavonoids

The extract (1g) was marcarated with 20 ml of ethylacetate for 5 min and filtered. To the filterate (5 ml), 5 ml of dilute ammonia was added and shaken for 5 min. The upper layer was collected and the absorbance read at 490 nm (Herbourne, 1989).

Test for Phenols

The extract (1g) was marcarated with 20 ml of 80% ethanol and then filtered. The filterate (5 ml) was added to 0.5 ml of folin-ciocalteus reagent and allowed to stand for 30 min. Then 2 ml of 20% sodium carbonate was added and absorbance measured at 650 nm (Herbourne, 1989).

Results and discussion

Result

Table 1: Phytochemical properties of black soap produced from banana peel stalk

Phytochemicals	Composition (%)
Tannins	5.68
Saponnins	3.26
Flavonoids	22.50
Alkaloids	8.63
Phytates	0.82
Steroids	0.69
Phenols	0.73
Glycosides	2.31

Discussion

Table 1 showed that blacksoap produced from plantain peel and stalk contains all the tested phytochemicals in varying concentrations. The table showed that the soap produced had 22.50% composition of flavonoid.

Flavonoids content**:** The amount of flavonoid in the black soap produced is 22.50%

Flavonoids are water soluble antioxidants and free radical scavengers which prevent oxidative cell damage, have strong anticancer activity and protect against the different levels of carcinogenesis. The presence of flavonoids in the intestine lowers the risk of heart diseases (Okwu, 2004).

Saponin contents of the soap produced was 3.26% some of the popularly known characteristics of saponins include formation of foams in aqueous solution and hemolytic activities (Okwu and Emenike, 2006). Saponins have natural tendency to ward off microbes which makes them essentials for treating fungal and yeast infections. These compounds serve as natural antibiotics and help the body to fight infections and microbial invasions (Okwu 2004, 2005, Okwu and Emenike 2006). Plant saponins help humans to fight fungal infections, combat microbes and viruses, decrease blood lipids, lower cancer risks and lower blood glucose response (Shi *et al.*, 2004). It also lowers blood cholesterol thereby reducing heart

disease. The most outstanding and exciting prospect of saponins is how they inhibit or kill cancer cells without killing the normal cells.
Cancer cells have more cholesterol-type compounds on their membranes than normal cells. Saponins therefore bind cholesterol and thus interfered with cell growth and division (Okwu 2005, Okwu and Emenike, 2006).
Black soap produced from banana and stalk gave a low composition of phenol of 0.73%. The outstanding phytochemical feature of phenols is their ability to specifically block enzymes that causes inflammations. They also modify the prostaglandin pathways, thereby protecting platelets from clumping (Okwu and Omodamiro, 2005). Phenolic compounds can enhance the body's immune system to recognize and destroy cancer cells as well as inhibiting the development of new blood vessels (angiogenesis) that is necessary for tumour growth. It also attenuate adhesiveness and invasiveness of cancer cells thereby reducing their metastatic potential (Wahle *et al.,* 2010).
Blacksoap produced from banana peels and stalks had 5.58% of tannins, 8.63% of alkaloids, 0.82% of steroids, 0.69% of steroids, 0.82% of phytates and 2.31% of glycosides. In some plant parts, the amount of phytoconstituents was comparatively lower as reported in a study for flower crude extract of *Bauhinia tomentosa* L. which showed that amount of alkaloids was (5.6%), amount of flavonoids was (15.8%) and amount of saponins was (2.1%), (Sathya *et al.,* 2013). General plant secondary metabolites or phytoconstituents are considered as good and unique source for food supplements and pharmaceuticals, their various roles were reported in many studies. The importance of alkaloids, sterols, saponins and tannins comes from their uses as antimicrobial for treating many pathogens (Kubmarawa, 2007) and (Mensah, 2008). Phyto-sterols and flavonoids have a role as immunomodulatory, anti-cancer, antioxidants, and anti-inflammatory agents (Laparra and Sanz, 2010). Alkaloids have anti-microbial and anti-fungal activities or properties, flavonoids have role in preventing liver peroxidation and anti-cancer properties, and sterols have anti-metastatic activity (Saxena *et al.,* 2013). Alkaloids are also effective in reducing headaches resulting from hypertension (Ayitey and Addae, 1977). This therefore makes blacksoap produced from banana peel and stalk as good raw material for production of soap.

Conclusion and recommendation

Conclusion

It can be conclude that the use of banana peel and stalk as local raw materials are advantageous because it is readily available for the production of black soap. Also, the making of organic soap from banana peel and stalk will reduce the dumping of waste peel and stalk after the edible portion has been processed into various food items.

Recommendation

This research work affirmed the use of banana peel and stalk as effective raw materials for the production of organic soap. It is therefore, recommended that the use of banana peel and stalk which as agricultural waste product is encouraged in the production of soap and for creation of job opportunities for the masses

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MODIFIED EXPONENTIAL-TYPE ESTIMATOR FOR POPULATION MEAN WITH TWO AUXILIARY VARIABLE IN TWO PHASE SAMPLING

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Abstract

An exponential-type estimator of population mean in two phase sampling is an improvement of the class of ratio estimator of finite population mean. In real life situation complete information about population mean are usually unavailable which make ratio estimation impracticable. This study proposed a modified exponential-type estimator that can be suitable when population mean of auxiliary variable is unknown in two phase sampling. Three data sets; Head length of second son; Head length of first son and Head breadth of first son of 25 families in Pakistan in 1958 were used in this study. The proposed estimator was derived using exponential as an improvement strategy. Taylor series expansion up to second degree approximation was used to derive the biases and mean square error of the proposed estimator. Efficiency of the proposed estimator was examined. The data sets were used to validate the proposed estimator and their percentage relative efficiency was obtained. The proposed estimator was compared with the existing estimators. The Mean Square Error (MSE) for the six existing estimators are 0.299, 0.283, 0.252, 0.249, 0.238, 0.290 while for the proposed estimator is 0.080 for the first data set. The corresponding Percentage Relative Efficiency (PRE) for existing estimators are 100, 105.72, 118.783, 119.887, 125.495, 103.154 while for the proposed is 371.693 respectively. For the second data set, the MSE for the exiting are 0.494, 0.461, 0.422, 0.399, 0.373, 0.259, while for the proposed is 0.1383101. The corresponding PRE for existing are 100, 107.2759, 117.1526, 123.9095, 132.686, 191.203 while for the proposed is 357.398 respectively. For the third data set, the MSE for the exiting are 10.363, 8.457, 5.795, 9.927, 6.465, 10.973 while for the proposed is 7.95. The corresponding PRE for exiting are 100, 122.539, 178.819, 104.395, 160.289, 94.442 while for the proposed is 130.295 respectively. The three proposed estimators are less biased and more efficient. The MSE for the proposed estimators are lower than the MSE of all existing estimators with higher PRE. This study revealed that the modified exponential-type estimators of population mean in two phase sampling is efficient for estimating population mean

***Keywords*:** Estimator, Mean, Efficiency, Mean Square Error, Bias. Existing Estimator.

Introduction

The use of auxiliary information has been used in practice to increase the efficiency of estimators. This information is generally used in ratio, product and regression type estimators to estimate the population mean of the study variable. When the correlation between the study variable and the auxiliary variable is positive, the ratio estimation method is used. On the other hand, if the correlation is negative, the method of estimating the product is preferred. Some research works such as Searls (1964), Chand (1975), Kiregyera (1984), Murthy (1967), Singh *et al. (*2013), have been carried out in ratio, product and regression using one or two auxiliary variables. In this study, a class of relative exponential estimators using two auxiliary variables is considered to estimate a finite population mean for the variable of interest. We have considered several special estimators of the suggested

estimators, comparisons between traditional multivariate ratio estimators and estimators proposed by Singh *et al. (*2013). With the proposed family of estimator using the information two variables are considered. There is a lot of work in which auxiliary information is used to improve the precision of the estimator.

Literature review

The auxiliary information is frequently used to increase precision of the population estimated by taking advantage of the correlation between the study variable and the auxiliary variable. Several authors including Kadilar and Cingi (2006) have proposed different estimators by utilizing information on the auxiliary variable for estimation of population mean. For ratio estimators in sampling theory, population information of the auxiliary variable, such as Coefficient of variable, Coefficient of skewness is often used to increase the efficiency of the estimation for a population mean. Murthy (1964), Chand (1975), Cochran (1977), Prasad (1989), Sen (1993), Upadhyaya and Singh (1999), Singh and Tailor (2005), Singh *et al. (*2004), Koyuncu and Kadilar (2009), Lu and Yan (2014), Khan (2016), Olayiwola *et al. (*2020), among others used the population information of the auxiliary variable to increase precision.

The usual unbiased estimator to estimate the population mean of the study variables is

$$T_0 = \bar{y} \qquad (2.1)$$

The variance of the estimator $\bar{y}$ up to first order of approximation is given by

$$Var(T_0) = \bar{y}^2 f_1 C_y^2 \qquad (2.2)$$

The usual ratio in two phase sampling and their mean square error are given by $T_1 = \frac{\bar{y}}{\bar{x}}\bar{x}'$ (2.3)

$$MES(T_1) = \bar{Y}^2\left[f_1 C_y^2 + f_3\left(C_x^2 - 2\rho_{yx} C_y C_x\right)\right] \qquad (2.4)$$

Searls (1964), proposed an estimation procedure for population mean using known knowledge of the coefficient of variation of the auxiliary variable.

$$T_2 = a\bar{y} \qquad (2.5)$$

$$\text{var}(T_2) = (1-B) f_1 \bar{Y}^2 C_y^2 \qquad (2.6)$$

Chand (1975), proposed the following chain ratio-type estimator in double sampling by incorporating the knowledge of two auxiliary variables, the suggested estimator is given by

$$T_3 = \frac{\bar{y}}{\bar{x}}\frac{\bar{x}'}{\bar{z}'}\bar{z} \qquad (2.7)$$

The mean square error of the suggested estimators is given as

$$\text{MSE}\left(T_3\right) = \bar{y}^2\left[f_1 C_y^2 + f_3\left(C_x^2 - 2p_{yx} C_y C_x\right) + f_2\left(C_z^2 - 2p_{yz} C_y C_z\right)\right] \qquad (2.8)$$

Kiregyera (1984), suggested the following chain-type exponential estimators in two phase sampling, the suggested estimators are given as

$$T_4 = \frac{\bar{y}}{\bar{x}}\left[\bar{x}' + b_{yx}(\bar{z} - \bar{z}')\right] \qquad (2.5)$$

$$T_5 = \bar{y} + b_{yx}\left[(\bar{x}' - \bar{x}) - b_{xz}(\bar{z} - \bar{z}')\right] \qquad (2.6)$$

The mean square error of the suggested estimators up to first order of approximation are given as follows:

$$MSE(T_4) = \bar{Y}^2\left[f_1 C_y^2 + f_3 C_x (C_x - 2p_{yx}C_y) + f_2 p_{xz} C_x (p_{xz}C_x - 2p_{yx}C_y)\right] \quad (2.7)$$

$$MSE(T_5) = \bar{Y}^2 C_y^2\left[f_2 p_{yx} p_{xz} (p_{yx}p_{xz} - 2p_{yz}) + f_1 - f_3 p_{yx}^2\right] \quad (2.8)$$

Singh *et al.* (2013), recommended a class of exponential chain ratio-product type estimator for estimating population mean using two auxiliary variables as follow

$$T_6 = \bar{y}\left[\alpha \exp\left(\frac{\bar{x}'\frac{\bar{Z}}{\bar{z}'} - \bar{x}}{\bar{x}'\frac{\bar{Z}}{\bar{z}'} + \bar{x}}\right) + \beta \exp\left(\frac{\bar{x} - \bar{x}'\frac{\bar{Z}}{\bar{z}'}}{\bar{x} + \bar{x}'\frac{\bar{Z}}{\bar{z}'}}\right)\right] \quad (2.9)$$

Where α and β are suitable chosen constants, such that $\alpha + \beta = 1$

The minimum mean square error of the suggested estimator is given as follow

$$MSE(T_6) = \bar{Y}^2 C_y^2\left[f_1 - \frac{\left(p_{yx} f_3 C_x + p_{yz} f_2 C_z\right)^2}{\left(f_3 C_x^2 + f_2 C_z^2\right)}\right] \quad (2.10)$$

Where the optimum value of α is $\alpha_{opt} = 1/2 + \frac{\left(p_{yx} f_3 C_{xy} + p_{yz} f_2 C_{zy}\right)}{f_3 C_x^2 + f_2 C_z^2}$

Lu and yan (2014), proposed family of ratio estimators of a class of multivariate ratio estimators using information of two auxiliary variables as follows:

$$T_7 = w_1 \bar{y}\frac{a_1\bar{X}_1 + b_1}{a_1\bar{x}_1 + b_1} + w_2 \bar{y}\frac{a_2\bar{X}_2 + b_2}{a_2\bar{x}_2 + b_2} \quad (2.15)$$

Where w_1 and w_2 are weights that satisfy the condition, such that $w_1 + w_2 = 1,$

MSE of this estimator is given as follows:

$$MSE(T_7) = \frac{1-f}{n}\bar{Y}^2\begin{pmatrix} C_y^2 + w_1^2 a_1^2 C_{x_1}^2 + w_2^2 a_2^2 C_{x_2}^2 - 2w_1 a_1 p_{yx_1 c_y c_{x_1}} \\ -2w_2 a_2 p_{yx_2 c_y c_{x_2}} + 2w_1 w_2 a_1 a_2 p_{x_1 x_2} C_{x_1} C_{x_2} \end{pmatrix} \quad (2.16)$$

Khan (2016), suggested a ratio chain-type exponential estimator for finite population mean of the study variable y, given by

$$T_8 = \bar{y}\left(\frac{\bar{x}' - \bar{x}}{\bar{x}' + \bar{x}}\right)^{k_1} + k_2\left[\bar{x}' \exp\left(\frac{\bar{Z} - \bar{z}'}{\bar{Z} + \bar{z}'}\right) - \bar{x}\right] \quad (2.11)$$

Where k_1 and k_2 are the unknown constants, whose value is to be determined for optimality conditions.

Hence, the mean square error up to first order of approximation, given as

$$MSE(T_8)=\bar{Y}^2C_y^2\left[f_1-f_3\rho^2{}_{xy}-\frac{f_2(2\rho_{xy}C_x-\rho_{yz}C_z)^2}{4C_x(C_x-\rho_{xz}C_z)+C_z^2}\right] \quad (2.12)$$

Olayiwola *et al. (*2020), proposed a class of ratio estimators of a finite population mean using two auxiliary variables under two-phase sample scheme, given as

$$T_9=\bar{y}\left[a_1\frac{a_1\bar{x}'+b_1}{a_1\bar{x}+b_1}+a_2\frac{a_2\bar{x}'+b_2}{a_2\bar{x}+b_2}\right] \quad (2.13)$$

Hence, the mean square error up to first order of approximation, given as

$$MSE(T_9)=\bar{Y}^2\left[\begin{array}{l} f_1\left(\begin{array}{c} a_1^2Q_1^2C_{x_1}^2+a_1^2Q_2^2C_{x_2}^2+a_2^2C_y^2-2a_1^2Q_1\rho_{yx_1}C_yC_{x_1} \\ +2a_1a_2Q_1Q_2\rho_{x_1x_2}-2a_1a_2Q_1\rho_{yx_1}C_yC_{x_1} \\ -2a_1a_2Q_2\rho_{yx_2}C_yC_{x_2}+2a_1a_2C_y^2 \\ -2a_2^2Q_2\rho_{yx_2}C_yC_{x_2} \end{array}\right) \\ +f_2\left(a_1^2Q_1^2C_{x_1}^2+a_1^2Q_2^2C_{x_2}^2+2a_1a_2Q_1Q_2\rho_{x_1x_2}C_{x_1}C_{x_2}\right) \end{array}\right] \quad (2.14)$$

Proposed Modified Estimator

Having studied the Olayiwola *et al. (*2020), this estimator for estimating finite population mean are proposed;

$$T_{10}=\bar{y}\left[\beta_1\exp\left(\frac{a_1\bar{x}'_1+b_1}{a_1\bar{x}_1+b_1}\right)+\beta_2\exp\left(\frac{a_2\bar{x}'_2+b_2}{a_2\bar{x}_2+b_2}\right)\right]$$

0

3.2 Bias and MSE of Estimator T10

$\bar{y}=(1+e_0),\ \bar{x}'_1=(1+e'_1)\bar{X}_1,\ \bar{x}_1=(1+e_1)\bar{X},\ \bar{x}_2=(1+e_2)\bar{X}_2,\ \bar{x}'_2=(1+e'_2)\bar{X}_2$

$E(e_0)=E(e_1)=(e_2)=E(e'_1)=E(e'_2)=0$

$E(e_0^2)=\theta_1C_y^2,\ E(e_1^2)=\theta_1C_{x_1}^2,\ E(e_1'^2)=\theta_2C_{x_1}^2,\ E(e_2^2)=\theta_1C_{x_2}^2,\ E(e_2'^2)=\theta_2C_{x_2}^2$

$E(e_0e_1)=\theta_1\rho_{yx_1}C_yC_{x_1},\ E(e_0e'_1)=\theta_2\rho_{yx_1}C_yC_{x_1},\ E(e_0e_2)=\theta_1\rho_{yx_2}C_yC_{x_2},\ E(e_0e'_2)=\theta_2\rho_{yx_2}C_yC_{x_2},$

$E(e_1e'_1)=\theta_2C_{x_1}^2,\ E(e_1e_2)=\theta_1\rho_{x_1x_2}C_{x_1}C_{x_2},\ E(e'_1e'_2)=\theta_2\rho_{x_1x_2}C_{x_1}C_{x_2},\ E(e_1e'_2)=\theta_2\rho_{x_1x_2}C_{x_1}C_{x_2},$

$E(e'_1e_2)=\theta_2\rho_{x_1x_2}C_{x_1}C_{x_2},$

To obtain Bias and Mean Square error (MSE) of the proposed Estimator T10, we write

$$T_{10}=\bar{Y}\left[\begin{array}{l} \beta_1\left[1-\phi_1e_1+\phi_1e'_1+\frac{3}{2}\phi_1^2e_1^2+\frac{1}{2}\phi_1^2e_1'^2-2\phi_1^2e_1e'_1+e_0-\phi_1e_0e_1+\phi_1e_0e'_1\right]+ \\ \beta_2\left[1-\phi_2e_2+\phi_2e'_2+\frac{3}{2}\phi_2^2e_2^2+\frac{1}{2}\phi_2^2e_2'^2-2\phi_2^2e_2e'_2+e_0-\phi_2e_0e_2+\phi_2e_0e'_2\right] \end{array}\right] \quad (3.2)$$

Subtract $\bar{Y}$ from both sides of (3.2) and taking expectation to obtain bias of T_{10} for case I and II as;

$$Bias(T_{10})_1 = \bar{Y}\begin{bmatrix}\beta_1\left[(\theta_2-\theta_1)\rho_{yx_1}C_yC_{x_1} - \frac{3}{2}(\theta_2-\theta_1)\phi_1^2C_{x_1}^2\right] \\ +\beta_2\left[(\theta_2-\theta_1)\rho_{yx_2}C_yC_{x_2} - \frac{3}{2}(\theta_2-\theta_1)\phi_2^2C_{x_2}^2\right]\end{bmatrix}$$

(3.3)

$$Bias(T_{10})_{11} = \bar{Y}\left[\beta_1\left[\tfrac{1}{2}(3\theta_1+\theta_2)\phi_1^2C_{x_1}^2 - \theta_1\phi_1\rho_{yx_1}C_{yx_1}\right] + \beta_2\left[\tfrac{1}{2}(3\theta_1+\theta_2)\phi_2^2C_{x_2}^2 - \theta_1\phi_2\rho_{yx_2}C_yC_{x_2}\right]\right]$$

(3.4)

Squaring both sides of (3.2) and taking expectation to obtain MSE of T_{10} for case I and II as;

$$MSE\left(T_{10}\right)_1 = \bar{Y}^2\begin{bmatrix}\beta_1^2\left[\theta_1C_y^2 + \theta_1\phi_1^2C_{x_1}^2 + \theta_2\phi_1^2C_{x_1}^2 - 2\theta_1\phi_1\rho_{yx_1}C_yC_{x_1} + 2\theta_2\phi_1\rho_{yx_1}C_yC_{x_1} - 2\theta_2\phi_1^2C_{x_1}^2\right] + \\ \beta_2^2\left[\theta_1C_y^2 + \theta_1\phi_2^2C_{x_2}^2 + \theta_2\phi_2^2C_{x_2}^2 - 2\theta_1\phi_2\rho_{yx_2}C_yC_{x_2} + 2\theta_2\phi_2\rho_{yx_2}C_yC_{x_2} - 2\theta_2\phi_2^2C_{x_2}^2\right] + \\ \beta_1\beta_2\begin{bmatrix}\theta_1C_y^2 - \theta_1\phi_2\rho_{yx_2}C_yC_{x_2} + \theta_1\phi_2\rho_{yx_1}C_yC_{x_1} - \theta_1\phi_1\rho_{yx_1}C_yC_{x_1} + \theta_1\phi_1\phi_2\rho_{x_1x_2}C_{x_1}C_{x_2} \\ -\theta_2\phi_1\phi_2\rho_{x_1x_2}C_{x_1}C_{x_2} + \theta_1\phi_1\rho_{yx_1}C_yC_{x_1} + \theta_1\phi_1\rho_{yx_1}C_yC_{x_1} + \theta_2\phi_1\rho_{yx_1}C_yC_{x_1} \\ -\theta_2\phi_1\phi_2\rho_{yx_1}C_yC_{x_1} + \theta_2\phi_1\phi_2\rho_{yx_2}C_yC_{x_2}\end{bmatrix}\end{bmatrix}$$

(3.5)

$$MSE\left(T_{10}\right)_{11} = \bar{Y}^2\begin{bmatrix}\beta_1^2\left[\theta_1C_y^2 + \theta_1\phi_1^2C_{x_1}^2 + \theta_2\phi_1^2C_{x_1}^2 - 2\theta_1\phi_1\rho_{yx_1}C_yC_{x_1}\right] \\ +\beta_2^2\left[\theta_1C_y^2 + \theta_1\phi_2^2C_{x_2}^2 + \theta_2\phi_2^2C_{x_2}^2 - 2\theta_1\phi_2\rho_{yx_2}C_yC_{x_2}\right] + \\ \beta_1\beta_2\left(\theta_1C_y^2 - \theta_1\phi_2\rho_{yx_2}C_yC_{x_2} - \theta_1\phi_1\rho_{yx_1}C_yC_{x_1} + \theta_1\phi_1\phi_2\rho_{x_1x_2}C_{x_1}C_{x_2}\right)\end{bmatrix}$$

(3.6)

To obtain minimum mean square error in case I and II, differentiating (3.5) and (3.6) partially w.r.t β_1 and β_2 and equating to zero and then, substitute the values of β_1 and β_2 back into (3.5) and (3.6)

$$MSE(T_{10})_{I\min} = \bar{Y}^2\left[\beta_1^2a + \beta_2^2b + \beta_1\beta_2c\right]$$

$$\beta_1 = \frac{-c}{a-b}, \qquad \beta_2 = \frac{-c}{b-c}$$

$$MSE(T_{10})_{I\min} = \bar{Y}^2\left[\frac{c^2}{(a-b)^2}a + \frac{c^2}{(b-c)^2}b + \frac{c^3}{(a-b)(b-c)}\right]$$

$$MSE(T_{10})_{II} = \bar{Y}^2\left[k\beta_1^2 + l\beta_2^2 + 2\beta_1\beta_2m\right]$$

$$\beta_2 = \frac{-m}{k-m}, \qquad \beta_2 = \frac{-m}{l-m}$$

$$MSE(T_{10})_{II\min} = \bar{Y}^2\left[\frac{m^2}{(k-m)^2}k + \frac{m^2}{(l-m)^2}l + 2\frac{m^3}{(k-m)(l-m)}\right]$$

Empirical study

To examine the merit of the suggested estimator, we have considered three natural population data sets. The descriptions of the population are given below.

Data 1: Lu (2014) doi: 10.1371/journal.pone.0089538.tool

$N = 180; n' = 100; n = 70; \bar{Y} = 13.9951; \bar{X}_1 = 27.3981; \bar{X}_2 = 38.7167; C_y = 0.4180; C_{x_1} = 0.4254;$

$C_{x_2} = 0.3339; \rho_{yx_1} = 0.5630; \rho_{yx_2} = 0.5273; \rho_{x_1x_2} = -0.2589; \phi_1 = 0.002; \phi_2 = 1.6519$

Table1: Shows the MSE and PRE of Proposed and Existing Estimators Using Data I

ESTIMATORS	MSE	PRE
$T_{4(Kiregyera,1984)}$	0.299	100
$T_{5(Kiregyera,1984)}$	0.283	105.72
$T_{6(Singh\ et\ al,\ 2013)}$	0.252	118.783
$T_{7(Lu\ and\ Yan,2014)}$	0.249	119.887
$T_{8\ (Khan,2016)}$	0.238	125.495
$T_{9(Olayiwola\ et\ al,2020)}$	0.290	103.154
$T_{10}(\Pr oposed)$	0.080	371.693

Data 2: Source: Lu (2014)

$N = 180; n' = 90; n = 50; \bar{Y} = 13.9951; \bar{X}_1 = 17.3981; \bar{X}_2 = 28.7167; C_y = 0.4180; C_{x_1} = 0.4254;$

$C_{x_2} = 0.3339; \rho_{yx_1} = 0.5630; \rho_{yx_2} = 0.5273; \rho_{x_1x_2} = 0.2589; \phi_1 = 0.002; \phi_2 = 1.6519$

Table2: Shows the MSE and PRE of Proposed and Existing Estimators Using Data II

ESTIMATORS	MSE	PRE
$T_{4(Kiregyera,1984)}$	0.494	100
$T_{5(Kiregyera,1984)}$	0.461	107.276
$T_{6(Singh\ et\ al,\ 2013)}$	0.422	117.153
$T_{7(Lu\ and\ Yan,2014)}$	0.399	123.910
$T_{8\ (Khan,2016)}$	0.373	132.686
$T_{9(Olayiwola\ et\ al,2020)}$	0.259	191.203
$T_{10}(\Pr oposed)$	0.138	357.398

Data 3: (Source: Data used by Anderson (1958)); (25 families have been observed for the following three variable.) Y: Head length of second son; X1: Head length of first son; X2: Head breadth of first sons

$N = 25; n' = 10; n = 7; \bar{Y} = 183.84; \bar{X}_1 = 185.72; \bar{X}_2 = 151.12; C_y = 0.0546; C_{x_1} = 0.0526;$

$C_{x_2} = 0.0488; \rho_{yx_1} = 0.7326; \rho_{yx_2} = 0.6430; \rho_{x_1x_2} = 0.6837; \phi_1 = 0.002; \phi_2 = 1.6519$

Table3: Shows the MSE and PRE of Proposed and Existing Estimators Using Data III

ESTIMATORS	MSE	PRE
$T_{4(Kiregyera,1984)}$	10.363	100
$T_{5(Kiregyera,1984)}$	8.457	122.539

$T_{6(Singh\ et\ al,\ 2013)}$	5.795	178.819
$T_{7(Lu\ and\ Yan,2014)}$	9.927	104.395
$T_{8\ (Khan,2016)}$	6.465	160.289
$T_{9(Olayiwola\ et\ al,2020)}$	10.973	94.443
$T_{10}(\Pr oposed)$	7.954	130.295

Conclusion

A class of relative exponential-type estimator for population mean employing two auxiliary variables was suggested under two phase sampling in the study. The proposed estimator's MSE and PRE (T10) was computed, and the improved estimator had the lowest Mean Square Error (MSE). In comparison to other relative estimators, the percentage Relative Efficiency (PRE) is higher. As a result, the proposed estimator outperforms the existing estimators in this investigation.

Recommendations

The proposed estimators are recommended for use instead of the previous estimators, because the proposed estimators are more efficient than the previous estimators.

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OYSCATECH GLOBAL CONSULT

IN VITRO ANTI DIABETIC POTENTIAL OF ETHANOL EXTRACT OF CINNAMON BARK (*CINNAMON* VERUM)

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Abstract
This research aimed at investigating its anti-diabetic potential of ethanol extract of cinnamon verum bark. The objective is to compare the therapeutic potential, (i.e. anti-diabetic effect) with synthetics drugs such acarbose. The in vitro anti-diabetic properties of ethanol extract of Cinnamon was determined. Acarbose was used as the positive control (standard) (0.03125µg/mL – 1µg/mL). The α-amylase and α-glucosidase inhibitory activities of each extract was expressed as percent inhibition. Antioxidant properties and phytochemicals present were also analyzed. The IC_{50} values for the α-amylase and α-glucosidase inhibition was 0.32 ± 10.50µgmL^{-1} and 0.33 ± 10.08 µgmL^{-1} respectively for the Cinnamon Verum ethanol extracts. Phytochemicals were present as follows: Phenol 207.95, Tannin 20.68 and Alkaloid 34.05. Oxidants were present as follows, Total Antioxidant Capacity (TAC) 0.43, Feric Reducing Antioxidant Power assay (FRAP) 176.13 and 2,2, Diphenylpicrylhydrazyl (DPPH) 0.31. From the results realized, it was concluded that extracts of cinnamon using ethanol has higher alpha glucosidase inhibitory activities than the acarbose which is the standard. While alpha amylase and acarbose have the same range of inhibitory activity.
Keywords: Cinnamon, Acarbose, α-amylase, α-glucosidase, Anti-oxidant, Phytochemical**s.**

Introduction

People had been using herbs for therapeutic purposes in different parts of the world, and this behavior date back to immemorial times. Recently there is a very big attention to medicinal herbs, because of its readily availability, their low cost of production and less toxic action compared to those of synthetic compounds (Asima and Pakrashi, 1995).

The plant *Cinnamon verum* known as ***Egbo Igi Oloorun*** in Yoruba Language. Apart from its medicinal properties which allows the plants to be used as antioxidant, anti-inflammatory, it is also an edible plant especially the fruits, *Cinnamon* berry. The plant is used in herbal treatment of Neuro Degenerative Diseases, Cancer and Fungal Infections (Goel *et al.*, 2016).

Diabetes mellitus are commonly referred to as "diabetes" -- a chronic disease associated with abnormally high levels of the sugar glucose in the blood. Diabetes mellitus is a term for several conditions involving how the body turns food into energy. When eating carbohydrate, the body turns it into a sugar called glucose and sends it to bloodstream. The pancreas releases insulin, a hormone that helps move glucose from the blood into the cells, which use it for energy.

Diabetes symptoms are caused by rising blood sugar. The general symptoms of diabetes include increased hunger, increased thirst, weight loss, frequent urination, blurry vision, extreme fatigue, sores that do not heal (Henry 2007). The study of *cinnamon* and its effect on diabetes mellitus carried out by Khan *et al. (*2003) showed the effect of *Cinnamon* cassia powder with type 2 diabetes. The result of the study showed significant decrease in blood glucose of people with type 2 diabetes. *Cinnamon* has been shown to be generally safe when ingested, recently it has been the subject of intense research and have been granted GRAS (**Generally Recognized As Safe**) status by the United States Food and Drug Administration (USFDA), as a food additive.

Extensive investigation in recent years suggests that *cinnamon* possess numerous pharmacological activities including antioxidant (Beers and Porter, 2006; Gunot 2003; Khan *et al.,* 2003) antimicrobial (Pawar and Thaker, 2006).
Cinnamon, is an aromatic spice isolated from the inner bark of *cinnamon* trees which is a green tree all the seasons of the year, its height about 12 miters and it has horizontal branches, simple and ovate leaves, yellow or white flowers and its fruit is globe or ovate shaped coumarin. *Cinnamon* bark contains: between 0.5-4% essential oil containing 80% cinnamaldehyde, up to 10% eugenol and 5-10% transcinnamic acid; 4-10% phenolic compounds and condensed tannins; catechins; (Jayawardena and Smith, 2010).

Materials and Methods
Alpha (α)-Glucosidase, porcine pancreas alpha (α)-amylase, p-nitrophenyl-α-D-glucopyranose (p-NPG), 3,5-dinitrosalicylic acid (DNS),1,1-Diphenyl-2-picrylhydrazyl (DPPH), 2,2'-azino-bis(3-ethyl benzothiazoline-6-sulfonic acid) (ABTS), butylatedhydroxytoluene (BHT), gallic acid, rutin, quercetin, ascorbic acid and acarbose were purchased from a reputable chemicals supplier in Nigeria. Soluble starch, sodium potassium tartarate, sodium dihydrogen phosphate (NaH_2PO_4), Di-sodium hydrogen phosphate (NaH_2PO_4) sodium chloride, sodium hydroxide, butylatedhydroxytoluene (BHT), potassium persulfate, sodium carbonate, Folin-Ciocalteu (FC) reagent, potassium ferricyanide, potassium per sulphate, aluminum chloride, ferric chloride ($FeCl_3$) were also purchased from a reputable chemicals supplier in Nigeria. All the chemicals used including the solvents were of analytical grade.

Extraction of *Cinnamon verum bark with ethanol*
The air-dried and coarse powdered plant sample *Cinnamon* (10 g) was extracted with 100 ml ethanol by maceration on an orbital shaker with agitation for five days at room temperature. The extract was filtered and the residue was again extracted with the same solvent for another five days and filtered. The filtered extracts were combined and concentrated using a rotary evaporator.
The extracts were analyzed for their α-glucosidase and α-amylase inhibition assays. The total phenolic, tannin and alkaloid content, reducing power and their free radical scavenging capacity of the ethanol extracts from the plant were also investigated, Olien. (2010).
***In Vitro* Alpha Amylase Inhibitory Activity**
The α-amylase enzyme solution was prepared by mixing 27.5 mg of porcine pancreatic amylase (PPA) in 100 ml 20 mmol of phosphate buffer (pH 6.9) containing 6.7 mol of sodium chloride. To 100 µl of (2,4,8,10,15µg/ml) plant extracts, 200 µl PPA solution was added and the mixture was incubated at 37 °c for 20 min. To the reaction mixture 100 µl (1%) starch solution (A starch solution (1% w/v) was prepared by stirring 1g starch in 100 ml of 20 mol of phosphate buffer (pH 6.9) containing 6.7 mol of sodium chloride) was added and incubated at 37 °C for 10 min. The reaction was stopped by adding 200 µl DNSA (1g of 3,5 di-nitro salicylic acid, 30g of sodium potassium tartarate and 20 ml of 2N sodium hydroxide was added and made up to a final volume of 100 ml with distilled water) and kept it in a boiling water bath for 5 min. The reaction mixture diluted with 2.2 ml of water and absorbance was read at 540 nm. For each concentration, blank tubes were prepared by replacing the enzyme solution with 200 µL in distilled water. Control, representing 100% enzyme activity was prepared in a similar manner, without extract. The experiments were repeated thrice using the same protocol.

***In Vitro* Alpha Glucosidase Inhibitory Activity**

The inhibition of alpha-glucosidase activity was determined using the modified published method. One mg of alpha-glucosidase was dissolved in 100 ml 20 mol of phosphate buffer (pH 6.8). To 100 µl of (2, 4, 8, 10, 15µg/ml) plant extracts, 200 µl alpha-glucosidase were added and the mixture was incubated at 37 °C for 20 min. To the reaction, mixture 100 µl 3 mmol p-nitrophenyl alpha-D-glucopyranoside (p-NPG) was added and incubated at 37 °C for 10 min. The reaction was terminated by the addition of 2 ml Na_2CO_3 (0.1M) and the alpha-glucosidase inhibitory activity was determined spectrophotometrically at 405 nm on spectrophotometer UV-VIS (Shimadzu UV-1800) by measuring the quantity of p-nitrophenol released from p-NPG.

Acarbose was used as positive control of alpha-amylase and alpha-glucosidase inhibitor. The concentration of the extract required to inhibit 50% of alpha-amylase and alpha-glucosidase activity under the assay conditions was defined as the IC_{50} value.

Calculation of Alpha-Amylase and Alpha-Glucosidase Inhibitory Concentration (Ic_{50})

The concentration of the plant extracts required to scavenge 50% of the radicals (IC_{50}) was calculated by using the percentage scavenging activities at five different concentrations of the extract.

Percentage inhibition (I %) was calculated by I % = (Ac-As)/Ac X 100,

Where:

Ac is the Absorbance of the control and

As is the Absorbance of the sample.

Values are presented as mean±standard error mean of three replicates.

Determination of DPPH free radical scavenging activity

The free radical scavenging activity of the plant extract and butylated hydroxyl toluene (BHT) as a positive control was determined using the stable radical DPPH (1,1-diphenyl-2-picrylhydrazyl). Aliquots (20, 40 and 80 ml) of the tested extracts were placed in test tubes and 3.9 ml of freshly prepared DPPH solution (25 mg L-1) in ethanol was added in each test tube and mixed. 30 min later, the absorbance was measured at 517 nm (UV-visible spectrophotometer Shimadzu UV 1800). The capability to scavenge the DPPH radical was calculated, using the following equation: DPPH scavenged (%) = {(Ac–At)/Ac} x 100 Where Ac is the absorbance of the control reaction and At is the absorbance in the presence of the sample of the extracts. The antioxidant activity of the extract was expressed as IC_{50}. The IC_{50}value was defined as the concentration in mg of dry material per ml (mg/ml) that inhibits the formation of DPPH radicals by 50%. Each value was determined from the regression equation.

Total Antioxidant Capacity (TAC)

The **total antioxidant capacity** of the extracts was assessed spectrophotometrically by the phosphor molybdenum method. One milliliter of each sample extract (0.5 mg mL^{-1}) was mixed with 3 mL reagent solution (0.6 M H_2SO_4, 28mM Sodium phosphate and 4Mm Ammonium molybdate). The blank solution contained 4mL reagent solution only. The mixtures were incubated at 95°C for 150min. After the mixture had cooled to room temperature, absorbance was measured at 695nm. Total antioxidant capacity (TAC) was expressed as tannic acid equivalent (TAE).

Estimation of total phenolic content

The amount of total phenolic content of crude extracts was determined according to Folin-Ciocalteu procedure. The tested extracts (100 ml) were introduced into test tubes. 1.0 ml of

Folin-Ciocalteu reagent and 0.8 ml of sodium carbonate (7.5%) were added. The tubes were mixed and allowed to stand for 30min. Absorption at 765 nm was measured (UV-visible spectrophotometer Shimadzu UV 1800).

Estimation of Total Tannins:
The amount of total tannins was determined. 500 mg of the sample was weighed into a 50 ml plastic bottle. 50 ml of distilled water was added and shaken for 1hr in a mechanical shaker. This was filtered into a 50 ml volumetric flask and made up to the mark. Then 5 ml of the filtered was pipetted out into a test tube and mixed with 2ml of 0.1M $FeCl_3$ in 0.1M HCl and 0.008M potassium ferrocyanide. The absorbance was measured at 120nm within 10 min.

Estimation of Total Alkaloid
Total alkaloid was determined by weighing 5 g of the sample into a 250 ml beaker and 200 ml of 10% acetic acid in ethanol was added, covered and allowed to stand for 4hr. This was filtered and the extract was concentrated on a water bath to one-quarter of the original volume. Concentrated ammonium hydroxide was added drop wise to the extract until the precipitation was complete. The whole solution was allowed to settle and the precipitated was collected and washed with dilute ammonium hydroxide and then filtered. The residue is the alkaloid, which was dried and weighed.
The percentage yield of the ethanol extract of cinnamon bark gave the values:
Percentage yield= ((weight of sample) /Starting material) x100

Alpha amylase inhibitory assay
The concentration of the plant extracts required to scavenge 50% of the radicals (IC_{50}) was calculated by using the percentage scavenging activities at six different concentrations of the extract.

Results

Alpha amylase	**IC_{50} ±**	**SEM**
EXTRACT OF CINNAMON	1.27	± 0.22
ACARBOSE	1.05	± 0.70

The results proved the IC_{50} ethanol extract of cinnamon and acarbose are very close to each other, therefore the cinnamon can be used in place of the synthetic drug which is the acarbose

Alpha glucosidase

SAMPLE	**IC_{50}**	**±SEM**
EXTRACT OF CINNAMON	0.10	± 0.03
ACARBOSE	1.23	± 0.45

Results for Anti-oxidansts

Name	**Mean**	**SD**	**SEM**
DPPH	0.32	0.03	0.02
TAC	0.43	0.91	0.53
FRAP	176.13	18.46	10.65

Results for Phytochemical

PHYTOCHEMICALS	**AVERAGE**	**SD**	**SEM**
Phenol	207.9557	18.46257	10.65508
Tanin	20.68273	0.025355	0.014639
Alkaloid	34.05766	0.395249	0.228192

Table 1: Activities of ethanol extract of *cinnamon* on alpha amylase inhibitory assay

Sample	Concentration (ug/ml)	% Inhibition+SEM	IC_{50} (ug/ml)+SEM
Ethanol extract of *cinnamon*	1	42.48±0.03	0.32±0.07
	0.5	22.54±0.04	
	0.25	11.43±0.02	
	0.125	6.20±0.05	
	0.0625	3.59±0.08	
Acarbose	1	1.05±0.70	0.32±0.01

Table 2: Activities of ethanol extract of cinnamon on alpha glucosidase inhibitory assay

Sample	Concentration (ug/ml	% Inhibition + SEM	IC_{50}(ug/ml)+ SEM
Ethanol extract of *cinnamon*	1	85.63±1.15	0.33±0.03
	0.5	77.23±0.75	
	0.25	73.44±0.43	
	0.125	62.60±0.05	
	0.0625	51.21±0.75	
Acarbose	1	1.23±0.45	0.46±0.09

Table 3: Antioxidant activities of the ethanol extract of *cinnamon*

TEST	Mean + SEM
Total Antioxidant Capacity (TAC) (GAE mg/g dry extract)	0.52± 0.09
Feric Reducing Antioxidant Power assay (FRAP) (Rutin equivalent mg/g dry extract)	0.47±0.002
Free radical scavenging ability (DPPH) (IC_{50} mg/g dry extract)	0.32±0.09

Table 4: Phytochemicals activities of the ethanol extract of *cinnamon*

TEST	Mean + SEM
Alkaloid	34.27
Phenol	218.60
Tannin	20.69

Conclusion

- Ethanol was identified as major compounds in Solvent extracts. These compounds are believed to be responsible for strong enzymatic inhibitory activity of the extracts.
- The IC_{50} values for the α-amylase and α-glucosidase inhibition was 0.32 ± 10.50µgmL^{-1} and 0.33 ± 10.08 µgmL^{-1} respectively for the *Cinnamon verum* ethanol extracts.
- This study attempts to introduce a novel environmentally friendly extraction methodology using ethanol to improve the quality of *cinnamon* extract to investigate the effect of *Cinnamon* verum in controlling type 2 diabetics
- This study was mainly focused on investigating the in-vitro hypoglycemic effects of Cinnamon. This was in view of developing a safe, readily soluble Cinnamon extract for human consumption that could effectively control hyperglycemia in diabetic individuals.
- From the results realized, my findings was concluded that extracts of *cinnamon* using ethanol has higher alpha glucosidase inhibitory activities than the acarbose which is the standard.

- Ethanol extract of *cinnamom* 0.10 ± 0.03
- Acarbose 1.23 ± 0.45

While alpha amylase and acarbose have the same range of inhibitory activity.

- Ethanol extract of *cinnamom* 1.27 ± 0.22
- Acarbose 1.05 ± 0.70

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POTENTIAL USE OF OIL EXTRACTED FROM SNAKE TOMATO SEED *Tricosanthe cucumerina* AS MOSQUITO REPELLENT CREAM

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Abstract
Diseases such as dengue, malaria and yellow fever transmitted by mosquitoes bites contribute to high rates of morbidity and mortality, especially in tropical countries like Nigeria. In order to control the transmission of these diseases, the use of repellent is adopted to avoid mosquitoes' bites. Repellents such as (N, N-diethyl-3-m-toluamide) have been useful but they have shown toxicity effects. In recent time, studies have been focused on using essential oils extracted from natural products as repellents because they are eco-friendly, although, formulations are still a challenge. This study investigated the potential use of oil extracted from snake tomato seed (T.cucumerina) as mosquito repellent cream formulated in a vanishing type cream. Snake tomato seed oil was extracted by soxhlet extraction. The extracted oil was characterized using Fourier Transform Infra-Red spectroscopy and then prepared in different concentrations of 2.5, 5.0, 7.5 and 10.0 % w/w in a vanishing cream base to give formulations F1, F2, F3 and F4. An oil yield of 61.1 % (w/w) was characterized for iodine value (34.92 gI_2100^{-1}*), saponification value (*$201.72\ mgKOHg^{-1}$*), acid value (0.61* $mgKOHg^{-1}$*) and peroxide value of (4.25* $meqkg^{-1}$*). The formulations revealed high alkalinity, with gradual increase in the pH values as concentration of the snake tomato seed oil increased in the produced cream. High extrudability rate was deduced with increase in the concentration of snake tomato seed oil in the formulations. The high corresponding rate of repellency followed the trend F1>F2>F3>F4. The repellency was tested by spreading the cream on a smooth surface of a wood in a mosquito infested room with physical observations. This study revealed the potential of snake tomato (T. cucumerina) seed oil cream as eco-friendly mosquito repellent particularly at higher concentrations of 7.5 and 10.0 %w/w.*
Keyword: Repellency, Formulation, Alkalinity, Extrudability, Morbidity

Introduction

Many mosquito-borne diseases, such as malaria, dengue fever (DF), dengue haemorrhagic fever (DHF) and filariasis, are serious public health problems in tropical regions, especially in Africa and Asia (Rodríguez-Barraquer *et al.*, 2015). These diseases are transmitted to human beings through mosquito bite only since there is no effective vaccine available for the control of these diseases. Prevention of mosquito bites is one of the main strategies to control or minimize incidence of these diseases. The use of insect propellants can provide practical and economical means of preventing mosquito-borne diseases (Eldridge *et al.*, 2008). It is important not only for local people in disease risk areas especially in tropical countries, but also for travelers who are vulnerable to diseases spread by mosquito vectors when they visit and seek leisure away from their home countries.

Justification of the study

Seed oils have been characterized but the vast majority have not been explored for the preparation of mosquito repellent creams. It is obvious that there is no known research yet into using *Trichosanthe cucumerina* seed oil in preparation of mosquito repellent cream. In this study, *Trichosanthe* cucumerina seed oil was extracted and formulated in Vanishing cream base for repellent action against mosquito.

Materials and methods

Plant species: Ripe fruits of tomato snake gourd were collected from Ile-Oluji, a town in western part of Nigeria. The seed were removed from the gourd then sun dried until moisture content was reduced to barest minimum. The seed kernels were later separated from the seed coat and stored in air tight container.

Preparation of seed: Procedure previously described by Othman *et al. (*2016), was followed with slight modification. The dried *Trichosanthe cucumerina* seeds were milled using electric blender. Exact 1.02g the seed were weighed and milled. After milling, 1 g of the powdered seed was stored in an airtight container for seven days at temperature of 25°C before extracting the oil.

Extraction of oil: Ground seed of *Trichosanthe cucumerina* of 100g was weighed and transferred to thimble. 250 mL of n-hexane was put into the set up and left for five hours for complete extraction of the oil (Adebooye, 2006). This procedure was repeated for the complete extractions of the remaining grams.

Preparation of Oil cream containing *Trichosanthe cucumerina* seed Oil as the active ingredient: The preparation is in different concentrations of 2.5, 5.0, 7.5 and 10.0 % w/w in a vanishing cream base to give formulations F1, F2, F3 and F4. Equal percentage of cetyl alcohol (2 %), lanolin (1 %), mineral oil (2 %), stearic acid (15 %), glycerine (10 %) and potassium hydroxide (1%) were added. Gradually, the aqueous mixture containing lanolin (1 %), mineral oil (2 %), stearic acid (15 %), and glycerine was added followed by *Trichosanthe cucumerina* seed oil until a smooth uniform cream was obtained. This mixture was then allowed to cool, stored in an appropriate container, and labelled. The same procedure was followed to prepare 4 other different concentrations: 2.5 % v/w, 5 % v/w, 7.5 % v/w, and 10 % v/w. (The British Pharmacopoeia and British Pharmacopoeia commission, 2018).

Determination of pH of *Trichosanthe cucumerina* Seed Oil Cream: After the formulation of the cream at the various concentration levels, the pH was determined. *Trichosanthe cucumerina* seed formulated cream of 20 mL was measured. The electrode of the pH meter was removed from the storage solution and rinsed thoroughly with distilled water. Furthermore, the probe was gently wiped with tissue paper and dipped into the cream. The pH value was recorded. The electrode was replaced after rinsing with distilled water. Triplicate measurements were made.

Testing for viscosity of *Trichosanthe cucumerina* seed oil cream: The viscosity of the cream was determined using the Rapid Viscosity Analyzer (RVA). A mass of 10 g of the cream was weighed into the canister. The paddle was inserted and stirred up and down for the cream to homogenize. The paddle was then inserted into the RVA, and the instrument was run for 12 minutes at 10 rpm at 25°C. The results were read by the analyzer in centipoise. This was triplicated for all the other concentrations, and the average was found(Olive *et al.*, 2021)

Extrudability study on the cream: Extrudability is the power required to push or force something out of something. A compression-extrusion test consists of applying force was carried out on *Trichosanthe cucumerina* seed oil cream until it flows through an outlet in holes that are in the test cell. The product of *Trichosanthe cucumerina* oil cream is compressed until the structure of the product is disrupted and it extrudes through the outlets.

Washability study: washability and abrasion testers were used to determine the washability strength. *T. cucumerina* seed oil cream was applied on a abbration tester to determine how washable it is. It was also applied on a smooth wooden surface, then washed with soap.

Oil content: A specific quantity of the oil (5 g) was weighed and transferred into a dried Petri dish, which was pre-weighed. The dish was placed in the hot air oven, which was thermostatically controlled at 105°C for 5 hours. The sample was removed and placed in a desiccator to cool at 30℃room temperature, and the weight was recorded later. It was then dried again for 30 minutes, cooled, and weighed again. The experiment was replicated until a constant weight was reached.

Repellency studies: The repellency test was carried out by spreading the cream on a smooth surface of a wood in a mosquito infested room with physical observations.Repellency (R) was calculated using a formula similar to that was used by Schreck (1977)

$$R = C - \frac{T}{(C \times 100)}$$

Where C is the number of mosquito in invested room and T is the number of mosquito on smooth wood surface.

Results and discussion

Trichosanthes cucumerina seed oil has mean values of Iodine Value of 84.90 g I2 / 100 g of oil, pH of 5.74, Acid Value 3.79 mg KOH / g; Peroxide value 4.2 meq/kg, and Saponification Value 201.7 mg KOH /g.The saponification means value of 184.93 mg KOH/g of oil recorded suggests the possible use of *Trichosanthes cucumerina* seed oil for cosmetic and soap making purposes (Agatemor, 2006). The iodine value indicates the oil has a few unsaturated bonds and is non-drying oil, this further revealed by its low peroxide value, which confirmed there are anti-oxidants present in the oil (Gordon, 1995).

Table 2: Characterization of *Trichosanthe cucumerina* seed oil

Property	Values
Odour	Pungent
Colour	Brown
Saponification value (mgKOH/g)	184.93
Acid value (mgKOH/g)	3.79
Peroxide value (meq/kg)	4.25
pH value	5.74
Iodine value (gI/100g)	84.9
Oil content	61

The FTIR of *T.cucumerina* shows weak sharp peak at 3013.6cm^{-1} due to C-H aromatic range (range 3050-3150cm^{-1}). Intense sharp peak at 2924.1cm^{-1} due to C-H aliphatic, also intense sharp peak at 2853.3cm^{-1} possible due to C-H aldehyde which shows is nondrying oil. (Siano *et al*, 2018) The spectrum also shows sharp peak at 1707.1cm^{-1} due to C=O carbonyl range value might have decreased due to conjugation. Medium sharp peak at 1459.3 due to C=C aromatic. A medium sharp peak 3100cm^{-1} which is due CH_3. There is an out of plane peak at 937.4cm^{-1} corroborates C-H aromatic. (Aidoo *et al*, 2021)

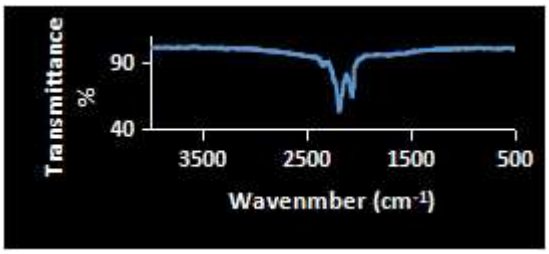


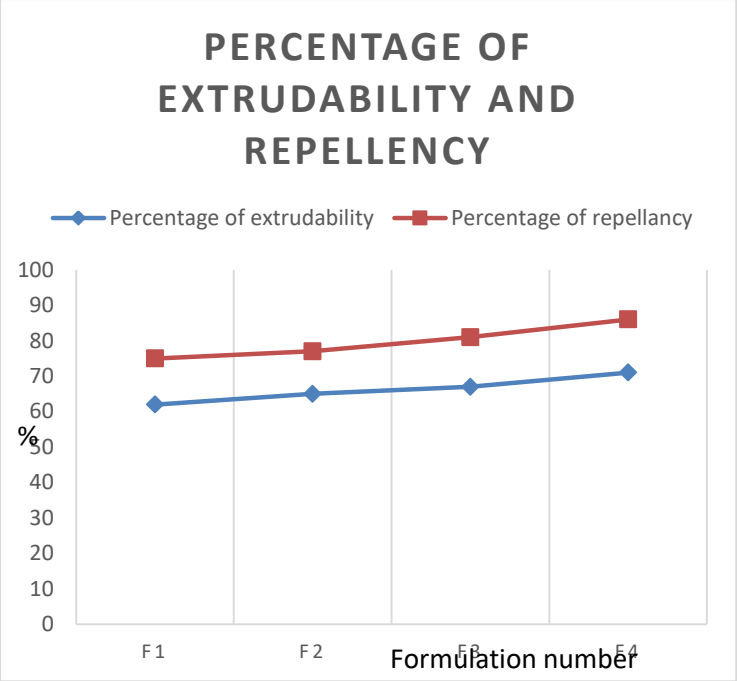
Figure1: FTIR of *T.cucumerina* seed oil.

Table 1: FTIR spectrum of *Trichosanthe cucumerina* seed oil

Absorption band (cm^{-1})	Functional group	Functional group name
3013.6	$C = H$ *stretching*	Aromatic
2924.1	$C = H$ *stretching*	Aliphatic
2853.3	$C = H$ *stretching*	Aldehyde
1707.1	$C = O$	Carbonyl
937.4	$C = H$ *stretching*	Aromatic
987	$C - 0$ *stretch*	Alcohol

The pH of the formulation was carried out in order to be sure that the formulation can be used without the risk of irritancy to the skin. The pH was carried out at all concentrations levels, that is, at 2.5%, 5.0%, 7.5%, 10.0%. It was observed that there was infinitesimal increase as % V/W. The pH was found to be between 6.11 and 6.21 for the formulations, which was also close to the neutral pH values of the skin at range of (5.9-6.1). Hence, the formulation can be used without any skin irritation. This also showed that the selected constituents of this formulation did not alter the pH of the *Trichosanthe cucumerina* seed oil cream. It also implies that the oil cream formulation of the*Trichosanthe cucumerina* seed oil is user-and eco-friendly and could be applied by all. (Saba *et al.,* 2013). In all cases there is increase in extrudability of the formulated cream as the concentration of the oil increases.

There was no significant difference in viscosity of the prepared cream. The viscosities of the formulations of *Trichosanthe cucumerina* seed oil (2.5%–10% v/w), means that the rate of concentration is directly proportional to the viscosity of the formulated cream The result showed slight difference to that of neem seed oil cream based (Abiy *et al.,* 2015) The higher the concentration, the greater the viscosity. An increase in viscosity across the concentration range is a result of an increase in the concentration of *Trichosanthe cucumerina* seed oil.



There was low repellency at F1 (2.5%) and F2 (5.0%). There was however a significant increase in the repellency of F3 at concentration of 7.5% of *Trichosanthe cucumerina* seed oil in formulated cream. The highest repellency rate was obvious at F4 (10%), which correspond to that of neem seed oil. (Olive *et al.*, 2021). It implies that *Trichosanthe cucumerina* seed oil cream showed repelling strength at 7.5% v/w and 10% v/w. Table 2 below shows repellency values of prepared oil cream containing *T. cucumerina* seed oil as the active ingredient.

Table 2: **Repellancy of formulation**

Formulation no	**Repellency %**
F1	75
F2	77
F3	81
F4	86

Conclusion

Formulations were tested for their washability strenght after been spread on a smooth surface of a wood, then ease extend of washing with water and little soft soap. Formulations where tested in mosquito invested room at different concentration of *T. cucumerina* seed oil in the formulated cream. There are four formulated creams with different percentage of *T. cucumerina* seed oil. F1 – Formulation of mosquito repellent oil cream containing *T. cucumerina* seed oil as the active ingredient at 2.5% v/w, F2 Formulation of mosquito repellent oil cream containing *T. cucumerina* seed oil as the active ingredient at 5.0 % v/w, F3 - Formulation of mosquito repellent oil cream containing *T. cucumerina* seed oil as the active ingredient at 7.5 % v/w, F4 - Formulation of mosquito repellent oil cream containing *T. cucumerina* seed oil as the active ingredient at 10.0 % v/w. This research work has revealed the potential of snake tomato seed (*T. cucumerina*) oil as a valuable insect repellent particularly at higher concentrations of 7.5 % and 10.0 %.

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ISOLATION, CHARACTERIZATION AND ANTIBIOGRAM OF MICROORGANISMS ISOLATED FROM BOILED AND FRIED COW CHEESE PURCHASED FROM IGBOORA

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Abstract

Cheese is a fresh, solid, product which is obtained by addition of enzyme called rennet in the presence of lactic acid produced by the adventitious microorganisms that causes coagulation and whey separation of milk, cream or partly skimmed milk, buttermilk. The purpose of this research is to isolate, characterize and determine the antibiogram of microorganisms isolated from selected cheese samples obtained from Igboora. Four (4) samples each of Boiled and Fried cheese were purchased from cheeses sellers in Igboora and analyzed microbiologically using dilution 3, 5and 7 for Nutrient Agar and Potatoes Dextrose Agar respectifully. The isolates were characterized conventionally using biochemical test. Highest colony count was recorded in fried sample 2 for all the dilution for bacteria (5.0 x10^{3,}3.0 x 10^{5}, and 2.9x 10^{7}) and fungi (2.5 x10^{3}, 2.5 x 10^{5,} 2.0 x 10^{7}). Six bacteria were characterized biochemically, they include, Corynebactrium xerosis (14.3%), Klebsiella spp (14.3%), Staphylococcus aureus (42.9%), Clostridium spp (7.1%), Bacillus megatarium (14.3%) and Enterobacter spp (7.1%) while three fungi were characterized, these are, Fusarium spp (28.6%), Aspergillus flavus (42.9%) and Yeast (28.6%). These organisms have ability to cause foodborne illness with distinct symptoms such as emetic, food poisoning and diarrhea syndrome. The antibiogram results shows highest inhibitory zone in Ofloxacin with 51.0 mm for Staphylococcus aureus isolate from boiled cow cheese and lowest inhibitory zone in Erythromycin with 10.0mm in Klebsiella spp isolated from fried cheese sample 2 for bacteria while highest inhibitory zone in fungi was recorded from Fluconazole (27.0mm) for Yeast , lowest inhibitory was recorded in Fushcin (10.0mm) for Fusarium spp respectively . This study reveals that the hygiene of selected cheese seller in Igboora is unsatisfactory due to the presence of human pathogens isolated from their samples which could cause a serious health problem to the consumer. Therefore, cheese seller should be educated on how to improve their personal hygiene, use of clean water and equipments used during and after cheese processing.

Keywords: Cheese, Igboora, Antibiogram, characterization, inhibitory

Introduction

Soft cheese normally called ‘wara’ in Yoruba is a very nutritious food obtained from cow milk. Milk is an aqueous colloidal suspension of proteins, fats, and carbohydrates that contains numerous vitamins and minerals. Cheese is one of the numerous products obtained from the processing of milk (Broadbent *et al.*, 2004, Orhevba and Taiwo, 2016). The production of cheese in African countries has increased and about one third of the total volume of milk is used for this purpose (FAO, 2001). This soft cheese produced in some parts of southern Nigeria and predominantly in the northern parts makes use of local ingredients. Cheese making began about 8000 years ago and now Cheese is made in almost every country in the world with the existence of more than 2,000 varieties (O’ Connor, 1993 Orhevba and

Taiwo, 2016). There is uniqueness in each cheese production with respect to its flavour and form. Manufacture of most cheese varieties involves combining 4 ingredients; milk, rennet, microorganisms and salt. Variations in ingredient blends and subsequent processing have led to the evolution of all these cheese varieties. The manufacturing process of soft cheese in Nigeria is undeveloped and at its infancy left with the natives to manufacture locally, hence there is difficulty in extending shelf life and conserving the nutritious components of milk. Microorganisms found in cheese can be classified based on their biochemical types, temperature, response and ability to cause infection and disease (Cogen, 2000). Organisms associated with milk and milk products include streptococci, lactobacilli, coliform bacteria and some fungi. All of these are from various sources and act on different substrates in cheese thereby producing various end products (Ogbolu *et al.,* 2014). Soft cheese has also been found to have outstanding antimicrobial properties. It contains a variety of factors and compounds which have been reported to have health promoting effects and prevent disease (Ha and Zemel, 2003). Several Cheese is popular in many countries (CDIC, 2014) because of the associated health benefits and flavour. The health benefits of cheese include natural probiotic and antitumour properties (Goldin and Gorbach, 1992). Additionally, cheese is a rich source of dietary calcium (IOM, 2011), phosphorus, and proteins (USDA, 2011), and has been shown to reduce the incidence of type II diabetes (Mozaffarian *et al.,* 2010). Although cheese is generally considered a safe food because of the physicochemical and antagonistic properties of lactic acid bacteria, 0.4% of all food borne outbreaks were related to contaminated cheese in 2006 in the European Union (Kousta *et al.,* 2010).

The various cheese types can be classified according to the milk used (cow, sheep, goat, buffalo), their manufacture (rennet, sour milk cheese, ultra filtration), consistency (extra-hard, hard, semi-hard, semi-soft, soft, fresh cheese), fat content (double cream, cream, full fat, three quarters fat, half fat, quarter fat cheese), fermentation type (lactic acid, lactic and propionic acid, butyric acid), surface (hard, soft, with smear, moulds) and interior (eyes, moulds). Additionally, they differ in flavor as well as some bioactive components, which are mainly created during the different stages of ripening when the main ingredients lactose, protein and fat are broken down by fermentation, proteolysis and lipolysis (Molimard and Spinnler, 1996). Thus, the varieties of cheese on the market are enormous, which is also reflected in the variability in the composition of the different types of cheese. In most of the countries with a high consumption of milk products the major part is produced from cow's milk. So we have concentrated on the composition of cow's milk which mainly consist of fat, protein and water as well as vitamins, minerals and trace elements. In view of this there is need to determine the drug sensitivity and resistance patterns of isolated organisms using commercial antibiotic discs

Materials and method

Sample Collection

Four (4) samples each of Boiled and Fried cheese was purchased from cheeses sellers in Igboora, Ibarapa Central Local Government of Oyo State. The samples were placed inside sterile ziplock nylon and transported to the Research laboratory Oyo State College of Agriculture and Technology, Igboora with ice pack.

Sample Preparation

Adequate amount of boiled and fried cheese samples was uniformly homogenized using mortar and pestle (Balamurugan *et al.,* 2013). Ten (10) grams each of homogenized cheese samples was taken aseptically with a sterile spoon and transferred carefully into a sterile pestle containing 90 ml of distilled water and tenfold serial dilution was prepared.

Isolation of Associated Microorganisms

Isolation of microorganisms associated with fried and boiled cheese was carried out on Nutrient Agar and Potatoes Dextrose Agar by plating 50µl from dilution 10^{-3}, 10^{-5} and 10^{-7} fromeach of the cheese sample on freshly prepared medium. Nutrient Agar plates was kept in an incubator at 37 ^{0}C for 24 hrs while PDA plates for Fungi were incubate at room temperature for 3days.

Determination of Total Viable Count (TVC)

After incubation, plates exhibiting visible colony growth were counted and the average number of colonies in each dilution was multiplied by the dilution factor to obtain the total viable count (ISO, 1995). Each of the bacteria isolates was then subculture to get a pure culture and kept in slant bottle for further analysis.

Morphological and Biochemical Characterization of Isolated Microorganisms

The cultural examination of boiled and fried cheese samples was done according to the standard method of International Commission on Microbiological Specifications for Foods (ICMSF, 1985). Morphological Identification of Microorganisms isolated was performed on the basis of colony morphology and Gram's staining reaction. Biochemical tests, such as sugar fermentation, coagulase, catalase, MR, VP, and indole tests etc. were also performed using standard methods (Cheesbrough, 1985).

Antibiogram Study

Drug sensitivity and resistance patterns of isolated organisms were performed using commercially purchased antibiotic discs. The antibiotic resistance was determined by Kirby-Bauer disc diffusion technique using Mueller-Hinton agar (Difco), according to the guidelines of clinical and Laboratory Standards Institute (CLSI, 2007). Borehole method was used for fungi using homogenized antibiotics. After overnight incubation at 37°C and 27 °C, the diameter in millimeters of the zones of inhibition around each of the antimicrobial discs was recorded and categorized as resistant, intermediate and sensitive in accordance with recommendations (Cappuccino and Carpenter, 2005).

Table 1: Total Viable Count of Microorganisms Isolated from Boiled and Fried Cheese Purchased from Igboora

Sample	**Nutrient Agar (cfu/g)**			**Potatoes Dextrose Agar (cfu/g)**		
	10^{-3}	10^{-5}	10^{-7}	10^{-3}	10^{-5}	10^{-7}
BCC_2^{-7}(1)	3.2 x10^3	2.8 x10^5	2.0x10^7	2.0 x 10^3	1.8 x10^5	1.0 x 10^7
BCC_2^{-5}(2)	3.0 x 10^3	2. 2 x10^5	1.9 x 10^7	1.5 x 10^3	1.2 x 10^5	1.1 x 10^7
FCC_2^{-7}(2)	**5. 0 x 10^3**	**3.0 x 10^5**	**2.9x 10^7**	**2.5 x10^3**	**2.5 x 10^5**	**2.0 x 10^7**
BCC_4^{-7}(1)	2.8 x 10^3	2. 5 x10^5	2.2 x 10^7	2.1 x 10^3	2.0 x 10^5	1.5 x 10^7
BCC_3^{-5}(1)	2. 0 x 10 ^{3}	2.3 x 10^5	2.0 x 10^7	1.9 x 10^3	1.5 x 10^5	1.0 x 10^7
FCC_3^{-5}(2)	3.0 x 10^3	2.9 x 10^5	2. 0 x 10^7	2.0 x 10^3	1.7 x 10^5	1.5 x 10^7
FCC_1^{-7}(2)	3.1 x 10^3	2.5 x 10^5	1.9 x 10^7	1.8 x 10^3	1.5 x 10^5	1.0 x 10^7

FCC_3^{-7}	3.0×10^3	2.4×10^5	2.2×10^7	1.9×10^3	1.6×10^5	1.2×10^7
$FCC_3^{-5}(1)$	2.9×10^3	2.5×10^5	1.8×10^7	1.5×10^3	1.3×10^5	1.1×10^7
$FCC_1^{-7}(3)$	2.4×10^3	2.2×10^5	2.1×10^7	1.7×10^3	1.4×10^5	1.1×10^7
$BCC_4^{-5}(1)$	4.0×10^3	3.0×10^5	2.5×10^7	$2.1x\ 10^3$	1.9×10^5	1.9×10^7
$FCC_3^{-7}(1)$	2.3×10^3	$2.0x\ 10^5$	1.5×10^7	1.6×10^3	1.4×10^5	1.0×10^7
$BCC_2^{-7}(1)$	2.8×10^3	2.6×10^5	2.2×10^7	1.8×10^3	1.5×10^5	1.2×10^7
$FCC_2^{-5}(2)$	2.7×10^3	2.3×10^5	2.0×10^7	2.1×10^3	1.8×10^5	1.4×10^7

Key: **BCC (Boiled Cow Cheese)**
FCC (Fried Cow Cheese)

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Table 2: Biochemical Test for Selected Boiled and Fried Cheese Samples Purchased from Igboora.

S/N	Isolate	Gram Reaction	Shape	Sporeforming	Strict Anaerobe	Catalase test	Stacrh Hydrolysis	Glucose fermentation	Manitol fermentation	Citrate	Swollen cell	Galactose fermentation	Yellow pigment	Oixdase	Lactose fermentation	Melole	Matest	VP test	Maltose fermentation	Probable Organism
1	BCC_2^{-7}(1)	+	R	-	-	+	-	-	-	-	-	+	-	-	+g	-	-	-	+g	*Corynebactrium xerosis*
2	BCC_2^{-5}(2)	+	C	-	-	+	-	+	+	-	-	+	-	-	+	-	-	-	+	*Staphylococcus aureus*
3	FCC_2^{-7}(2)	+	R	-	-	+	+	+	-	-	-	-	-	-	+	-	-	-	+g	*Corynebactrium xerosis*
4	BCC_4^{-7}(1)	+	R	+	+	-	-	+	-	-	-	+g	-	-	+g	-	-	-	-	*Clostridium spp*
5	BCC_3^{-5}(1)	+	R	-	-	-	+	+	-	-	-	+g	-	-	+	-	-	-	+	*Bacillus megatarium*
6	FCC_3^{-5}(2)	-	R	+	-	-	+	+	-	-	-	+	-	-	+	-	-	-	+	*Klebsiella* spp
7	FCC_1^{-7}(2)	+	C	-	-	+	-	+	+	-	-	+	-	-	+	-	-	-	+	*Staphylococcus aureus*
8	FCC_3^{-7}	+	R	-	-	+	+	+g	-	-	-	+g	-	-	+	-	-	-	+	*Bacillus megatarium*
9	FCC_3^{-5}(1)	+	C	-	-	+	-	+	+g	-	-	+	-	-	+	-	-	-	+g	*Staphylococcus aureus*
10	FCC_1^{-7}(3)	+	C	-	-	+	-	+g	+	-	-	+	-	-	+g	-	-	-	+	*Staphylococcus aureus*
11	BCC_4^{-5}(1)	+	C	-	-	+	-	-	+g	-	-	-	-	-	+	-	-	-	+g	*Staphylococcus aureus*
12	FCC_3^{-7}(1)	-	R	-	-	-	-	+	-	-	-	+	-	-	+	-	+	+	+	*Enterobacter* spp
13	BCC_2^{-7}(1)	+	C	-	-	+	-	-	+	-	-	+g	-	-	+g	-	-	-	+	*Staphylococcus aureus*
14	FCC_2^{-5}(2)	-	R	-	-	-	-	-	-	-	-	+	-	-	+g	-	-	-	-	*Klebsiella* spp

Key: **BCC (Boiled Cow Cheese)**
FCC (Fried Cow Cheese)

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Table 3: Microscopic and Macroscopic Examination of Selected Boiled and Fried Cow Cheese Purchased in Igboora

S/N	ISOLATES	MACROSCOPY	MICROSCOPE	PROPABLE
1	BCC^{3}	Colony on the plate appear greenish yellow the mycelium grow slowly spreading over the plate	Septate hyphae conidia head split into loose column	*Aspergillus flavus*
2	$BCC1^{-7}$	Colony on the appear greenish yellow the mycelium grow slowly spearing over the plate	Septate hyphae conidia head split into loose column	*Aspergillus flavus*
3	FCC_1^{7}	Colonies grow rapidly on the aerial mycelium whitish	Micro-conidia are slightly curved septate and pointed at the tip	*Fusarium* spp
4	FCC_2^{-7}	Colony on the plate appears greenish yellow the mycelium grow slowly spreading over the plate	Septate hyphae conidia head split into loose column	*Aspergillus flavus*
5	$FCC1_2^{-5}$	Colonies grow rapidly with theaerial mycelium colouryish	Micro-conidia are slightly curved septate and pointed at the tip	*Fusarium* spp
6	$FCC1_1^{-2}$	Colony is creamy and spread across the plate	Spherical and budding	Yeast
7	FCC_2^{-2}	colony is creamy and spread across the plates	Spherical l and budding	Yeast

Key: **BCC (Boiled Cow Cheese)** **FCC (Fried Cow Cheese)**

Table 4: Positive Antibiogram of Bacteria Isolates from Selected Boiled and Fried Cow Cheese Purchased in Igboora

	Zone of inhibition		
Isolates	**Erytromycin (mm)**	**Gentamycin (mm)**	**Ofloxacin (mm)**
Klebsiella spp	10.0	15.5	34.0

Staphylococcus aureus	12.0	27.5	45.5
Bacillus megatarium	32.0	25.5	36.5
Corynebactrium xerosis	31.0	24.0	41.5
Staphylococcus aureus	38.0	24.0	46.0
Bacillus megatarium	36.0	36.5	25.0
*Enterobacter*spp	32.0	26.5	14.9
Staphylococcus aureus	44.5	24.0	40.5
Corynebactrium xerosis	25.1	34.0	41.0
Staphylococcus aureus	25.0	28.5	51.0
Bacillus megatarium	36.0	33.5	41.0
Corynebactrium xerosis	31.0	39.0	36.5

Table 5: Negative Antibiogram Test on Boiled and Fried Cow Cheese Purchased in Igboora

	Zone of inhibition			
Isolates	**Gentamicin (mm)**	**Ciprofloxacin (mm)**	**Ofloxacin (mm)**	**Nitrofloxacin (mm)**
*Enterobacter*spp	20.0	37.5	36.5	25.0
Bacillus megatarium	19.5	23.5	21.0	22.5
*Klebsiella*spp	16.5	30.0	28.5	28.0
Staphylococcus aureus	21.5	28.0	27.5	28.0
Staphylococcus aureus	17.5	28.5	25.0	26.5
Staphylococcus aureus	20.0	22.5	25.0	25.5
Staphylococcus aureus	18.5	27.0	23.0	23.0
Bacillus megatarium	20.0	28.5	23.5	-
Bacillus megatarium	20.5	24.5	21.0	24.0
Klebsiella spp	21.5	25.0	24.0	25.5
Staphylococcus aureus	13.0	25.5	23.5	-

Clostridium spp	20.5	31.0	30.5	36.5
Corynebactriumxerosis	20.0	49.0	24.5	25.0
Staphylococcus aureus	20.5	24.5	21.5	25.0
Staphylococcus aureus	22.0	27.5	24.0	26.0

Table 6: Fungi Antibiogram Test on Cheese Isolates

Isolates	Zone of Inhibition			
	Cotrimoxazole (mm)	Nystatin (mm)	Fuschin (mm)	Fluconazole (mm)
Fusarium spp	20.0	26.0	10.0	25.0
Asperillus flavus	30.00	23.0	32.0	24.0
Yeast	18.0	25.0	20.0	27.0

Result

Total viable of boiled and fried cheese bought from selected area in Igboora was shown in Table 1 in which FCC_2^7 (sample 2) was having the highest colony count for both bacteria(5.0×10^3 , 3.0×10^5, 2.9×10^7) and fungi (2.5×10^3 , 2.5×10^5, 2.0×10^7) in fried Cheese while BCC_4^{-5}(1) was having the highest count for boiled cheese with4.0×10^3, 3.0×10^5, 2.5×10^7 for bacteria and2.1×10^3, 1.9×10^5, 1.9×10^7 for fungi. Fried cow cheese sample 3 (FCC_3^7)have the least viable count of 2.3×10^3, 2.0×10^5, 1.5×10^7 for bacteria and 1.6×10^3, 1.4×10^5 , 1.0×10^7 for fungi while BCC_3^{-5}(1) sample 3have the least viable count for boiled cheese with2.0×10^3, 2.3×10^5, 2.0×10^7 for bacteria and 1.9×10^3, 1.5×10^5, 1.5×10^5 for fungi. Table 2 showed the biochemical characterization of bacteria isolates from boiled and fried cheese samples purchased from igboora, six organisms were isolated namely, *Corynebactrium xerosis* (14.3%), *Klebsiella* spp (14.3%), *Staphylococcus aureus* (42.9%), *Clostridium* spp (7.1%), *Bacillus megatarium* (14.3%) and *Enterobacter* spp (7.1%). The Macroscopic and Microscopic Characterization of Fungi isolates was also represented in Table 3 in which *Fusarium* spp, *Aspergillus flavus* and *Yeast* were isolated from selected Boiled and fried cheese obtained from Igboora. Antibiogram result for positive commercial antibiotic disc of bacteria isolated was shown in Table 4 with highest zone of inhibition recorded in *Staphylococcus aureus* (51mm) for Ofloxacin and lowest in *Klebsiella* spp (10.0mm) for Erytromycin. *Staphylococcus aureus* also had the highest and lowest inhibitory zone in negative disc with 49.0mm and 13.0mm in Ciprofloxacin and Gentamycin , for fungi, Yeast had highest inhibitory zone in Fluconazole with 27.0 mm and lowest in *Fusarium* spp with 10.0mm in Fushcin respectively.

Discussion

The samples used in this research work were collected from Igboora, isolated and subjected to morphological features and biochemical tests (Gram staining, spore forming, Catalase test, Glucose fermentation, citrate test, galactose, oxidase e.t.c) to determine the probable organisms present in the isolated samples. Bacteria isolated from the cheese samples collected include *Corynebactrium xerosis* (14.3%), *Staphylococcus aureus* (42.9),*Clostridium* spp (7.1%), *Bacillus megatarium* (14.3%), *Klebsiella* spp (14.3%), *Enterobacter* spp (7.1%), *Staphylococcus aureus isolated* from this work ws similar with the work done by Senbetu, 2014 on Comparative Study on Microbiological Evaluation of Cheese Collected from Two Different Markets where 58% of *Staphylococcus aureus* was reported.*S. aureus* is a Gram-positive clustered cocci bacteria that lives on both human and animal skin and in mucosal

cavities of the hosts as microflora. *Staphylococcus aureus* is the commonest cause of mastitis in dairy animals and also from post-processing contamination through unhygienic handling of products by the vendors (Little and De Louvois, 1999, Senbetu, 2014). It is also the most common pathogen associated with cheeses from raw or unspecified milk in food-borne disease outbreaks as reported in France in 1992-1997 (De Buyser *et al.,* 2001, Senbetu, 2014, Feyissa, *et al.,* 2023). *Enterobacter* spp isolated are ubiquitous inhabitants of the gut of human beings and other warm-blooded animals, members of this group are generally harmless, majorly found in faeces. Their presence in these sample may be due to poor husbandry and unhygienic practice of the vendors during and after processing, use of contaminated equipments. *Corynebactrium xerosis* present could be as a result of the environment because *it was* found to be ubiquitously in the environment and known to cause subclinical mastitis in dairy cows (Gonçalves *etal.,* 2016, Hahne, 2018).). *Bacillus megatarium* are Gram Positive rod which was found in the environment, their presence in cheese may produce enterotoxin which could cause food poisoning when consumed. *Klebsiella* spp. is a common cause of bovine mastitis, but information regarding its molecular epidemiology is lacking from many parts of the world it is also an important opportunistic human pathogen predominantly affecting immune-compromised. Podder,*et al.,* 2014 in his work also isolated *Klebsiella* species Associated with Bovine Mastitis in Newfoundland from cow milk.

The Antibiogram result in this work reveals that Ofloxacin, Gentamycin and Erythromycin were able to inhibit the growth of all the bacteria isolated from this work for Gram Positive disc.The same thing is applicable to Gram negative where gentamycin, Ciprofloxacin, Ofloxacin and Ntirofloxacin were able to inhibit the growth of all the bacteria isolated. Fungi isolated from this work are *Fusarium* spp (28.6%), *Aspergillus flavus*(42.9%) and Yeast (28.6%) which is similar to the work done by Senbetu in 2014 and Álvarez-Días, *et al. (*2022) where *Aspergillus flavus* and Total Aflatoxins Occurrence in Dairy Feed and Aflatoxin M_1 in Bovine Milk in Aguascalientes, Mexico were isolated.

Conclusion

The presence of pathogenic bacteria and fungi isolated from this work was unsatisfactory, because their presence in cheese when consume by consumer may lead to serious health problem and food borne illness.

Recommendation

This findings emphasis the importance of isolation, characterization and antibiogram of selected cheese samples, therefore continuous training should be given to the cheese seller or vendors on how to improve their personal hygiene, equipments used and good hand washing practice so as to minimize the rate at which cheese can be contaminated. They should also be informed on the importance of food safety hygiene. In order to alleviate poverty, fresh cheese can be bought from the vendor boiled properly, repacked under hygienic condition and sell at affordable price to the consumer.

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COMPARATIVE EVALUATION OF FERMENTED LOCUST BEAN AND SOYBEAN CONDIMENTS

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Abstract
This study was conducted to compare locust bean and soybean condiments (Iru) with each other in terms of nutrient composition and consumer acceptability. The proximate, macro- and micro-nutrients compositions and sensory evaluation was conducted on the two condiments. The locust bean seed were soaked for 15minutes, cooked for 8 hours, dehulled and re-cooked for another 1 hour and fermented for 12hours then packaged. Soybean seeds were boiled for 25 minutes. Dehulled and was allowed to drain very well, it was then roasted until light brown, the roasted seeds were boiled again for 1 hour drained and fermented for two days, packaged and labelled, then kept for further laboratory analysis. The result showed that the proximate composition of the fermented locust bean and soybean was 23.47 and 28.09% crude protein, 15.72 and 7.88% crude fibre, 6.43 and 5.64% ash, 31.57 and 34.59% carbohydrate, 17.10 and 13.02% fat, 11.96 and 10.78% moisture content. While the micro and macro-nutrient composition of the locust bean and soybean condiments were Vitamin A (0.995 and 1.370mg/100g), Sodium (353.74 and 335.03mg/100g), potassium (118.51 and 273.54mg/100g), Calcium (1,110.19 and 1,111.12mg/100g), Manganese (119.26 and 117.99) and Copper (0.897 and 0.835mg/100g). Sensory evaluation showed that there was no significant difference (P≤0.05) for taste, texture, colour and overall acceptability between the two samples.
Keywords: Locust bean, Soybean condiment, Fermentation, Proximate composition, Micro-nutrients, Macro-nutrients and sensory evaluation.

Introduction

Food condiments or spieces are strong-smelling sharp-tasting substance usually used to improve or adjust the flavour of food. They are usually of vegetable/plant origin. Common examples include mustard, nut meg, ginger, garlic, coriander, locust bean etc. A condiment can also be said to be a substance applied in food in the form of a sauce, powder, spread or anything similar to enhance or improve the flavour. In Nigeria and most African countries condiments such as fermented locust bean (iru), fermented melon seed (ogiri), fermented pigeon pea etc. are widely used to season food. The production of condiments is largely done on a traditional small-scale household basis under highly variable condition (Odunfa, 1981).
Locust bean seed (*Parkia biglobosa*) is a grain legume found in savanna area of Africa. It is fermented and added to soup and stew as condiment to enhance flavor and nutritional value. The fermented locust bean seed is commonly consumed in Ghana, Nigeria, Sierr'leone and Togo (Odunfa, 1985). In Nigeria it is called 'Iru' in Yoruba, 'dawadawa' in Hausa and 'Ogiri ingala' in Igbo. It is also referred to as 'Kinda' in Sierr'leone and 'Kpalueu' in Ghana. Fermented food species (Iru) have remained popular among Africans especially now that the industrial processed food seasoning such as curry and thyme are costly and beyond the reach of many people traditional diet of most people (Akande *et al.*, 2010). Other legume seeds such as soybeans, African oil bean seeds, melon seeds, castor oil seeds and mesquite bean seeds are fermented to value-added products with increased flavour and taste (Nwagu *et al.*, 2010; Ndamitso *et al.*, 2020).

Numerous advantages of food fermentation include: improved health benefits due to detoxification and removal of anti-nutrients in the food, the increase in the nutritional composition, improvement in the functional properties of food, enhanced aroma and flavour, increased shelf-life (depending on the type of food) and increased food variety (Zebedee *et al.,* 2022: Verardo *et al.,* 2020). In this study locust bean and soybean are made into Iru, the proximate, mineral, vitamins and consumer preference were checked for nutrient diversity and making of soy-iru popular among the consumers of its locust bean counterparts.

Materials and methods

Materials: The materials used are locust bean seed (1 kg), soybean (1 kg), bowls, water, Sieve, Pot, Calabash, River sand (10kg), Salt (40 g), wood, 6 Jute sacks. African locust bean, soybean seeds and other materials used for the study were purchased from a local market, Towobowo, in Igbo-ora, Oyo State.

Methods: Iru was prepared in the, Food Processing Laboratory of Food Technology Department, Oyo State College of Agriculture and Technology, Igboora, using the modified method of Edema and Fawole (2006).

Locust bean seeds (1kg) was soaked in 100L of water for 15minutes. The water was drained and reasonable quantity of sand was added and pounded with pestle in the mortal. It was washed with sieve in three different bowls of water to remove sand and stones and also peel off the outer shell of the locust bean seeds. After this process, fire was set. The locust bean seeds were boiled for eight hours (8hrs) on firewood. The seed was left to cool and was later poured into the mortal and pounded with pestle until the shell was completely removed. The seeds were washed and rinsed again in three different bowls with a sieve to ensure that there was no stone, particles and or sand in it. It was boiled again for one hour (1hr), after 1 hour, it was removed from the fire and without wasting time, it was left to cool and spread in a wide calabash and covered with a lot of jute sack and placed in a corner on a plank for four days for fermentation process to take place. It was opened after 4 days, salt was added to discontinue fermentation and packaged.

The seed of soybeans was cleaned from stone and extraneous particles and boiled for 25 minutes for easy removal of the skin. The skin was removed and allowed to drain well; it was then roasted until light brown. The roasted seeds were boiled again for 1 hour drained and spread in a wide calabash and covered with another calabash, it was then wrapped with jute sack. Kept in a warm place to allow fermentation to take place. It fermented for three days. Salt was then added to the fermented soybean to discontinue fermentation and for preservation. It was then packaged and labelled.

Physico-chemical and Sensory Analysis: analysis determined were proximate (Carbohydrate, crude protein, moisture, crude fiber, ash and fat contents), macro and micro-nutrients (magnesium, potassium, sodium, calcium and Vitamins A) were all determined using standard procedures (AOAC, 2010). The analyses were performed in triplicate, the means were recorded. Sensory evaluation was done using the method of Sharif *et al. (*2017) and Gaffney (1976). Analysis of variance (ANOVA) was also used to report the consumer preference.

Results and Discussion:

Table 1 showed the proximate composition of the locust bean and soybean condiments. Present studies revealed the moisture content of locus bean to be 31.96% and 35.78% for soya bean while moisture content in the previous research carried out by Obinna, (2012) was 38.41% for locust bean and 48.43% for soybean respectively. Research carried out by

Odunfa, (1986) shows that the moisture content of raw African locust bean seed was 8.6% and fermented locust been seed was 36.80%. The moisture content of both samples was moderate. Crude protein was 23.47% and 28.09% for fermented locus bean and soy bean respectively while 16.56% and 36.5% was reported in the previous research by Egan *et al. (*1981). Crude fat content was 17.10% and 13.02% for fermented locust bean and soy bean respectively. The crude fat reported for African locust bean agreed favourably with 17.80% reported earlier by Eka (1980) while that of soy bean was close to the 12.9% value reported for another sample of soy bean by Egan *et al.* (1981). Crude fibre (CF) content of 15.725% and 7.88% was reported for fermented African locust bean and soy bean respectively; these values were close to the 8.8% value reported for African locust bean seed by Oyenuga (1968). Boiling and dehulling the African locust bean seed reduced its crude fibre by 61% but fermentation increased the crude fibre by 30% it depends on the hours. This pattern agreed with the observations of Gle (1992). The Ash content of fermented African locust bean and soy bean was 6.43% and 5.64% respectively. The value reported for African locust bean agreed favourably with 6.1% reported earlier by Eka, (1980). Boiling, soaking in water and dehulling of Afican locust beans led to a loss of 41% ash. This means that 41% of the total mineral content of African locust bean may reside in the hull of the seed and or leached during processing. When the African locust bean seed was boiled for up to about 8hours during processing, 13% of the mineral will further be leached into the broth. Fermentation seemed to have increased the ash content of African locust bean seed by 29% in direct agreement with the observation of Eka (1980), about 30% increase in ash after fermentation of soy bean did not seem to have any significant effect on the ash content. Carbohydrate contents were 5.32% and 9.59% respectively. The CHO reported for fermented African locust bean was not close to the 67.30% value reported for another sample of locust bean (Obinna, 2012) while that of soy bean was close to 5.1% reported earlier by Stephen *et. al.* (1996).

Table 1: **Proximate Analysis of Fermented Locust bean and Soybean**

Sample	**Moisture content (%)**	**Crude protein (%)**	**Crude fat (%)**	**Crude fibre (%)**	**Ash Content (%)**	**Carbohydrate (%)**
Locust bean	31.96	23.47	17.10	15.72	6.43	5.32
Soybean	35.78	28.09	13.02	7.88	5.64	9.59

Table 2 shows the macro- and micro-nutrient composition viz: Calcium (10.19 and 11.12mg/100g), Magnesium (119.26 and 117.99mg/100g), Potassium (118.51 and 273.54mg/100g), Sodium (3.53 and 3.35mg/100g), Copper (0.897 and 0.835 mg/100g), Vitamin A (0.995 and 1.370mg/100g). The Calcium value reported for African locust beans was very close to the 12.19mg/100g by Egan *et al. (*1981), which is a little higher value than the one for this study. The magnesium content of the fermented African locust bean agreed favourably with 119.28mg/100g reported by Cataldo *et al. (*1999). The potassium content reported for African locust bean was very close to that of 115.41mg/100g reported earlier by Obinna, (2012). The values gotten for sodium agreed with the 2.851mg/100g value reported for locust bean by Obinna (2012). The Copper contents of both samples were very close to 0.786mg/100g and 1.7mg/100g of the previous research carried out on fermented locus bean by Egan *et. al*., (1981). The value of Vitamin A was lower compared with that of

1.985mg/100g vitamin A of locust bean by Obinna, (2012), while soy bean agreed favorably with 1.380mg/100g vitamin A value reported by Egan *et al. (*1981).

Table 2: Macro and Micro-Nutrients Composition of Fermented Samples

Sample	Calcium (mg/100g)	Magnesium (mg/100g)	Potassium (mg/100g)	Sodium (mg/100g)	Copper (mg/100g)	Vitamin A (mg/100g)
Locust bean	10.19	119.26	118.51	3.53	0.897	0.995
Soybean	11.12	117.99	273.54	3.35	0.835	1.370

The result of the sensory evaluation of the samples are shown in Table 3. The results shows that there was no significant difference for texture, colour, taste and overall acceptability between the two samples. There was a slight difference in odour and appearance of both.

Table 3: **Mean Rank for the Quality Attributes of Locust bean and Soybean Condiment**

Sample	Flavour/odour	Texture	Colour	Taste	Appearance	Overall Acceptability
Locust bean	5.2^{ab}	5.3^{a}	5.0^{b}	5.5^{a}	5.1^{b}	5.3^{a}
Soybean	5.0^{b}	5.4^{a}	5.0^{b}	5.5^{a}	5.2^{ab}	5.4^{a}

Values in the same column with the same superscript are not significantly different from each other at $P \leq 0.05$

Conclusion

The usage of other leguminous seeds in the production of "Iru" offers diversity of processing those foods. Therefore, fermentation of African locust bean seeds and soybean seed to condiments increases the nutritional composition most especially protein and micro-nutrient contents of the foods.

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DETERMINATION OF PHYSICOCHEMICAL PARAMETERS OF SOME SELECTED WELL WATER SAMPLES IN IGBOORA HIGH SCHOOL, PAKO AND OLORUNSOGO AREA OF IGBOORA

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Abstract
The quality of any surface or ground water is a function of either both natural nuances and human nuances. Aim of this study was to determination of physicochemical parameters of some selected well water samples in Igboora high school, Pako and Olorunsogo area of Igboora. The water samples were collected around Oluyole, Pako and Olorunsogo area of Igboora and taken into science laboratory technology laboratory in sterile containers and kept until use and Physico-chemical Analyses were discovered on pH, nitrate, dissolved oxygen, biochemical oxygen demand, hardness and alkalinity in which the result indicate that Igboora High School has the highest value of 8.6 while Olorunsogo has the lowest value 8.2. The value indicate that the samples are alkaline. The values of the alkalinity obtained for Igboora High School, Olorunsogo and Pako, are 224.9, 201.3 and 221.0 respectively. The results on dissolved oxygen indicate that Olorunsogo had the highest value while Pako had the least value. These values are within the range of WHO standard except Olorunsogo which is slightly higher than the recommended value of WHO

Key words: Igboora, WHO standard, physical parameter, chemical parameter, water quality

Introduction
Water is a fundamental resource, integral to all environmental and social processes (Edimeh, 2011). Access to adequate safe drinking water is of prime importance to many governmental and international organizations since undesirably, it is the core component of primary health care and a basic component of human development as well as a precondition for man's success to deal with hunger, poverty and death (SOPAC/WHO, 2005). There is a growing concern everywhere that in the coming century, cities will suffer imbalances in quality water supply, consumption, and population (Joshi *et al.*, 2008). Many regions of the world are already limited by the amount and quality of available water (Wilson, 2007). According to World Health Organization (WHO, 2002), in the next thirty years alone, accessible water is unlikely to increase more than ten percent (10%) but the earth's population is projected to rise by approximately one-third. Unless the efficiency of water use rises, this imbalance will reduce quality water services, reduce the conditions of health of people and deteriorate the environment and the world. (Moyer and Morita, 2000)**.** The quality of any surface or ground water is a function of either both natural nuances and human nuances. Without human nuances water quality would be determined by the weathering of bedrock minerals, by the atmospheric processes of evapotranspiration and the deposition of dust and salt by wind, by the natural leaching of organic matter and nutrients from soil, by hydrological factors that lead to runoff, and by biological processes within the aquatic environment that can alter the physical and chemical composition of water. Pollution of water is measured by assessing the Physio-chemical parameters of water (Ramachandramohan *et al.*, 2014). Physico-chemical analysis is the prime consideration to assess the quality of water for its best utilization like drinking, irrigation, sheries, and industrial purpose and helpful in understanding the complex processes, interaction between the climatic and biological processes in the water (Salve and

Hiware, 2006).Water intended for human consumption must conform to standard magnitude of Physico-chemical parameters such as pH, hardness, conductivity and turbidity. It must also abide to certain permissible levels of heavy metals (Hanaa *et al.,* 2000; Maigari *et al.,* 2014). Actually specific drinking water standards are not given or not mentioned for all the four parameters by WHO. On the other hand, USEPA has quoted the pH acceptable value, which is normally, considered as a "Secondary Maximum Contaminant Level" where the regulations are based on aesthetic considerations. Fecal coliform bacteria have a great significance in indicating sewage contamination of a waterway that indicates the possible presence of other pathogenic microbes (Hanaa *et al.,* 2000; Maigari *et al.,* 2014).

Materials and method

Description of experimental site

The study was carried out in the Research Laboratory of Oyo State College of Agriculture and Technology, Igboora. Igboora is in derived savannah zone of $7^{o}15^{l}$ north and $3^{o}30^{1}$ east of the equator with an average annual rainfall of 1278mm and an annual temperature of 27 (Sanusi, 2011).

Sample collection

The water samples were collected around Oluyole, Pako and Olorunsogo area of Igboora and taken into science laboratory technology laboratory in a sterile containers and kept until use.

Procedure for Physico-chemical Analyses

pH

A serihtech instrument (PHS-3c) pH meter was used to determine the pH of samples after calibrating with three different buffer solutions (4.0, 7.0 and 10.0 pH values).

Nitrates

The D – R 2000, Direct Reading SpectropHotometer was used. The stored program number for high range nitrate nitrogen (NO_3^--N) - (that is 355) - powder pillows was entered. The display showed: 'DIAL nm TO 500'. Then the wavelength dial was rotated until the small display showed '500 nm'. The 'READ/ENTER' button was then pressed. The display showed :'mg/l N NO_3^- H. Afterwards, a sample cell with 25 ml of sample was filled. The content of one Nitra Ver 5 Nitrate Reagent Powder Pillow was then added to the cell (i.e. the prepared sample). It was then stoppered. The 'SHIFT TIMER' was pressed. The cell was shaken vigorously until the time beeped in one minute. When the timer beeped, the 'SHIFT TIME' was pressed. Five minutes was allowed to elapse for the reaction to take place if nitrate nitrogen was present. An amber color developed indicating the presence of nitrate nitrogen. Another sample cell was then filled with 25 ml of the blank sample.

Dissolve oxygen (DO)

Dissolve oxygen (DO) is the amount of oxygen that is presented in water bodies receive oxygen from the atmosphere and form aquatic plants. Running water, such as that of swift moving tream dissolve more oxygen than the still water of a panel or lake

Biochemical oxygen demand (BOD)

Biochemical oxygen demand is an analytical parameter representing the amount of dissolve oxygen consumed by aerobic bacteria growing on the organic material present in a water sample at a specific temperature over a specific time period.

Hardness
Hardness are those which are present in water without filtering water. The procedure is carried out taking direct samples in crucible dish and heating in oven till drying crucible dish at 103^0C.

Alkalinity
Alkalinity is the total concentration of bases in water expressed as parts per million (ppm) or milligrams per liter (mg/l) of calcium carbonate ($CaCO_3$). These bases are usually Bicarbonates (HCO_3) and carbonates (CO_3), and they act as a buffer system that prevents drastic changes in pH. Alkalinity is usually given in the unit mEq/L (mill equivalent per liter). Commercially, as in the pool industry, alkalinity might also be givenin the unit ppm or parts per million.

Results and discussion
Table 1: Result of Physicochemical parameters of Igboora high school, Pako and Olorunsogo wells

Parameters	WHO	Sample A	Sample B	Sample C
Ph	6.5-7.5	8.6	8.2	8.4
Alkalinity (mg/L)	150	224.9	201.3	221.0
Dissolved Oxygen (mg/L)	6.5-8	5.9	9.7	4.8
Total hardness (mg/L)	500	341.5	414.6	330.0
BOD (mg/L)	5.0	3.22	5.6	3.0
Nitrate (mg/L)	5.0	7.2	4.3	7.6

Key: Sample A: Igboora High School, Sample B: Olorunsogo, Sample C: Pako

Discussion
pH: The test pH of water was carried out to determine whether it is acidic or alkaline in nature. The values obtained for Igboora High School,Olorunsogo and Pako, are 8.6, 8.2 and 8.4 respectively the values of the three samplesare higher than the range recommended by WHO (6.5-7.5). The result indicate that Igboora High School has the highest value of 8.6 while Olorunsogo has the lowest value 8.2. The value indicate that the samples are alkaline, it is in agreement with what was reported by other researchers in similar study (Edimeh *et al.*, 2011).

Alkalinity: The values of the alkalinity obtained for Igboora High School, Olorunsogo and Pako, are 224.9, 201.3 and 221.0 respectively. The result indicate that Igboora High School had the highest value while Olorunsogo had the least value. This value are higher compared with the WHO standard, this may be due to the presence of carbonates and bicarbonate of the water (Obuobie and Barry, 2010).

Dissolved oxygen: The values of Dissolved oxygen obtained for Igboora High School, Olorunsogo and Pako, are 5.9, 9.7 and 4.8 respectively. The result indicate that Olorunsogo had the highest value while Pako had the least value. This value are within the range of WHO standard except Olorunsogo which is slightly higher than the recommended value of WHO.
Total Hardness: The values of the total hardness obtained for Igboora High School, Olorunsogo and Pako, are 341.5, 414.6 and 330.0 respectively. However Olorunsogo has the

highest value while Pako has the lowest value.The value are within the range when compared with WHO standard.

BOD: The value of BOD obtained for Igboora High School, Olorunsogo and Pako, are 3.22, 5.6 and 3.0 respectively. The results indicate that Olorunsogo had the highest value while Pako had the lowest value. The value are within the range when compared with WHO standard except Olorunsogo which is slightly more than the WHO standard.

Nitrate: Nitrate indicates the presence of fully oxidized organic matter. The value obtained for Igboora High School, Olorunsogo and Pako, are7.2, 4.3and 7.6. Pako had the highest amount of nitrate while Olorunsogo had the lowest value of nitrate. The values obtained are higher than WHO standard for drinking water than Olorunsogo which is within the range of WHO standard.

Conclusion

This work has presented the levels of Physico-chemical parameters such as pH, Alkalinity, Dissolved Oxygen, Total hardness, BOD and Nitrate contents in the well water samples collected from three well in Igboora. The result showed that most of the parameters are within the permissible limit of the World Health Organization. It was now concluded that the water with low Physico-chemical parameters is not the best for drinking. It is also recommended that further studies should be carried out on the effect of different processing methods on Physico-chemical parameters of well water.

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PRODUCTION OF PARENTAL EMAIL ALERTING SYSTEM FOR PRIMARY SCHOOL PUPILS' MONITORING USING FACIAL RECOGNITION TECHNIQUES

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Abstract
The security challenged faced by pupils from homes to school for education purpose, calls for urgent attention. Therefore, this paper aimed at production of parental email alerting system for primary school pupils' monitoring using facial recognition techniques. The research was carried out at Department of computer science Laboratory, Faculty of science Oyo State College of Agriculture and Technology, Igboora. Three Primary schools were selected, using the most severe security threat (Kidnapping), Violence, accident, raping, child molestation and theft) faced by students while coming and after closing. Twenty-one students were interviewed after selecting seven from each school randomly. Data collect were analyzed by qualitative techniques. The result indicated that pupils who board commercial vehicles, bicycles and those that trek are under great security risk. To avert this danger parental email alerting system was then developed for primary school pupils monitoring using facial recognition techniques. This system monitoring will ensure safety of children movement and enable proper security guides for both parent and their wards. It is recommended that collaboration between public and private institutions, developing plans, training for both academic and administrative staff for efficient adoption and utilization of the software in our schools.
Keyword: Pupil, Biometric, Facial recognition, Email, Alerting system

Introduction

Primary education significance can be shown through the proliferation and patronage of private and public owned schools in Nigeria. The act of enterprising with primary school education generates income for the government, proprietors and teachers as well as other categories of staff. This goes to parents, a safe place for keeps their children thereby allowing them to pursue their businesses without panic. With regard this Duruamaku-Dim and Anero (2011) explined that parents and guardians do not regret sending their children to school because the services derived justify the reasons for the choose of school. The proprietors also do not regret their involvement because of the financial rewards derived. The government on part is comfortable because the schools imparted skills that would make citizens survived better.

Primary education ensures that the child is not deficient in the area of character. It helps the child to get acquainted with the essentials of what is morally expected within the confines of the society but yet the current security and safety of the country leaves a huge worry and burden to parents who are not mobile considering this, there is need for parent to be alerted on their child arrival to school so as to ensure safety and security and to help tracking and retracking of missing child from school within reasonable time frame.

A safe and healthy school environment is critical to education. However, various studies in recent years have shown that the schools are no more safe for the students and the school personnel any more due to problems threatening the school security. Montee (2008), concluded that it is the responsibility of schools to provide a safe environment so that students and teachers could maximize the education experience, because the schools are faced with numerous problems especially school safety. A lot of researchers emphasize the uniqueness of each school in dealing with the security problems. According to Dantala

(2014), one of the greatest challenges facing the education industry in Nigeria is kidnapping, which is part of the insecurity issues in the country.

Ensuring safety has always been of utmost importance in all ages and during all situations. One cannot deny the importance of safety of primary school children because it helps parent and school management avoid danger and other life-threatening situations. Fatma Ozmena,(2010) narrated that primary systems have been deeply affected by the economic, political, and social conditions of our time, and exposed to many undesirable events and behaviors such as substance addiction, violence, child abuse, sabotage, and the like. He ascertained that to tackle the security problems at schools, it is essential to diagnose the problems at hand and provide a wide solution. Based on this views, this research was carry out to determine the security problems experienced at schools; and to develop a solution to eradicate them.

Material and Methods

This research was carried out at department of Computer Science Laboratory, Oyo State College of Agriculture and Technology, Igboora.

Two stages were involved in the experiment.

Stage One: Three primary schools were considered for this investigation. The choice of the schools was based on schools that were mostly affected by security threats during student's movement, during coming from home and after closing while returning. Seven (7) pupils were randomly selected from each schools and given a total of twenty-one pupils. Questions were drawn to ascertain the risk faced by pupils during movement on the way. Some of the factors considered in questionnaire were the challenges faced such as accidents, rape, violence, theft and child molestation and host of others.

Data collected from the oral interview given to these students were then analyzed by qualitative techniques.

Stage Two: The result from stage one shows that a lot of pupils are under threat while going and returning to schools and the parents are also under risk and unrest. To avert this issue, a parental email alerting system was therefore developed using facial recognition techniques in the department laboratory. The stages of design for email alerting system are listed below to includes.

Interview: it is the most commonly used and usually the most useful fact finding technique. It enables collection of information from individuals face-to-face. There are two types the open-ended questions which allow the interviewee to respond in any way that seems appropriate and the Close-ended question which restrict answers to specific choices.

i. Observing the Organization in Operation: is an effective way to understand a system, observation is made by watching or participating in activities. It is usually adopted when the complexity of an aspect of the system prevents a clear explanation by the end-users, it therefore enables the observer to see exactly what is being done.

ii. Research: information is gathered using computer trade journals, reference books, and the internet. It provides information on how others have solved similar problems whether software packages exist to solve or partially solve the problems.

Stages of Design for Email Alerting System

i **Haarcascade (Frontalface Detecting) Algorithm:** It is an Object Detection Algorithm used to identify faces in an image or a real time video. The algorithm uses edge or line detection features. The algorithm is given a lot of positive images consisting of faces, and a lot of negative images not consisting of any face to train on them. The haarcascade algorithm will be used for face detection

ii Eigenfaces Algorithm: An eigenface is the name given to a set of eigenvectors when used in the computer vision problem of human face recognition. The eigenvectors are derived from the covariance matrix of the probability distribution over the high-dimensional vector space of face images.

iii Cascading Classifiers Algorithm: Cascading is a particular case of ensemble learning based on the concatenation of several classifiers, using all information collected from the output from a given classifier as additional information for the next classifier in the cascade. Unlike voting or stacking ensembles, which are multiexpert systems, cascading is a multistage one. Cascading classifiers are trained with several hundred "positive" sample views of a particular object and arbitrary "negative" images of the same size. After the classifier is trained it can be applied to a region of an image and detect the object in question.

Basic Components of a Biometric System

In general, a biometric system can be divided into four basic components. Let us see them briefly:

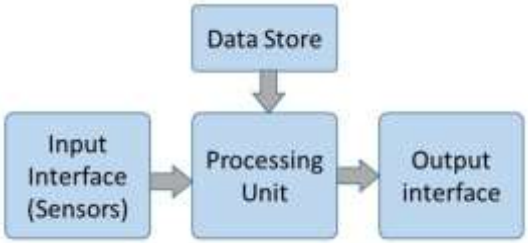

Fig.1. Input Interface (Sensors)

It is the sensing component of a biometrics system that converts human biological data into digital form. For example,

1. A Metal Oxide Semiconductor (CMOS) imager or a Charge Coupled Device (CCD) in the case of face recognition, handprint recognition, or iris/retinal recognition systems.
2. An optical sensor in case of fingerprint systems.
3. A microphone in case of voice recognition systems.

Processing Unit

The processing component is a microprocessor, Digital Signal Processor (DSP), or computer that processes the data captured from the sensors. The processing of the biometric sample involves:

1. Sample image enhancement
2. Sample image normalization
3. Feature extraction
4. Comparison of the biometric sample with all stored samples in database

Database Store

The database stores the enrolled sample, which is recalled to perform a match at the time of authentication. For identification, there can be any memory from Random Access Memory (RAM), flash EPROM, or a data server. For verification, a removable storage element like a contact or contactless smart card is used.

Output Interface

The output interface communicates the decision of the biometric system to enable the access to the user. This can be a simple serial communication protocol RS232, or the higher

bandwidth USB protocol. It could also be TCP/IP protocol, Radio Frequency Identification (RFID), Bluetooth, or one of the many cellular protocols.

Stages of Proposed System

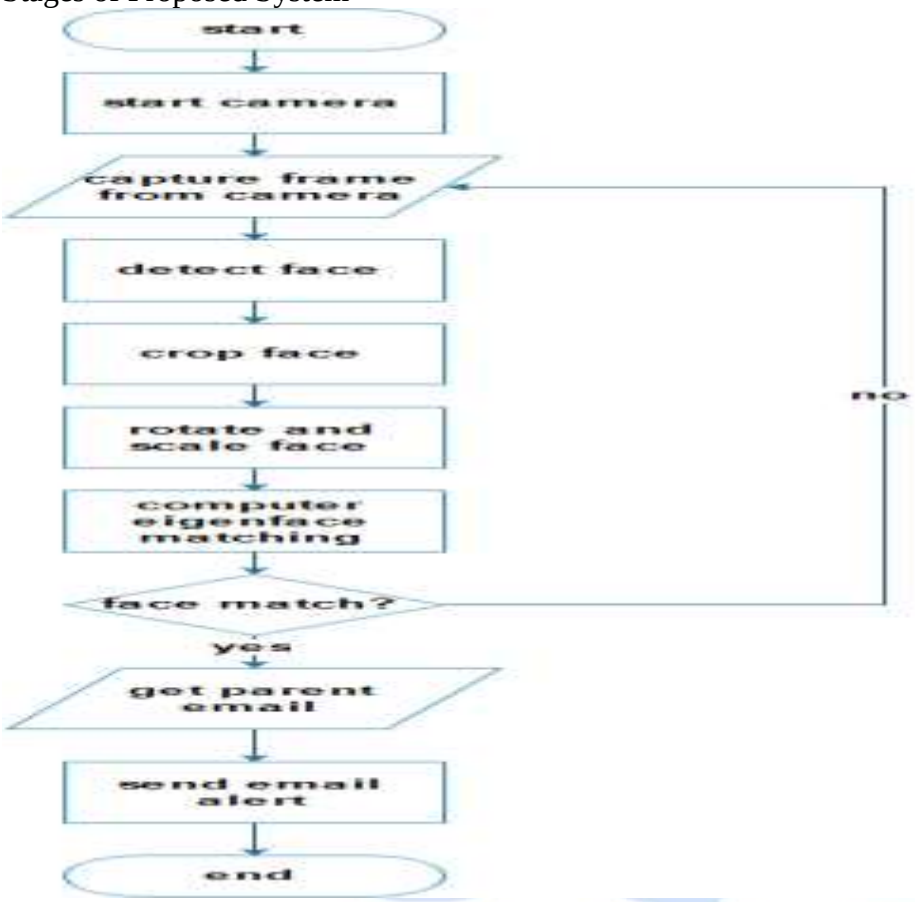

Fig .2 Stages of flowchart the proposed system

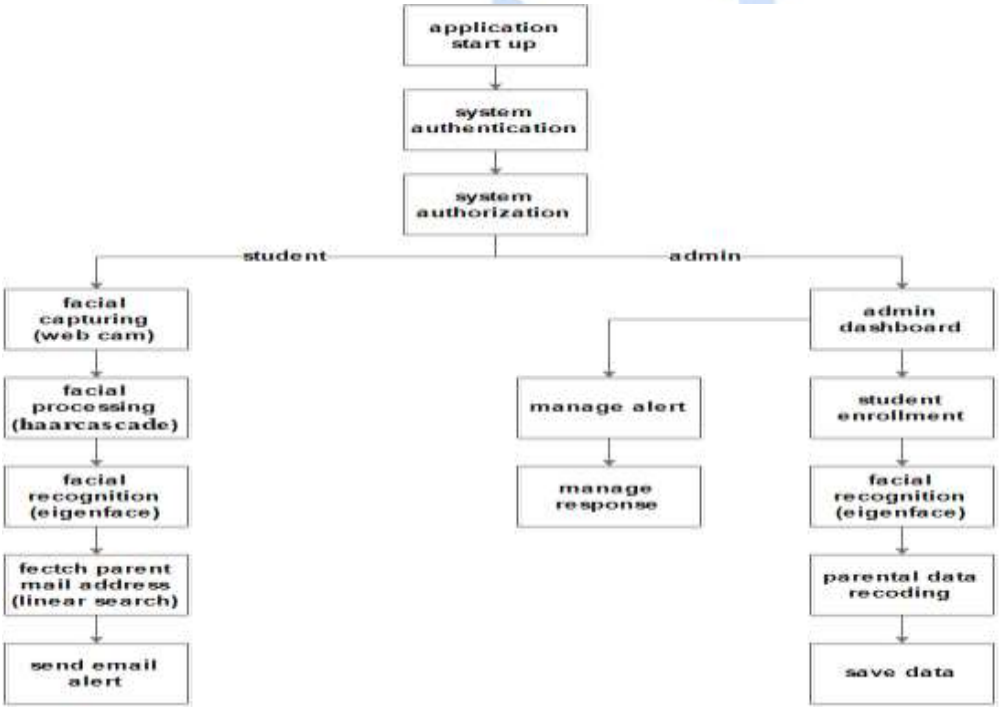

Fig 3 Design of the proposed system

Fig 4 application main module.

Fig 5 Student registration

Implementing Student Bio-Data Enrollment Module

This form was used to enroll student Bio-data against their names, the module registered the students and captured their facial look and was later used for verification. Students are to focus on the webcam during facial capturing.

Fig 6 bio-data capturing.

Production of Parent Alerting System

Fig 7 alerting process

Conclusion and recommendation

Conclusion

The system can be used for taking student attendance both at resumption and at closing time and this will be mailed to their parents. The prototype will ensure successful capturing of new faces to be stored in the database. Also, Webcam that captured face will be compared to those stored in the database for successful implementation.

Recommendation

From the findings of this study, for effective usage and good management of the software, it is essential to provide computer for the security officials at the gate and staff should be well trained on the use of the computer and system. Hence, the current systems must be changed so as to meet the global standard and modern challenges of information technology.

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ANTIBACTERIA ACTIVITIES OF *Phyllanthus amarus* LEAVES OIL EXTRACT AGAINST *Staphylococcus aureus* AND *Pseudomonas aeruginosa* ISOLATED FROM THE GUT OF AFRICAN CATFISH (*Clarias gariepinus*)

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Abstract
The oil extract of Phyllanthus amarus was selected for antibacterial activity against bacteria isolated from the gut of Clarias gariepinus. Minimum inhibitory concentration was performed by broth dilution method and the zone of inhibition was studied by agar disc diffusion method at concentrations of 10 and 20 mg/ml in DMSO (Dimethyl Sulfoxide). The results revealed the antibacterial activity of extract against the tested microorganisms concentrations in ranges of 60 and 500 µg/ml. Aqueous extract leaves of Phyllanthus amarus exhibited significant antibacterial activity against the tested bacteria (Staphylococcus aureus and Pseudomonas aeruginosa). The minimum inhibitory concentration (MIC) of methanol extracts of leaves of P. amarus against test microbes ranged from 6.25 mg/mL to 50mg/mL. The leave extracts exhibited MIC consistently at 12.5-50 mg/mL. The minimum bactericidal concentration (MBC) of methanol extracts of P. amarus ranged from 25 mg/mL to 100 mg/mL. There was no significant difference in the antimicrobial activities between the methanolic extracts leaves of P. amarus for the results of MIC and MBC. The antibacterial efficacy of P. amarus oil extract may be attributable to some of its constituent biomolecules with high drug properties reported in this study.
Keywords: Antibacterial activity, *Clarias gariepinus*, *Phyllanthus amarus*, pathogens

Introduction

Phyllanthus amarus is native probably to West Pakistan and Western India and has been introduced in to Africa and the West Indies. A herb, up to 60 cm in height, occurring as a winter weed throughout the hotter parts of India, particularly on cultivated land (Anonymous, 1969). *P.amarus* is generally known as Bhumiamla, having an erect or straight stem, herbs or shrubs, usually with milky white thorn juice. In Unani literature, it is described by the name of 'Bhuti' which means BhumAmlak - Amla of (Evi and Degbeku, 2011). It plays an important role in the development of green drugs. The use of *P.amarus* is safer and more reliable than expensive synthetic drugs and has no side effects. In folk medicine it is generally used to treat jaundice, diabetes, otitis, diarrhoea, swelling, skin ulcer, gastrointestinal disturbances and blocks DNA polymerase in the case of hepatitis B virus during reproduction (Adegoke *et al.,* 2010). In Nigeria the level of awareness of the impact of disease to aquaculture is lacking as revealed by numerous personal interactions. Parasitic diseases of fish are very common all over the world and are of particular importance in the tropics. In fish farming or aquaculture, some parasites may be highly pathogenic and contribute to high fish mortalities and economic loss, while in natural systems they may threaten the abundance and diversity of indigenous fish species (Evi and Degbeku, 2011). *Clarias gariepinus* is one of the most resistant and widely accepted and highly valued fish that could be cultivated in Nigeria, therefore the need for documented research on parasites which might constitute serious problems on this fish cannot be over emphasized (Adegoke *et al.,* 2010). The increasing popularity of catfish among fish consumers has created an overwhelmingly increased demand for *Clarias gariepinus*and conventional can no longer meet up with this high demands. The application of genetics and biotechnology to fish farming have been playing significant role in meeting the high and increasing demands for

fish protein. These conditions cause diseases and anatomical malformations in catfish (Adegoke *et al.*, 2010). The aim of the study is to determine the antimicrobial effect and properties of *Phyllanthus amarus* oil extract on *Staphylococcus aureus* and *Pseudomonas aureginosa* isolated from the gut of African catfish (*Clarias gariepinus*).

Materials and Methods

Sample collection

The plant was collected from various sites at Oyo State College of Agriculture and Technology premises, and within Igboora metropolis. The leaves and the beads were painstakingly picked from the front and thoroughly washed in clean water, then rinsed in distilled water. It was allowed to air dried at room temperature for several days, and then oven-dried at 45^{O}C for one hour until it was considered brittle enough for blending into fine powder. This was sieved to remove bigger particles, then re-blended and sieved again.

Extraction Procedure

The dried and powdered plant materials (15g) were extracted successively with 200 ml of methanol solvent by using soxhlet extractor for 5 hours. The solvent used for the study was methanol. The extracts were filtered and then concentrated to dryness using a steam bath at 37ºC.

Collection of African Catfish (*Clarias gariepinus*)

Three catfish was purchased at Obasanjo Farm Nigeria (OFN), Igboora. Sterile swab stick was used to rub/swab the gut of the fishes and inoculated on Petri dish containing prepared nutrient agar.

Antibacterial screening

Overnight cultures of the Gram positive strains *Staphylococcus aureus*, and the Gram negative strains *Pseudomonas aureginosa* were prepared on nutrient broth plates. All bacterial isolates were suspended in saline to a turbidity equivalent to 0.5 McFarland (1.5 x 108 CFU/ml) and a sterile swab stick was dipped into the test tube containing the organisms and it was used to seed the organism on the solidified Nutrient agar(MHA, pH 7.3 ± 0.1, Difco).Then 6 mm wells were prepared. In these wells 3.125ug, 6.125 ug, 12.50 ug, 25, 50 ug and 100 ug of the solvent extract of *Phyllanthus amarus* was added and allowed to stand for 30 minutes for pre-diffusion. The plate was incubated overnight at 37ºC for 24hours. After incubation the zones of inhibition were measured and recorded

Table 1: Biochemical test on tested microorganisnms

Biochemical Test	*Staphylococcus aureus*	*Psuedomonas aureginosa*
Gram stain	+	-
Oxidase test	-	+
Catalase test	+	+
Indole test	-	-
Nitrate test	+	+
Urease test	+	-
Gas	-	+

Determination of minimum inhibitory concentration (MIC)

The MIC of the extracts were determined for each of the isolate at varying concentrations of 200mg/ml, 100mg/ml, 50mg/ml, 25mg/ml, 12.5mg/ml and 6.25mg/ml as described by

(Adegoke *et al.,* 2010) To obtain this concentration 1ml of the containing double strength of concentration was placed in test tubes. One milliter (1mL) was added and then a loopful of the test organism previously diluted to 0.5McFarland turbidity stand was introduced into the tubes. All the tubes were incubated at 37ºC for 24 hours after which they were examined for MIC.

Determination of minimum bactericidal concentration (MBC)

From the test tubes that show no visible growth in MIC determination, a loopful of broth was collected from the test tubes, which did not show any visible sign of growth and inoculated on sterile nutrient agar by streaking. Nutrient agar plates were streaked with the test organisms only to serve as control. The plates were then incubated at 37ºC for 24 h. After incubation the concentration at which no visible growth was seen was noted as the minimum bactericidal concentration.

Results

The antibacterial susceptibility of *Staphylococcus aureus* and *Pseudomonas aureginosa* isolated from the gut of African catfish (Clariasgariepinus) with the oil extract of *Phyllanthus amarus* are given in (Table 2). It shows that *Staphylococcus aureus* (Gram positive bacteria) has highest reaction at 20%, 40%, 60% and 80% level of concentrations than *Pseudomonas aureginosa* (Gram negative bacteria) but at 100% *Pseudomonas aureginosa*, demonstrated the same concentration as *S. aureus*. This result showed that *Phyllanthus amarus* oil extract was effective on Gram positive bacteria than Gram negative bacteria when comparing the values obtained from both isolates.

Table 3 shows the Minimum Inhibitory Concentration (MIC) of both *Staphylococcus aureus* and *Pseudomonas aureginosa* obtained from the gut of African catfish. All values reported in this study were higher for *Staphylococcus aureus* (21, 23, 21, 20 and 18) as compared with *Pseudomonas aeruginosa* (19, 21, 18, 16 and 13) for 20%, 40%, 60% and 80% level of concentration respectively. The determination of zone of inhibition revealed that *Staphylococcus aureus*reported higher value at 20% (14), 40% (13), 60% (12), 80% (10) and 100% (08) than *Pseudomonas auruginosa*, which have 20% (13), 40% (12), 60% (10), 80% (09) and 100% (06)

Table 2: Antibacterial Activities of *Phyllanthus amarus* Oil Extract against *Staphylococcus aureus* and *Pseudomonas aureginosa*

Extract Conc. (%)	*Staphylococcus aureus*	*Pseudomonas aeruginosa*
20	17.00	16.00
40	18.00	16.00
60	15.00	12.00
80	12.00	11.00
100	10.00	10.00

Unit: mm

Table 3: Minimum Inhibition Concentration of *Phyllanthus amarus* oil extract against *S. aureus* and *Pseudomonas aureginosa.*

Serial dilution (80%) Conc.	*Staphylococcus aureus*	*Psuedomonaaurigenosa*
20	21	19
30	23	21
40	21	18

50	20	16
60	18	13

Unit: mm

Table 4: Determination of zone of inhibition of *Phyllanthus amarus* oil extract against *S. aureus*and *Pseudomonas aureginosa.*

Concentration (%)	*Staphylococcus aureus*	*Pseudomonas aureginosa*
20	14	13
40	13	12
60	12	10
80	10	09
100	08	06

Unit: mm

Discussion

Phyllanthus amarus plant oil extract has been reported upon with therapeutic properties that include antibacterial, antioxidants and anti-inflammatory. This study showed the antimicrobial effects of this plant on bacteria of medical importance. The results showed that methanolic extracts of the leaf and seed of *P. amarus* have antibacterial activities on all the bacteria screened. This finding is in tandem with the report of Olufemi and Debiri, 2008 who and could be attributed to the phytochemical constituents which include tannin, saponin, alkaloid and phenol. These phytochemicals have been reported in varieties of plant foods and beverages to prevent the initiation, progression and spread of cancer. The antibacterial results of this study conformed to the reports of Adegoke *et al. (*2010) that *S. aureus*, *E. coli*, *S. Typhi* and *Klebsiella* species were susceptible at a concentration of 100 mg/mL with an increased zone of inhibition as the concentration of extract increased. One among the defence mechanisms, against infection and predation has been the chemical defences developed by these organisms for survival. This study demonstrated the antibacterial activities and properties of *Phyllanthus amarus* oil extract against the Gram positive bacteria (*Staphylococcus aureus*) and Gram negative bacteria (*Pseudomonas aureginosa*) isolated from the gut of African catfish (*Clarias gariepinus*). The observed antibacterial effects of this study are similar to the reported work on plant extracts and antibacterial efficacies of the quinolones and cephalosporins (Moshi *et al.*, 2001). Also it was observed that the potency of the activity of *Phyllanthusamarus* oil extract depends on the solvent used for extraction (methanol and n-hexane). *Phyllanthus amarus* is effective in organic solvent than water, this may be due to the fact that there is better solubility of the active components in organic solvent (Bruton, 2009). The therapeutic value of the medicinal plants have been reported to depend on the various chemical components in it. Infact, active principle in combination inhibit greatly the life process of microbes by binding with their protein molecules acting as chelating agents (selective binding polyvalent metal ion so that it loses its biological activities), altering their biochemical systems, preventing utilization of available nutrients to the microorganism (Gorinstein *et al.*, 2001). In addition, bioactive substances have been reported to confer resistance to plant against bacteria, fungi and pests and therefore explain the demonstration of antibacterial activities by the plant oil extract used in this study (Srinivasan *et al.*, 2001). *Phyllanthus amarus* was effective against Gram positive than Gram negative bacteria but its effectiveness cannot be generalized beyond certain levels of concentration. In earlier studies *Phyllanthus amarus* oil extract is reported to possess potent bactericidal activity against Gram positive and Gram negative bacteria (Chao *et al.*, 2001) but in most cases the concentration used to inhibit the bacteria was too high (1 to 100mg/ml)

varying for different organisms (Chao *et al.,* 2001). According to the results above, it was realized that the sensitivity increased with increasing concentration which was in agreement with what (Oluduro and Omoboye, 2010). According to Oluduro and Omoboye (2010) the antibacterial activities of most plant extracts are concentration dependent as zone of growth inhibition increased with increasing concentration of the extracts. Chao *et al.,* 2001 also reported that the efficacy of most plant extracts is concentration dependent. Umbare *et al. (*2009) assessing the quality of *Phyllanthus amarus* leaves extract for its hypolipidemic activity found the presence of four phyto-constituent namely alkaloids, flavonoids, saponins and tannins in the plant sample. Flavonoids, tannins, alkaloids, steroids, terpenoids, saponins and glycosides were also obtained by Obianime and Uche (2009) in their comparative study of the methanol extract of *P. amarus* leaves.

This work has been able to highlight the possible antibacterial potentials of *Phyllanthus amarus* oil extract. Extraction of active component of *Phyllanthus amarus* results in inhibitory concentrations recorded against the isolates, which gives a head start to pharmaceutical industries willing to develop potent antibiotics from *Phyllanthus amarus* oil extract. Hence a strong case is made on the need for government and grant agencies to commit resources to this novel area as it is a potential to deliver potent antibiotics against multi-drug resistant (MDR) strains cannot be overemphasized.

Conclusion

Phyllanthus amarus is an aromatic grass that produces a diverse array of bioactive compounds and exhibits a wide range of therapeutic activities. It has already found applications in the cosmetic and perfumery industries due to its strong fragrance. The therapeutic value of lemon grass and its essential oil may enable its use in herbal medicine in future.Demonstration of antibacterial activities of *Phyllanthus amarus* oil extract against *Staphylococcus aureus* and *Pseudomonas aureginosa* is an indication that *Phyllanthus amaru s*is a potential source for the production of drugs with a broad spectrum of activity. This study affirmed the antimicrobial potentials of *P. amarus* and revealed the molecules responsible for such abilities. This plant extract considering its potency, availability and cost-effectiveness, may be explored for therapeutic advances against drug-resistant organisms and it is recommended that *Phyllanthus amarus* oil extract have traditionally provided source of hope for novel drugs compounds, it has made a large contributions to human health and wellbeing.

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SCIENCE AND TECHNOLOGY: A PANACEA TO NATIONAL SECURITY CHALLENGES

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Abstract
No nation on earth today is free from security challenge but the side of the coin that faces each nation differs from one nation to the other. Security of life and properties is the responsibility of any government irrespective of the location whether in the urban or rural areas within the jurisdiction of such a government. This research work focus on the root causes of insecurity been faced in this country which has become a threat to her co-existence as a nation. These security problems range from herdsmen, banditry, cyber-security, fraudster as well as ritual killing among others. This has adverse effects on her economics growth with wrong signal to investors and migration of her citizens.
The methods to adopt, science and technology based on ranges from information technology like biometric and biometric authentication, games theory, network surveillance and involvement professional statisticians can also engaged to curb and forestall any further security challenges in the country.
Key words: biometric, government, network surveillance and security,

Introduction

Security as it is being generally understood to be any measure put in place by individual, family, organization, and in general by the government so as to ascertain protection of life, properties and keeping the environment safe for as many investors who desire to establish an industry which will add value to the immediate environment and public in general. According to Akin (2008) refers to security as the situation that exist as a result of the establishment of measures for the protection of persons, information and property against hostile persons, influences, and action. For any nation that will survive and thrive, security factor must be taken with all seriousness. The environment must be friendly to every key players in the economic growth of any nation, specifically Nigeria as been fondly call the giant of Africa.
Security can also be referred to as stability and continuity of livelihood (stable and steady income) predictability of daily protection from crime, and freedom from psychological harm and it's the pillar upon which every meaningful development in any nation is sustained. This research focuses on the scientific and technological methods of subduing numerous security challenges in the country**.** Ekeh, *et al. (*2021) posited that a well secured environment always inspires greater minds to achieve greater things that guarantees growth and development of the nation. To secure an environment is to protect it from attack which affect the physical, psychological and emotional wellbeing of the people. Every meaningful development can only be achieved in an atmosphere of peace and tranquillity, which is national security. Dada, (2016) submitted that national security involves effective policing and careful watch against elements that could breach peace or jeopardize the social, economic and political development of the country.

Nigeria and Security Challenges

Nigeria is facing security crisis because of inadequate, misplaced and misguided security agenda. Every country exist to give security to all human beings living in the country. Some of the security challenges facing Nigeria are food, finances, transport, health care, personal and national security issues. We also witness political and tribal/ethnic crises, political assassinations and kidnapping/abduction in different parts of the countries. There are cases of armed robbery here and there, human trafficking, environmental degradation and separatist agitations of the Niger Delta, desertification challenge in some parts of the Northern Nigeria, erosion problems in the Southern Eastern Nigeria. Annual flood in urban centres in Nigeria, to mention but a few. It seems we have limited issues of security to militarization or national security alone. Crises erupted from Nigeria systems; majority of Nigerians seem to lack access to pipe borne water, health care facilities, electricity, good transport system, food, affordable and qualitative education. Lack of these aforementioned could have given rise to some pervasive ethnic-religious crises and terrorism in the country.

The Fulani Herdsmen in most cases, settle in vital areas to rear their cattle and when the migration continued to be dictated by economic and social political factors, increased trends of conflicts between the herders and their host communities (farmers escalated). Many Nigerians lost their lives, properties/farm lands, or crops every year to Fulani herders. The conflicts between Fulani Herdsmen and farmers came into existence as a result of encroachment of farmlands by the Fulani Herders Ajibefun, (2017)

Insecurity is a state of danger, uncertainty, lack of protection and safety of lives and properties. Beland, (2005) defined insecurity as the state of fear or anxiety steaming from a concrete or alleged lack of protection. Achumba Ighomeroho and Akpor, (2013) defines Insecurity from two perspectives, firstly, insecurity is the state of being open or subject to danger or treat of danger, where danger is the condition of being susceptible to harm or injury. Secondly, insecurity is the state of being exposed to risk or anxiety, where anxiety is a vague of unpleasant emotion that is experienced in anticipation of some misfortune. These definitions of insecurity underscore a major point that those affected by insecurity are not only uncertain or unaware of what would happen but they are also venerable to the threat and dangers when it occur.

Ndubuisi-Okolo and Theresa, (2019) stated that insecurity is a critical issue that has hampered industrialization and sustainable development in Nigeria in particular and Africa at large. Nigeria which is perceived as the giant of Africa has witnessed an unprecedented incidences of insecurity ranging from the activities of Fulani Herdsmen; Boko haram insurgencies; armed robbers attacks; kidnapping ; political/religious crisis; murder; destruction of oil facilities by Niger Delta militants; child abduction/trafficking e.t.c. other crimes committed by these Islamic sects include; destruction of vehicles; burning of churches; police stations; schools; hospitals; clinics; shops; army barracks and residential houses; abduction of expatriates. These challenges have made security a pivotal issue that has culminated in the allocation of country's meagre resource to the protection of lives and properties.

Insecurity in Nigeria has led to the destruction of lives, properties, and equipment; relocation and closing down of businesses, Adeleke, (2013). Similarly, insecurity has threatened the desperate attempt to industrialize, the existing social-cultural tranquillity and sustainable development. Consequently, upon this, the Global Peace Index, (2012) rated Nigeria law as regards security matters. The implication is that Nigeria symbolizes unsafe of abode and has also been included among one of the terrorist countries of the world, Ndubuisi and Theresa, (2019).

Conceptual Framework

Security concept

Rothschild, (1995) defines security as an enigmatic concept that meant very different things for people according to their time and place in human history. Security means safety to the average street man or woman, or protection form harm and risk. Protection is very necessary because, as Zabadi, (2011) states that, 'until one can be assured of his physical safety, everything else will be meaningless' Zabadi, (2011). Moreover, Williams, (2013) define security as widely associated with mitigating the threat to cherished value, particularly if left unchecked in the nearest future threatens the existence of a specific referent object. Onibade,. (2013) submitted that security is seen as a situation that emerges from the establishment of ways of protecting individuals, information, and properties from hostile people, influences, and behaviour. It has to do with a situation in which people can travel around within a given natural spaces or elsewhere without any real and imaginary threats to their lives or properties. A condition where, with their two eyes firmly closed, people will sleep at night.

Insecurity Concept

According to the Advanced Learners Dictionary, insecurity simply means state of not being safe or protected. In wider perspective, insecurity presupposes a state of general breakdown of law and order, or a situation where the citizens of a country are exposed to an uncontrollable danger whereby everyone lives in fear of whatever might happen the next moment. Insecurity is just the opposite of what we have as security. Insecurity is often used in a number of ways. Many people would take it to mean lack of safety or the existence of danger; hazard; uncertainty; lack of trust, doubtful; inadequately guarded or protected; lack of stability; lack of protection and lack of safety. Achumba, et al (2013). Insecurity will make you lose trust, be frightened, unsettled, oppressed, lose focus, and be devastated and lose your humanity. Adebanjoko and Uguwoke, (2014) opined that insecurity is the state of being subject in every respect to terror, threat, risk, molestation, that often accounted for the arms and nuclear weapons race to protect the state. Insecurity is the state of been subject to danger or injury. The anxiety that is experienced when one feels vulnerable and insure. Michael Ezemoruye, (2011) affirms the above definition of insecurity as 'a state of been not secure,' 'lack of confidence'.

Insecurity really is not a problem that is particular to Nigeria. It has geographical spread across the globe. The United States, United Kingdom, and many countries face the challenges of insecurity within their borders on a daily basis, Adejumo, (2011). According to Adejumo the difference between these nations and Nigeria is how they managed threat posed by the insecurity. According to Omede (2015) the speed at which evil is growing in Nigeria and merciless ways that lives of innocent ones are being wasted are worrisome. People are burdened on daily basis with psychological and emotional trauma resulting from gory sight of lifeless and mutilated bodies of loved family members, close associates and colleagues littered on the streets, public squares and everywhere. A stable economy cannot be guaranteed in the

Causes of security challenge in nigeria

Causes of Nigeria security challenge according to Catholic Laity Connial of Nigeria (CLCN, 2019) spell out the following root causes of insecurity:

i. **Moral quandary:** Some of these prevailing moral issues of diversified native and consequences include; corruptions of different types and standards, inordinate desire to acquire wealth, debauchery which is made incredibly present in suffocating marital infidelity, haggling sexual relations among teens, sex

trivialization in the Institution of higher learning and marriage among the people of some gender (gay)

ii. **Breakdown of our cherished cultural values:** Cultural values link the community with their ancestor and with God. The value of the sacredness of life helps to eschew all attitude contrary to the promotion of human life while the value of communication stands against all attitudes that tends to promote excessive individualism and despotism. Values help to create a human community where her values, which are antidotes to moral crises are cultivated.

iii. **Injustice and faulty justice system:** Our legal and justice are so fault that the rule of laws have become the rule of men. Most of our laws are archaic and moribund. Some are prescriptions made by superiors for binding on injurious. There exist some "untouchables" cabals who are above the laws of this land. They can neither be arrested nor prosecuted. The worship of the untouchables of the land is a juxtaposition that reveals an aspect of security challenges in Nigeria. Such examples is the refusal of the former Head of State, General Ibrahim Babangida who repeatedly defy summons to appear before justice Oputa panel to answer allegations of human right abuses. Big shot in the country have been linked with sponsorship of Boko Haram insurgency in Nigeria where thousands of lives have been lost and thousand displaced, yet the untouchables are still parading the streets unscratched. James Ibori was innocent at home but guilty abroad, Nigeria law is meant for only the poor (Sta. Punch 04\04/2021).

iv. **Religious Intolerance and ethnic conflict:** Effiong C. (2019) also put forward the following factors as religious intolerance and ethnic conflicts.

- Devetion of ones religion.
- Value conflict
- Psychological jealousy
- Unregulated competition
- Alibi of other conflicts
- Growing pains

These aforementioned points have independently or in combination been causal elements influencing actions throughout history of security challenges emanating from religious intolerance. It could be over zealousness to ones religion, competition for scare goods, attitude to certain individuals of a religious belief that could provoke physiological jealousy which in turn leads to some kind of violence. It could be linked to ostensibly cultural differences that spill over into political conflict, reducing ends to economics.

Methology

Biometric and Biometric Authentication

Biometric is defined as a process of identifying a person identify on the basis of physiological and behavioural features; is capable of differentiating between the genuine person and the fake one.

Liu and Silverman, (2001) discussed a biometric system as the system which identifies data of the person by fetching the sets of features and verifying it with the set stored in the database, which is dependent on the application context. An individual's identity can be found out in two ways: identification and verification. Working of biometric system is divided into eight stages. First, capturing the biometric. Second, processing, enrolling and extraction of biometric template. Third, storing data in token such as smart card. Fourth, lively scan the selected biometric. Fifth, processing of biometric template. Sixty, matching of biometric with the store one. Seventh, matching score is provided to the business application. Eight, recording of correct audit train regards to the system.

Biometric Authentication: Biometric authentication is the security procedure that involves the use of unique biological characteristic of individuals such as retinas, irises, voice, facial characteristics, and fingerprints in order to verify people are who they claim to be, this process used to control access to physical and digital resources such as buildings, room, and different devices. The word biometric is a combination of two words: bio (human) and metric (measurement). It is a metric related to human features which make an individual different from other individual. Now, although biometric system can combine authentication and identification, there is a major difference between the two. Specifically, identification asks, 'who are you?' Biometric identification verifies who are you based on your body measurements. Biometric authentication goes one step further and uses that information to compare you against database and enter your information in service. Biometric Authentication works by comparing two sets of data; the first one is present by the owner of the device, while the second one belongs to a device visitor. If the two data are nearly identical, the devices knows the 'visitor' and the 'owner' are one the same, and give access to the person. The important thing to note is that the match between the two data sets has to be nearly identical bur not exactly 100%. One might have slightly sweaty finger or a tiny scar that changes the print pattern.

Changing the process so that it does not require and exact match greatly diminishes the chance of false negative (the device does not recognize your finger print) but also increase the odds that a fake fingerprint might be considered genuine

Games theory

Abdolmajid, (2021) put forward that terrorist attacks are of serious concern for the national economy and quality of life. He further, iterated posited that every year, thousands of people lose their lives or get injured or kidnapped due to this attack. In 2015, a total of 11,774 terrorist attacks occurred worldwide, resulting in more than 28,300 death, and more than 35,300 injuries. In addition, more than 12,100 people were kidnapped or taken hostage.

The psychological impact of the continued threat of terrorism is also considerable. Such incident create fear, panic, anxiety and distress in the society. Protecting critical infrastructures against terrorism is one of the top priorities in homeland security. Games theory as one of the statistical tools to curb menace of security challenge can be applied in finding optimal protection strategies for various infrastructure against intentional attacks. He further discussed the effective use of Games theory as being divided not two parts

(i) Resource allocation models; (ii) Patrolling and search game model.

Xiaojum, *et al. (*2013) said resource allocation to protect against intentional attacks is generally expensive and decoding how to allocate resources in order to protect critical infrastructures is a difficult problem. Many factors affects such allocation policy. For example, equity plays a significant role in determine defence allocation in practice. Moreover, creating a balance to protect against different type of threat (such as biological attacks versus bomb or between terrorism and non-terrorism prevention activities) is another factor. Allocation of resources to protect critical infrastructures involves decision made different levels in an organisation's hierarchy; strategic and operational decisions. The decision influence each other and need to be studied simultaneously. However, in reality, there may be many overarching protection options and each options may cover only a subset of targets. This subset may be each states of the country.

(Brian et al 2012) posited that the patrolling and search games are usually played on a graph where the players makes decisions over a time horizon. The members change over time and the terrorist tend to time their attacks according to these changes. The new model with dynamically changing node values, mode based attacks times, multiples patroller and attacks were designed to handle challenges like multiple attackers and human resources limitation.

John, (2005) put forward that protecting critical infrastructures against terrorism in one of the top priorities in homeland security. The physical protection of critical infrastructure can prevent the successful execution of high impact terrorist attacks. In addition, the immediate response to a a terrorist attacks against critical infrastructures can prevent the cascading effects associated with such attacks. Those reasons along with many high profile terrorist attacks that have happened during the past couple of decades. The consequences of attacks could be substantially reduced by evaluating the risk associated with each site within the infrastructure, mitigation planning and designing protection strategies and response policies.
Different approaches have been proposed to model strategic interactions in security problems these methods include system analysis (Elisabeth and Beth (2021), mathematical modelling (Benard 2004), probabilistic risk analysis (Mary (2005), Garrick et al (2004) and adversarial risk analysis (David, et al (2009).
However, since the terrorists can be strategic in their attacks, game – theoretic analysis of such attacks yields more realistic results. Thus, recent studies concentrated on developing game – theoretic model to capture terrorism risk and applying the result in enhancing security measure. One such model, AR – MOR (Praveen *et al.,* 2008; Praveen *et al.,* 2007; Praveen *et al.,* 2006; James *et al.,* 2008) has been deployed at the Los Angeles International Airport [LAX] to enhance the security of the Airport which the same can be replicated into all strategic places in Nigeria as well. Games theory applications is to find optimal protection strategic for various infrastructures against intentional attack.

Network Surveillance
Jeske, *et al. (*2018) stated that network surveillance is a term that means monitoring a network to detect abnormal behaviour. Applications where network surveillance is employed vary considerably, since the term network itself has a broad meaning; in telecommunications, a data network is infrastructure that enables point-to-point information transfer.
Interest in monitoring a network is driven by a desire to identify transitions away from normal or baseline, operation conditions. Such a transition may be associated with an interesting cause. In the case of a data network, the transition may signal a failure of a key piece of equipment of possibly a malicious attack.
He further discussed that malicious intrusion attempts such as spam campaigns, phishing, personal data theft, and worms, Distributing Denial-of Service (DDOS) attacks, man-in-middle attacks, and fast flux occur practically every day and have become common place in contemporary computer networks. These threats can incur significant financial damage and are a severe harm to the integrity of personal information.
The ability of change point detection techniques to run at high speeds and with low detection delays presents an interesting opportunity. What if one could combine such techniques with others that offer a very low False Alarm Rate (FAR) but are too heavy to use at line speeds?

Engagement of Professional Statisticians
Statisticians being the custodians of data dictate the tune of the data, they determine the tune that already processed data will bring out as they put to use the statistical methods known as statistical surveillance which is the tool for curbing security challenge of any nations. Statistic which are used in many of the security manager's function including budget requests and justification, security incident and crime analysis, risk analysis and programme monitoring and evaluation. Both internal and external statistical analysis are crucial for effective security management. After statisticians might have manipulated the raw data through the statistical method by which you draw inference with which meaningful decision can be arrived at and the security challenge is reduced to minimal level or complete eradication. Wilson et al (2006) posited that the data was out there to warn the United State of America about

impending attack, he asked, why did not we see it? This was frequently asked question in the weeks and months after the terrorist attack on the World Trade Centre and the Pentagon on September 2001. In the wake of the attacks, statisticians moved quickly to become part of the national response to the global war on terrorism.

Olayiwola (2022) advocated that proper statistics can help solve the security challenge in Nigeria. He attributed the insecurity challenge to communication gap in many quarters and communication gap which occurred as a result of lack of information. According to him, certain people are agitating for certain things that have not been identified which has given rise to the agitations. He said tracing and identifying what the people were agitating for would help solve the insecurity problem. He also said sampling technique which happen to be one of the statistical tool can also be organized through survey and from survey certain response predictors into model. Factors can be deduced from the response to the survey questions. This model according to him can as well be developed and run it, and at the end of the day it will search round and pick a particular response that will unveil the truth about the major cause of security problem in the country and such problem identified will be focused on and be solved.

Possible solution to security challenges

If Nigeria as a nation wishes to get out of this persistence security threats, the following steps suggested by Nashakyea, (2019) has to be taken without wasting time.

i. The role of the Government: the main responsibility of any government is to ensure the security and safety of her citizens, who willingly surrender their rights to be overseen by them. Government can ensure the secutity and safety of her citizenry through good governance. Good governance aids at;
   - Promoting and sustaining holistic and integrated human development, enabling people lead clean, descent, happy and autonomous lives and encouraging better service delivery and improved accountability. To deliver better services, governing bodies and individuals must act in the public interest at all times: consistent with legislation and government policies, avoiding self –interest and if necessary, act against perceived organisational interest.

ii. The role of religious bodies: The real essences of all religious is to sue for an ensure peace. Christians and Muslims are expected to be examples of peace. When we maintain a relationship with God, our common language of expression and alter of service becomes commitment to quality service delivery.

iii. Corporate and individual roles: corporate governance and corporate organizations can ensure the effective functioning of their organisations. Organisations that insure good governance give back to the community by insuring that the interest of all stakeholders is taken care of. To corroborate the above, Eme, Nwachukwu and Olise (2017) postulates the following as the solution to the Nigeria security threat thus: leadership development, good governance, social-economic development, elimination of corruption, and entrenchment of social justice, radical change in values and development of more balanced security strategy to counter violence crimes and local terrorism (Boko Haram). He says Nigeria needs to develop visionary leadership, war against insecurity would be won only by raising good governance, provides gainful employment, ensure fairness, social justice and equal right for all as well as radical change in value system which is paramount and imperative in restoring security in the country.

Conclusion

Combating insecurity goes beyond guns and drones, but rather spreading good education, good governance, and creating employment for the teeming youth who are awfully tough and restive because the future appears black. The solution involves concerted effort from all and sundry to build a nation where peace and justice shall reign.

Recommendations

1. Government should improve on information technology by installing CCTVs to monitor illegal immigrants, arms and ammunition into the country and tackle unemployment.
2. The Nigerian security agencies should be well remunerated to shun bribery and corruption.
3. There is need for civil societies to raise public awareness as well as in lobbying for concrete change or in helping to initiate and carry out a process of reforming national integrity.
4. Government need to modernize the security agencies with training, intelligence sharing, advanced technology, logistics, motivations and changes of orientations.

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EFFECT OF SELECTED COAGULANTS ON THE PHYSICAL AND CHEMICAL PROPERTIES OF SOY CHEESE (TOFU)

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Abstract
This study evaluated the effect of coagulants on the physical and chemical properties of Soy cheese. Soy cheese was produced from four coagulants namely; Alum salt, Mornings seed extract, Sodom Apple extracts and lime juice. The results showed that all the four samples (ABCD) were acceptable. The moisture contents of A B, C and D samples were 62, 65.9, 66.8 and 62.8 indicated that sample C had the highest thus, can easily spoil. The protein of sample A gave 13.8 which is higher than that of others. Fat values produced from the samples were 6.25, 4.54, 3.7 and 5.06 with the highest recorded by sample A. Ash contents were 3.04, 2.21, 2.13 and 2.46 with sample A given the highest followed by D. There was no significant difference in the crude fibre considered but higher result was shown in A (0.09mg/10g). Sample D had the highest carbohydrate content of 18.34mg/100g, while others A, B and C had (14.76, 7.18 and 16.89) mg/100g respectively. This study indicated that soybean, Moringa seed, Lime and Sodom Apple are always available in the various parts of the Country and thus, guaranteed Soy cheese production. Hence, there is the need to encourage Local production by government and the concern individual with intensive research for future purposes.
Keywords: Soy cheese, Coagulant, Alum Salt, Sodom Apple, Moringa Seed, Lemon Juice

Introduction

Soy cheese (Tofu) is a derivative of soybean. Soybean is a cheap source of high-quality plant protein that is comparable to animal source of protein (Ndife, 2019, Amusat and Ademola 2013). Soymilk is produced from soybean and after boiling, a coagulant (any of Alum salt, Moringa seed extract, Sodom apple extract, Lime juice) is added to thicken soymilk into curds by changing the protein structure.

Soybean, known as "wonder bean," the "meat of the soil," and the richest source of plant protein ever known to man is one of the greatest oil seed plant available on earth, and the only legume that give complete protein similar to all forms of animal protein. It contains eight essential **amino acids** and is a rich source of poly unsaturated fatty acids (including the good fat-omega 3) and free of cholesterol (Siyanna, 2022**;** Mikstas, 2021). Among its products is soymilk which is used in producing Soy cheese. Soy products are excellent source of infection busting antioxidants, vitamin B complex (including folate) and iron (Rizzo, 2020). It has been proven that soy protein has ability to promote heart health (American Heart Association 2020). Coagulant is used in curdling the soymilk. Coagulants used are alum salt, moringa seed extract, sodom apple extract and lime juice. Coagulant has effect on the physical, chemical and sensory evaluation of the Soy cheese (Tofu) produced.

The objective of this study is to evaluate the effect of coagulants on the properties of soy cheese and soy cake. It is also aimed to determine the acceptability of each and their comparism.

Materials and methods

Preparation of Soy Milk

This study was carried out to examine the comparative of analysis of soy cake (tofu) and proximate micro nutrient analysis of soy cheese (tofu). The production was carried out in food processing unit of home and rural economics. Questionnaire was given out to twenty

(20) students and staff of Home and Rural Economics Department in Oyo State College of Agricultural and Technology Igboora, Oyo State

The soy beans were sorted to remove dirt, stones and the spoilt ones, then washed. The seeds were blanched for 25 minutes and left in water to cool. The soy bean seeds were dehulled, drained out of water and milled. The soy milk was sieved and divided into four equal parts to cater for the four coagulants testing. Each part of the Soymilk was poured into a big pot and placed on fire.

Preparation of Coagulants

i. Sodom Apple Extract 10 g leaves were obtained and the juice was extracted 200ml was taken
ii. Moringa Seeds Extract: 300g. of Moringa seeds were ground and mixed in 300ml of water, and sieved and took 200ml
iii. Preparation of Alum Salt (Potassium Aluminium Sulphate): 200g. of Alum salt was ground into powder and dissolved in 250ml of water and sieved and used 200ml
iv. Preparation of Lime Juice: A quantity of Lime were juiced and sieved to give 200ml.

Preparation of Soy Cheese

Each Soymilk sample (in the pots) was allowed to boil for 30 minutes, the coagulants were added drop by drop during boiling, until it coagulated and the curd formed. The same was repeated for each sample. The soy paste was then screened in folded muslin cloth by squeezing out as much filtrate as possible, then salt and spice were added.

Results and discussion

Table 1: Sensory Evaluation of Soy cake (TOFU) using Alum Salt

Rating	Appearance		Taste		Colour		Aroma		Texture		Flavour		Overall acceptability	
	F	%	F	%	F	%	F	%	F	%	F	%	F	%
Like extremely	10	50	10	50	8	40	10	50	8	40	4	20	8.3	41.5
Like very much	4	20	5	25	8	40	8	40	7	35	8	40	6.7	33.5
Like moderately	6	30	5	25	4	20	2	10	5	25	2	10	3.80	19
Like slightly	-	-	1	5	-	-	-	-	-	-	6	3-	1.2	6
Neither like nor dislike	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dislike slightly	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dislike moderately	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dislike very much	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dislike extremely	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	20	100	20	100	20	100	20	100	20	100	20	100	20	100

Discussion

Appearance

From Table 1, the result shows that 50% of the respondents like the appearance of the soy cake produced extremely, 20% of the respondents like it very much while the remaining 30% of the respondents like it moderately

Taste

From Table 1, the result shows that 50% of the respondents like the taste of the soy cake produced, extremely 25% of the respondents like very much while 20% of the respondents like it moderately.

Colour

In terms of colour, 40% of the respondents like the colour of the soy cake produced extremely. 40% of the respondents like very much while the remaining 20% of the respondents like moderately

Aroma

In terms of aroma. 50% of the respondents like the aroma of the soy cake produced extremely, and 40% of the respondents like very much, while the remaining 10% of the respondent like it moderately

Texture

40% of the respondent like the texture of the soy cake produced extremely 35% of the respondent like very much while the remaining 25% of the respondent like it moderately

Flavour

20% of the respondent like the flavour of the soy cake produced extremely, 40% .of the respondents like very much, 10% of the respondent like moderately, while the remaining 30% of the respondent like it slightly.

Overall acceptability

41.5% of the respondent accepted the soy cake produced extremely, 33.5% of the respondents., like very much, 20% of the respondents like moderately and 5% like it moderately.

Table 2: Sensory Evaluation of soy cake (TOFU) using Moringa Seeds Extract

Rating	Appearance		Taste		Colour		Aroma		Texture		Flavor		Overall acceptability	
	F	%	F	%	F	%	F	%	F	%	F	%	F	%
Like extremely	9	45	8	40	4	20	5	25	8	40	5	25	6.5	32.5
Like very much	8	40	8	40	3	15	5	25	5	25	5	25	5.7	28.5
Like moderately	3	15	4	20	4	20	5	25	5	25	2	10	3.8	19
Like slightly	-	-			9	45	5	25	210		5	25	3.5	17.5
Neither like nor dislike	-		-		-		-		-		33	15	0.5	2.5
Dislike slightly	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dislike moderately	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dislike very much	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Dislike extremely	-	-	-	-	-	-	-	-	-	-
Total	20	20	100	20	20	20	20	20	20	100
	100			100	100	100	100			

Discussion

Appearance

From table 2 above, the result shows that 45% of the respondents like the appearance of the soy cake produced extremely, 40% of the respondents like it very much white the remaining 20% of the respondents like moderately

Taste

From table 2 above, the result shows that 40% of the respondents like the taste of the soy cake produced extremely, 20% of the respondents like very much 20% of te respondents like moderately while the remaining 20% of the respondents like slightly

Colour

From the above table the result shows that 20% of the respondents like the colour of the soy cake produced extremely. 15% of the respondents like very much, 20% like moderately while the remaining 45% like it slightly.

Aroma

From the above table the result shows that, 25% of respondents like the aroma of the soy cake produced extremely, 25% of the respondent like very much, while the remaining 25% of the respondents like it slightly.

Texture

In term of texture, 40%. of respondents like the texture of the soy cake produced extremely 25% of the respondent like very much,25% like moderately and the remaining 10% of the respondents like slightly

Flavour

In term of flavour 25% of respondents like the flavour of the soy cake produced extremely, 25% like very much, 10% like moderately 25% of the respondents like slightly, while 15% neither like it nor dislike the flavour

Overall acceptability

32.5% of respondents accepted the soy cake produced extremely 28.5% of the respondent like very much, 19.0% of the respondents like moderately, 17.5% of the respondents like slightly, while 2.5% neither like nor dislike it.

Table 3: Sensory Evaluation of soy cake (TOFU) using Sodom Apple

Rating	**Appearance**		**Taste**		**Colour**		**Aroma**		**Texture**		**Flavor**		**Overall acceptability**	
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**
Like extremely	9	45	10	50	10	50	6	25	5	25	6	30	7.7	38.5
Like it very much	2	10	4	20	5	25	8	40	6	30	8	40	5.5	27.5
Like moderately	4	20	6	30	5	25	6	30	4	20	6	30	5. 2	26.0
Like slightly	5	25	-				5 25		5	25	0	0	1.6	8.0
Neither like nor dislike	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Dislike slightly	-		-		-		-		-		-		-		-		-		-	
Dislike moderately	-		-		-		-		-		-		-		-		-		-	
Dislike very much	-		-		-		-		-		-		-		-		-		-	
Dislike extremely	-		-		-		-		-		-		-		-		-		-	
Total	20	100	20	100	20	100	20	100	20	100	20	100	20	100	20	100	20	100	20	100

Discussion

Appearance

From table 3, the result shows that 45% of the respondents like the appearance of the soy cake produced extremely, 10% of the respondents like it very much,20% like moderately while the remaining 25% of the respondents like slightly.

Taste

Also table 3 shows that 50% of the respondents like the taste of the soy cake produced extremely, 20% like very much, while the remaining 30% of the respondents like moderately.

Colour

The result of table 3 shows that 50% of the respondents like the colour of the soy cake produced extremely,. 25% like it very much , while the remaining 25%like moderately.

Aroma

From table 3 the result shows that, 30% of the respondent like the aroma of the soy cake produced extremely, 40% of the respondents like very much, while the remaining 30% of the respondents like moderately.

Texture

In term of texture, 25% .of the respondents like the texture of the soy cake produced extremely 30% like moderately, while the remaining 25% of the respondents like slightly

Flavour

In term of flavour 30% of the respondents like the flavour of the soy cake produced extremely, 40% like very much, while the remaining 30% of the respondent like moderately.

Overall acceptability

38% of the respondents accepted the soy cake produced extremely 28% like very much, 26% like moderately while the remaining 8% of the respondents like slightly.

Table 4: Sensory Evaluation of soy cake (TOFU) using lime juice

Rating	**Appearance**		**Taste**		**Colour**		**Aroma**		**Texture**		**Flavor**		**Overall acceptability**	
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**
Like extremely	5	25	8	40	5	25	5	25	4	20	5	25	5.3	26.5
Like very much	5	25	8	40	8	40	5	25	4	20	5	25	5.8	29.0
Like moderately	10	50	4	20	5	25	5	25	8	40	5	25	6.2	31.0
Like slightly	0	0	0	0	2	10	5	25	4	20	5	25	2.7	13.5

Neither like nor dislike	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dislike slightly	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dislike moderately	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dislike very much	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dislike extremely	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	20	100	20	100	20	100	20	100	20	100	20	100	20	100

Discussion

Appearance

From table 4, the result shows that 25% of the respondents like the appearance of the soy cake produced extremely, 25% like very much while the remaining 50% of the respondents like moderately.

Taste

Also table 4 result shows that 40% of the respondents like the taste of the soy cake produced extremely, 40% of the respondents like very much while the remaining 20% like moderately.

Colour

From the table, the result shows that 25% of the respondents like the colour of the soy cake produced extremely, 40% of the respondents like moderately while the remaining 10% of the respondents like slightly.

Aroma

Also table 4 result shows that 25% of the respondents like the aroma of the soy cake produced extremely, 25% of the respondents like very much, 25% like moderately while the remaining 30% of the respondents like slightly.

Texture

In term of texture, 20% .of the respondent like the texture of the soy cake produced extremely, 20% like very much, 40% like moderately while the remaining 20% of the respondent like slightly

Flavour

In term of flavour 25% of the respondent like the flavour of the soy cake produced extremely, 25% of the respondent like very much 25% like moderately while the remaining 25% of the respondent like slightly.

Overall acceptability

26.5% of the respondent accepted the soy cake produced extremely 29% like very much, 31% like moderately while the remaining 13.5% of the respondent like slightly.

Table 5: Micronutrients composition of soy cheese (TOFU) Produced

Sample	Vitamin B 1 (µg)	Vitamin B 2 (µg)	Vitamin C (µg)	Vitamin A(µg)	Calcium (mg/100)	Iron (mg/100)	Zinc (mg/100)	Magnesium (mg/100)
A	1.43 ±	3.037	3.48 ±	0.54	47.1	1.60 ±	0.98 ±	258.1 ± 1.83

	0.00		±0.2		0.38		±0.11		±0.79		0.17		0.11						
B	1.36	±	2.74		2.79		0.39		42.48		1.45		0.91		2.3296 ± 5.62				
	0.08		±0.62		±0.59		±0.08		±2.41		±0.45		±0.34						
C	1.36	±	2.57	±	2.77	±	0.37	±	39.95	±	1.36	±	0.91	±	218.73 ± 0.99				
	0.11		0.0		0.28		0.08		0.00		0.00		0.00						
D	1.35	±	2.07	±	2.72	±	0.43	±	32.14	±	1.09	±	0.73	±	176.29 ± 1.83				
	0.11		0.17		0.43		0.08		0.77		0.77		0.14						

Discussion

The vitamin B1 content of sample A, B, C D range from 1.43, 1.36, 1.36 respectively,
Sample A has the highest value, which is 1.43, while sample D has the lowest value
Vitamin B2 result showed that sample A 3.037 has the highest value while D 2.07 had the lowest value and
the highest vitamin C was found with Sample C, (3.48mg/100g).
Vitamin (retinol) is needed by humans for proper functioning of the sight and vision. The recommended dietary allowance for Vitamin A is 700ug of retino activity equivalent (RAE) per day for women and 900 ug per day far men. The result showed that sample A had the highest vitamin A content of 0.54ug.
The calcium content of sample A was found to be significantly high compared to other samples.
The iron content of Sample A was found to be significantly high compared to others samples
Similarly, same trend in calcium, iron was observed in zinc of Sample A. The zinc ranged from 0.98ml (A), 0.91 in B, 0.91m C and 0.73 in D.
Sample A had the highest value of magnesium

Table 6: The Proximate Analysis of soy cheese (TOFU) Produced

Sample	Moisture (mg/100)	Protein (mg/100)	Fat (mg/100)	Ash (mg/100)	Crude fibre (mg/100)	Carbohydrate (mg/100)
A	62 ± 1.41	13.8 ± 0.36	6.25 ± 0.22	3.04 ± 0.17	0.094 ± 0.1	14.76 ± 1.35
B	65.9 ± 0.77	10.0 ± 0.36	4.54 ± 0.22	2.21 ± 0.147	0.068 ± 0.1	17.18 ± 0.75
C	66.8 ±0.95	0.7 ± 0.24	4.37 ± 0.2	2.13± 0.14	0.067 ± 0.1	16.89 ± 0.94
D	62.8 ± 0.68	11.2 ± 0.50	5.06 ± 0.2	2.46 ± 0.14	0.059 ± 0.02	18.34 ± 0.77

Discussion

Table 6 illustrated that the moisture, fat, protein, ash, crude fibre and carbohydrate. Moisture content of sample A, B, C and D were 62, 65.9, 66.8 and 62.8 respectively.
Moisture content in food commodity play a key role in the chef life of food.
Sample C had the highest content which can easily spoiled. The protein content of sample A obtained from the analysis was 13.8 and this is higher in amount than other samples. Proteins are essential component of diet needed for survival of animal and humans
From this study, fat content among the samples varied from 6.25, 4.54, 4.37 to 5.06, the highest value of fat exhibited was by Sample A
Ash content obtained from the study were 3.04, 2.21, 2.13 and 2.46, while sample A had the highest ash content – followed by sample D
There is no significant different in crude fibre value among the samples, the higher crude fiber was found in Sample A (0.094mg/100g)
The highest carbohydrate was significantly noticed in Sample D compared to the samples. The carbohydrate ranges from 14.76mg/100g, 7.18mg/100g, 16.89mg/100g to 18.34mg/100g

Conclusion and Recommendation

Conclusion

The proximate and micronutrients results of Sample A had the highest values but lowest in carbohydrates and moisture content. All the samples were well accepted but the least is sample D The product if put to use, can increase intake of dietary fibre which has low prevalence of chronic disease. The study helps in the assurance of food security in country because soy bean is a yearly legume that is always available in all the producing area of the country..

Recommendations

There is the need for Government to encourage local producers who hope to carry out research on the use of soybean by approving grant for these purposes.

- Home makers and house wives should embrace soybean as a valuable food source that we should value that we have and be proud of it at lease since we can bring something good out of it.
- Government should encourage farmer to grow local grains so that more people will be aware of them and be a source of foreign exchange earning when exported.

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PHYTOCHEMICAL, NUTRITIVE COMPOSITION AND ANTIOXIDANT PROPERTY OF TOMATO (*LYCOPERSICUM ESCULENTUM MILL*)

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Abstract
Medicinal plants have continued to be used for the treatments of coughs, gastrointestinal disturbances, hypertension, impotence, insomnia, diarrhea, dysentery, scabies, worm infections and malaria. (Lycopersicum esculentum) because of its bioactive and nutritive composition has been used for the treatment of cancer, cardiovascular disease ,weak immune system, organ failure and as antioxidant for its Unique. This study was carried out to determine the phytochemical and nutritive composition present in Lycopersicm esculentum that it unique in traditional medicine. Lycopersicum esculentum fruits were air dried in the laboratory for two weeks. The dried fruit were grounded into powdery blender.50g of the powdered was soaked in methanol for three days. The mixture was filtered using Whatman No 1 filter paper. The filtrate was subjected to qualitative and quantitative analysis by using established methods. The results showed that Lycopersicum esculentum contained saponin, tannin, flavonoids, terpenoid, coumarin, phenol, protein and carbohydrate. Emodin, anthocyanin and cardiac Glycosides were absent. Saponin and flavonoids were found at higher percentage (4.73mg/g) and (3.63mg/g) respectively. Total phenol and tannin concentration were lower concentration .Antioxidant analysis using DPPH showed that Lycopersicum esculentum is a good free radical scavenging agent. Its percentage inhibition concentration at (100ug/ml) was about 71% when compare with same concentration of the standard (ascorbic acid). The trial therefore showed that (Lycopersicum esculentum can be used as a good therapeutic medicine and as a source of natural antioxidants,
Keywords: *Lycopersicom esculentum, phytochemical, antioxidant and nutritive*

Introduction

Nature is kind to human being because our environments are blessed with plants. These plants produce secondary metabolites which are of considerable importance to human health. The bioactive compounds have been used to treat various types of diseases, such as cardiovascular disease (CVD), cancer, and neurodegenerative diseases (Cheng *et al.*, 2019; Li *et al.*, 2020; Park *et al.*, 2020). Nutrients play important role in satisfying human needs for energy, body building and other life processes, a deficiency may results in abnormalities such as impaired mental health, kwashiorkor, oedema, organ failure, weak immune system, poor vitamin absorption, and heart disease (Adname *et al.*, 2012) .The tomato *(Lycopersicum esculentum* L) fruit is an important vegetable that has been used for its nutritive value and for medicinal purposes since ages. Tomato belong to *Solanaceae* family and genus Solanum. The most common species in the family are (Solanum lycopersicum L), Potato (*Solanum tuberosum L.*), Tobacco (*Nicotiana tabacum L.*), Pepper (*Piper nigrum L.*) and Egg plant (*Solanum melongena L).*Tomato has been found useful in traditional medicine for the treatment of cancer diseases such as lung, prostrate, stomach, cervical, Oral, breast, oesophageal, pancreatic, colorectal. It is also used as natural detoxifying agent for the body waste (Bhomik *et al.*, 2012). The presence of phytochemical such as flavonoids and lycopene make it a good antioxidant (Allardice, 1993). *Lycopersicum esculentum* is also a good source of vitamins A, B1, vitamin B2, C, soluble sugar, organic acids and it contains

large quantity of water (Kochhar, 1986). Flavonoids also help to manage symptoms of cardiovascular disease (Tiwari and Husain, 2017). Traditional medicine has been used since time immemorial to treat different ailments. The advent of orthodox or modern medicine has long time reduced the dominance of the used of herbs in curing diseases. Just of recent in Nigeria, the used of herbs has resurface again because of many hazards recorded from the use of orthodox medicine which is very expensive and difficult to get at times. *Lycopersicum esculentum*, due to its high demand for products with improved nutritive and sensory attribute, locally produced tomato can be an importance source to consumer needs. This research aims at investigating phytochemical present in *Lycopersicum esculentum* and the efficacy of phytochemical as antioxidant using methanol extract of *Lycopersicon esculentum* produced in Igboora, Ibarapa central area of Oyo State.

Materials and Methods

Plant Sample Preparation

Tomato fruits used for the analysis were bought from a farm in Igboora. The fruits were identified and authenticated at herbarium Department University of Ibadan, Ibadan. Tomato fruits were washed with clean water to remove dirt, sliced with knife, sun dried for five days. The dried fruit were then grounded into powdery form. The powdered tomato was soaked into methanol for 72 hours in the laboratory. The methanol solution was then filtered using the whatman filter paper. The filtrate was then analyzed for the presence of different phytochemicals, protein and carbohydrates present in tomato.

Preparation of extract from tomato (*Lycopersicum esculentum* L)

The dried powder (*Lycopersicum esculentum)* (250g) was soaked into 500ml methanol. The solution was allowed to stand for three days at room temperature. After three days the solution was filtered using Whatman (No 1) filter paper. The filtrate was then kept in a 10ml specimen bottle, covered and labeled, and put inside cupboard for further uses.

Qualitative Phytochemical Analysis

The crude methanol extract were subjected to phytochemical screening by using the procedure used by Manjulika Yadav *et al.,* 2014 and Williams Charles Evans. 2005.The phytochemicals present are saponin (Frost test),flavonoids(Lead acetate test),steroid(Salkowaski test), terpenoid (Salkowaski test), coumarin (reaction with 10%NaOH), emodin (reaction with ammonium hydroxide and benzene),quinone (HCl test),anthocyanin(reaction with acid and ammonia),alkaloid (Hagers test),cardiac glycosides (Legal test), phenol (ferric chloride test), chalcones (NH_4OH test),diterpene s(cupric acetate test, protein (conc HNO_3 test), carbohydrate (Molisch test).

Proximate analysis

Proximate composition of *Lycopersicon esculentum* for carbohydrate was determined by the methods described by AOAC (2006). Crude protein analysis was carried out by the method described by Oyeyemi *et al. (*2017).

Quantitative Phytochemical Analysis

The quantitative analysis was done using the established method used by Mythili *et al. (*2014) and Obadoni and Ochuko (2001). Total phenol quantity in extract was determined using folin-Ciocalteu in Mythili *et al.,*(2014), tannin present was. The following phytochemicals (total phenol, tannin, flavonoids were determine quantitatively using (folin-Ciocalteu in Mythili *et al.,* 2014).Alkaloid (Harbone, 2009). Percentage saponin was determined using (Obadoni and Ochuko, 2001).

Statistical Analysis
The data obtained in triplicate were analyzed using Probit analysis using Duncan Multiple Range Test (DMRT) and Analysis of variance Anova (ANOVA).

Determination of Antioxidant Properties of *Lycopersicon esculentum*
The free radical scavenging activity of *Lycopersicon esculentum* was determined according to the method described by Kordali *et al. (*2005). 0.1 mM solution of DPPH in methanol was prepared; 1ml of the solution was added to 1 ml of extract in water at different concentrations (0.1to 0.8 mg/mL).The mixture was shaken vigorously and allowed to stand at room temperature for 30 min. The absorbance was measured at 517 nm by using a UV-Visible Spectrophotometer. Lower absorbance of the reaction mixture indicated higher free radical scavenging activity. The percent DPPH scavenging effect was calculated using the following equation
DPPH Scavenging effect (%) = [(A0-A1)/A0] x 100
Where A0 was the absorbance of the control and A1 was the absorbance in the presence of the standard sample or extract.

Statistical Analysis
The results of the antioxidant analysis were expressed as a mean ± standard deviation. The results were replicated three times. The data were analyzed using Pearsons correlation coefficient (r) at $p<0.05$. Correlations among data obtained were calculated using Pearson's correlation coefficient (r) and $P<0.05$ was considered significantly different, SPSS 15 Version was used for the statistical analysis

Results and Discussion
Table 1: Qualitative Phytochemical Screening. (Procedures in Yadav and Agrawala., 2011; Williams Charles Evans. 2005)

	Phytochemicals	Inference
1	Saponin (Froth's Test)	+
2	Tannin (Braymer's Test)	+
3	Flavonoid (Lead acetate Test)	+
4	Steroid (Salkowaski's Test)	+
5	Terpenoid (Salkowaski's test)	+
6	Coumarin (Reaction with 10 % NaOH)	+
7	Emodin (Reaction with Ammonium hydroxide and benzene)	-
8	Quinone (Hcl)	+
09	Anthocyanins (Reaction with Acid and Ammonia)	-
10	Alkaloid (Hager's Test)	+
11	Cardiac Glycosides (Legal's Test)	-
12	Phenols (Ferric Chloride's Test)	+
13	Chalcones (NH_4OH's Test)	+
14	Di-terpenes (Cupric Acetate's Test)	+
15	Protein (Conc HNO_3)	+
16	Carbohydrate (Molisch's Test)	+

+ Present, - absent

Table 2: Results of the Quantitative Phytochemical screening.

Phytochemical	Concentration	Method.
Total Phenolics (mg/g GAE)	0.552±0.004	Folin-Ciocalteu method in K Mythili *et al.*, 2014,
Tannin (mg/g GAE)	0.427±0.005	Folin-Ciocalteu method *in* K Mythili *et al.*, 2014,
Alkaloid (mg/g)	1.94±0.05	Harborne JB, 1973.
Flavonoid (mg/g RE)	3.363±0.003	Folin-Ciocalteu method *in* K Mythili *et al.*, 2014,
% Saponin	4.73±0.82	Obadoni and Ochuko, 2001.

Values are express as mean ±standard deviation of triplicate determinations.

Table 3: Result of Antioxidant Analysis of *Lycopersicon esculentum*

Conc. (µg/mL)	% IH 1	% IH 2	% IH 3	MEAN	SD	MEAN±SD
100.00	68.10	68.10	68.60	68.27	0.29	68.27±0.29
50.00	36.45	36.45	36.45	36.45	0.00	36.45±0.00
25.00	19.33	19.33	19.33	19.33	0.00	19.33±0.00
12.50	11.23	11.23	11.23	11.23	0.00	11.23±0.00
6.25	8.08	8.10	8.15	8.11	0.04	8.11±0.04

Table 4: Result of Antioxidant Analysis of Ascorbic acid

Conc. (µg/mL)	% IH 1	% IH 2	% IH 3	MEAN	SD	MEAN±SD
100.00	96.12	96.19	96.17	96.16	0.04	96.16±0.04
50.00	88.85	88.72	88.79	88.79	0.07	88.79±0.07
25.00	55.77	55.71	55.78	55.75	0.04	55.75±0.04
12.50	46.39	46.18	46.29	46.29	0.11	46.29±0.11
6.25	37.89	37.83	37.22	37.65	0.37	37.65±0.37

The result of the phytochemical analysis in Table 1, showed that tomato contained nutritive nutrients that are of high benefits to man. The secondary metabolites such as saponin, tannin, flavonoids, steroids, terpenoids, coumarin, phenol and diterpenes found in tomato play an important role in improving the immune system. Flavonoids and phenol are used as antioxidant by scavenging the free radical present in the body as a result of reactive oxygen specie (ROS).Carbohydrate and protein present make tomato to be a good source of energy and including the maintenance of cellular structure, transport and storage of nutrients, wound healing, and repair of damaged tissues (Flango *et al.*,(2017). Table 2 showed the quantitative analysis of five major phytochemicals present in *Lycopersicon esculentum* . Flavonoids (3.363mg1/100g) and saponin (4.730mg/100g) concentrations were found to be higher than total phenol (0.555mg/100g), tannin (0.427mg/100g) and alkaloids (1.94mg/100g) concentrations. Higher amount of flavonoids with alkaloids though present in small amount is

a good indication that *Lycopersicum esculentum* can be used as antioxidant. The present of saponin at higher amount make *Lycopersicon esculentum* a good antimicrobial agent. ,
Table 3 showed the result of antioxidant analysis of *Lycopersicon esculentum*. The result showed that at higher concentration of extract, free radical scavenging activity was higher. At 100ug /mL concentration extract, the mean inhibitory concentration was 68.27%, this is about 71% better when the same concentration was compare with standard, ascorbic acid at the same concentration. According to table 3, the inhibitory ability of the extract decreases with decrease in concentration of the extract. High antioxidant activities of *Lycopersicon esculentum* was due the present of flavonoids, phenolic constituents present in *Lycopersicon esculentum*, this is in agreement with (Allardice,1993), that stated that phytochemicals are good antioxidants present in tomato

Conclusion

The chemical composition of *Lycopersicon esculentum* showed that it contained different vital chemicals that are of great benefit to man. The presence of flavonoids, total phenols, terpenoids, alkaloids, carbohydrate and proteins as shown in the phytochemical analysis and percentage inhibition of the extract makes the fruit useful for nutritive purposes and as antioxidant agent.

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DEVELOPMENT OF FORECASTS FOR PRODUCTS SALES IN CASSAVA PROCESSING MULTI-NATIONAL COMPANIES USING REGRESSION ANALYSIS AND THE BOX-JENKINS AUTO REGRESSIVE INTEGRATED MOVING AVERAGE (ARIMA) TECHNIQUES (A CASE STUDY OF GREENTECH INDUSTRIES LIMITED, OPIC- AGBARA INDUSTRIAL ESTATE, OGUN STATE, NIGERIA)

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Abstract
In this research work, data analysis was employed using regression analysis techniques and also a forecast model for products sales was formulated using ARIMA method for a particular cassava processing Multinational company i.e. Greentech industries limited, Opic-Agbara industrial estate, Ogun state Nigeria. It was observed that most cassava processing companies in Nigeria, have the problem of balancing the forces of supply chain of products and customers' demands or sales. In the light of this, the aim of this research work is to develop an ARIMA model for products sales forecast that these companies can be using in order to overcome the forces of customers' demands or sales and products supply into the market. The particular product chosen as a reference point is the glucose syrup in a particular company of our case study.The data collected from the records unit of the said company,was explored through the process of clustering,in order to group similar dataset together.In addition,data was analysed by plotting the correlation matrix to identify the relationship between variables and to decide on the most important variables to be intended for the study. A model was designed and developed using ARIMA technique. From the model evaluation, the result showed that yt, the product sale of the chosen model is given by: $yt=125.524+0.90792y_{t-1}-0.6388\varepsilon_{t-1}$. *To predict the trend and develop forecast, we used the IBM SPSS forecasting, table four and figure 5 presented the result of the sales forecast that we obtained by applying our model ARIMA (1,0,1) for the next 10 months from January,2021 to October, 2021. There, we got the sales, fit, lower control limit (LCL), upper control limit (UCL), and forecasting LCL and UCL. This forecasting model is, therefore, recommended for our cassava processing companies in Nigeria in order to help solve the problem of determining the customers' sales or demands of cassava products from the regression analysis and ARIMA modelling techniques.*
Keywords: Data exploration, regression analysis, ARIMA model, forecasting.

Introduction

Cassava is a type of crop usually planted in the southern part of Nigeria and some other parts of Africa. It's botanical name is Manihot Utilisima .They can be eaten after boiling. It also has major industrial products such as starch, ethanol,flour,glucose syrup,sweetners, among others. It has been observed that Cassava processing companies in Nigeria lack products sales forecasting mechanism and this always affect their performances in many respects.

From the background of data analysis using regression analysis techniques, the issue of how to develop a forecast model for products sales was investigated , using Autoregressive integrated moving average (ARIMA) technique in a particular cassava processing multinational company i.e GreenTech industries Limited,Opic-Agbara industrial estate,Ogun State, Nigeria.From the background of data analysis using regression analysis technique, we

have delved into the issue of developing a forecast for products sales using Autoregressive integrated moving average (ARIMA) techniques in a particular cassava processing multinational company i.e GreenTech industries limited, opic-agbara, industrial estate, Ogun state, Nigeria. The aim of this research work is to design and implement a new software system that will be able to forecast the product sales in multinational cassava processing companies.

Data will be explored using unsupervised machine learning clustering algorithm, precisely K-means clustering algorithm. When two variables are highly correlated, it is intuitive to cluster those two. Now a few things from the data set were plotted to see if there are any pattern that exists. The data is converted into a specific range using a linear transformation to generate good quantity clusters which ultimately improves the accuracy of clustering algorithm (Palaniappan, 2020)

Regression analysis involves identifying the relationship between a dependent variable and one or more independent variables (https://www. Britannica.com, 2023).Least squares method is a form of mathematical regression analysis used to determine the line of best fit for a set of data, providing a visual demonstration of the relationship between the data points (Kenton,Boyle and Perez, 2023).

Moreover, a commonly used measure of the goodness of fit provided by the estimated regression equation is the coefficient of determination. The coefficient of determination is a number between 0 and 1 that measures how well a statistical model predicts an outcome (Turney, 2022). R^2 can be interpreted as the proportion of variation in the dependent variable that is predicted by the statistical model. The measure of total variation , Total sum of squared deviation (SST) is the sum of the squared deviation of the dependent variable about its mean: $E(y-\bar{y})^2$. This quantity is known as the total sum of squares. The ratio r^2 = SSR/SST is called the coefficient of determination, where SSR is the regression sum of squared deviation.

Two questions arise about any hypothesized relationship between two variables:

- What is the probability that the relationship exist ?
- If it does, how strong is the relationship?

(https://www.home.csulb.edu, 2023)

The analysis of the residuals plays an important role in validating the regression model. If the error term in the regression model satisfied the four basic assumptions noted, then the model is considered valid.

A time series is a set of data collected at successive points in time or over successive periods of time. A primary concern of time series analysis is the development of forecast for future values of the series. Hence, statistical approaches to forecasting employs quantitative methods. Here ,ARIMA method of forecasting will be employed.

ARIMA methods are based on the assumption that a probability model generates the time series data. Future values of the time series are assumed to be related to the past values as well as to the past errors.

Literature review

Wana, Chien, and Trappey (2021). Suppliers are adjusting from the order-to-order manufacturing production mode towards demand and forecasting. Customers have increased demand uncertainty due to their own considerations such as end-product demand frustration which leads to supplier inaccurate demand forecasting and inventory wastes. Our research applies ARIMA techniques to establish rolling forecast models which greatly improves accuracy and efficiency of demand and inventory forecasting.

Dassanayake, Nugaliyadde and Mallawarachchi (2016). A high competition exists in the Fast Moving Consumer Goods (FMCG) market to increase the profits. Accurate sales forecasting

is an inexpensive method to reduce lost sales, product returns and support efficient product planning. The research focuses on integrating sales forecasting with sales force automation for taking intelligent business decisions. Sales force automation supports for accurate sales forecasting.

Fattah,Ezzine and Abdeslam (2018). The work presented in this article constitutes a contribution to modeling and forecasting the demand in a food company, by using time series approach. Our work demonstrates how the historical demand data could be utilized to forecast future demand and how these forecast affect the supply chain. The historical demand minformation was used to develop several auto regressive integrated moving average (ARIMA) models by using Box- jerkins time series procedure and the adequate model was selected according to four performance criterion, Schwarz Bayesian Criterion, maximum likelihood and standard error.

Methodology

The data used in this present study was retrieved from the records unit of the Green Tech industries limited, Opic-Agbara industrial Estate, Ogun State, Nigeria. The data consists of information about product sales at time intervals which formed time series problem, concerning product sales and supply chain. The total number of datasets was one hundred (100) which was divided into training and test datasets in the proportion of 70-30% i.e. 70% of the dataset was used to train the algorithms and 30% for the testing of performance of the algorithm with reference to its production capability. In this study, the methodology that was used is: data exploration and clustering algorithm: regression analysis and ARIMA modelling. The representation for the data exploration is a clustering algorithm i.e. k-means clustering (centroid-based), the data got from the company in question, is used for this study on “unsupervised learning”. Here, we have used k-means clustering: it is used for partitioning a given data set into a set of k—groups. We decided on the number of clusters. For this , the elbow method was used.

The general form of the multiple regression model is :$Y=B_0+B_1X_1+B_2X_2+\ldots+B_PX_P+E$. The parameters of the model are B_O,$B_1\ldots B_P$ and E is the error term

A primary use of the estimated regression equation is to predict the value of the dependent variable when the values for the independent variables are given .The difference between the observed value of Y and the value of Y predicted by the estimated regression equation is called a residual.

A commonly used measure of the goodness of fit provided by the estimated regression equation is the coefficient of determination. Computation of this coefficient is based on the analysis of variance [ANOVA] procedure that partitions the total variation in the dependent variable denoted SST, into two parts : the part explained by the estimated regression equation ,denoted SSR and the part that remains unexplained, denoted SSE.

ARIMA methods are based on the assumption that a probability model generates the time series data. Future values of the time series are assumed to be related to past values as well as to past errors. A time series must be stationary i.e one which has a constant mean, variance and autocorrelation function, in order for an ARIMA model to be applicable.

This study was carried out based on the following:

*Following the review of the literature, five years records of events on sales and cost of the glucose syrup was collected at the records unit of the aforementioned company in Ogun State

*Data exploration and clustering algorithm, regression analysis and ARIMA model were adopted on the data collected to formulate the forecasting model.

*The model was trained on the data obtained and tested on the unseen dataset obtained.

ARIMA method algorithm

Indeed, predicting the demand or sales facilitates the decision on the amount to produce and thus on the raw material [cassava and others] and inventory management.

Overtime, we feed our database to build a history that will be used to make our forecasts

*Modeling and forecasting of demand or sales by using Box- Jenkins time series approach.

*Model evaluated by four performance criteria: Akaike Criterion (AIC), Schwarz Bayesian Criterion(SBC), Maximum likelihood, and standard error.

*the adequate model was validated by new historical demand data under the same condition.

Autoregressive integrated moving average (ARIMA) to model time series, we can work with the traditional statistical models including moving average exponential smoothing and ARIMA. These models are linear since the future values are cramped to be linear functions of the past data, here we calculated the seasonal variation of demand/sales by using historical data and validated the models by examining the forecast performance. An ARIMA model is labeled as an ARIMA model (p,d,q), wherein;

P is the number of autoregressive terms

d is the number of differences;

q is the number of moving averages.

The autoregressive models assume that Y_t is a linear function (sales) of the preceding values and is given by equation

$Y_t = \grave{\alpha}_1\ Y_t - 1 + \varepsilon_t$……. (1)

Each observation consists of a random component (random shock, $\sum$) and a linear combination of the previous observations. a1 in this equation is the self-regression coefficient.

The integrated process.

The behaviour of the time series may be affected by the cumulative effect of some processes. A differentiation of order 1 assumes that the differences between two successive values of Y is constant. An integrated process is defined by equation (2)

$Y_t = Y_{t-1} + \sum_t$……. (2)

Where the random perturbation $\sum_t$ is a white noise.

The moving average process

The current value of a moving averaging process is a linear combination of the current disturbance with one or more previous perturbations.

The moving average order indicates the number of a previous periods embedded in the current value. Thus, a moving average is defined by equation …….(3)

$Y_t = \sum_t - \Theta_1 \sum_{t-1}$ ……. (3)

Box and Jenkins principle was founded to develop a practical approach in order to perform ARIMA models. The Box-Jenkins principle consists of three iterative steps of model identification, parameter estimation and diagnostic checking steps. Box and Jenkins proposed to use the autocorrelation function (ACF) and the partial autocorrelation function (PACF) of the sample data as the basic tools to identify the order of the ARIMA model.

As far as the identification step is concerned, we should produce a stationary time series, which is a required condition to find the ARIMA model, so, we mostly need data transformation, the statistical characteristics of a stationary time series such as the mean and the autocorrelation structure are constant over time. After that, it becomes easy to calculate the model parameters and then specify the model. These parameters are estimated so that the overall error is reduced. Finally, we move to the diagnostic checking of model adequacy. In this last step, we make sure that the hypothesis we made about the error are contended. The

diagnostic statistics and plots of residuals can be used to assess the adequacy of the future values to our data.
Box-Jenkins model constitutes a process approach to follow and repeat till reaching a high degree of satisfaction about the model and having reduced error.

Results and discussion
In this research work , the demand/sales forecasting of final product (glucose syrup) in the aforementioned Company above, was conducted based on real data, and the accuracy and characteristics are studied. This study examines the effectiveness of demand forecasting in the said company. Based on the Box-Jenkins approach, our study wad carried out in three parts: identification, estimation and verification. The model shown in figure 1 is based on the demand of the final product in the aforementioned company from January 2010 until December, 2015.

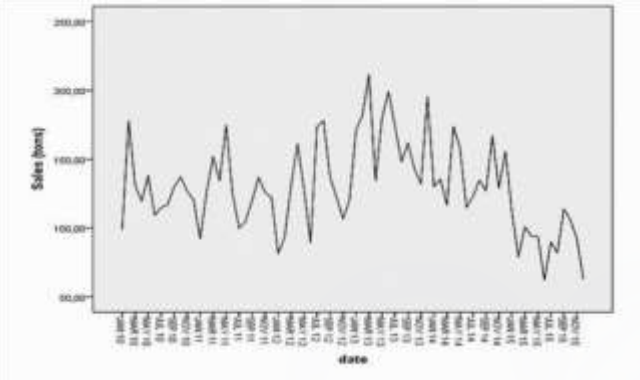

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Figure 1: evolution of final products sales.

Identification of model
It was started with the initial preprocessing of the data to make it stationary, and then we choose possible values of p and q which we can, of course, be adjusted as model fitting progresses.
For stationarity, the series shown in figure 2 and 3, respectively fluctuates around an average value and its ACF decays to zero fairly rapidly which proves the stationarity of the time series.

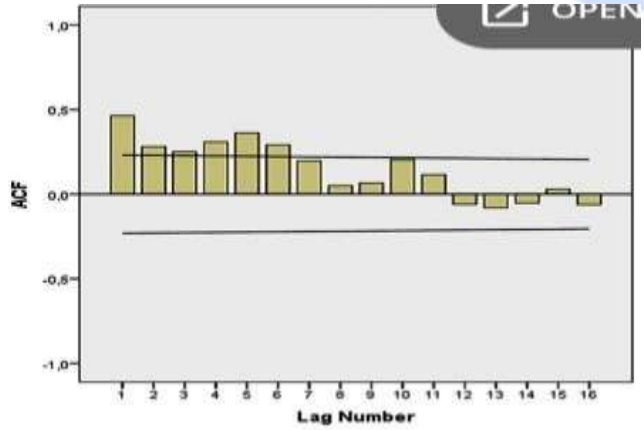

Figure 2:ACF correlograms of the demand series, ACF : Autocorrelation function

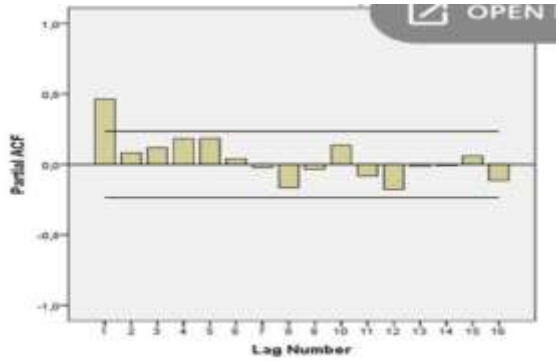

Figure 3:PACF correlograms of the demand series. PACF: partial autocorrelation function

Moreover, to assess whether the data come from a stationary process, we can perform the unit root test: Dickey – Fuller test for stationarity. After carrying out the test on the XIStatsoftware, the results are grouped in table 1

Ho :the series has a unit root

$H_{1:}$ the series does not have a unit root.

The series is stationary.

Table 1: Test results

T(observed value)	- 1.350
T(critical value)	-0.717
P value (unilateral)	0.844
a	0.05

Since the calculated p values is greater than the threshold significance level a=0.05, the null hypothesis Ho, cannot be rejected, the risk of rejecting the null hypothesis Ho, while it is time, is 84.38%

In our case, and after verification of stationarity of the series, we notice from the ACF and PACF correlograms, that our model is not pure AR or pure MA, we therefore, tested several models to identify the most suitable one for sales prediction.

Estimation of model's coefficients

The ARIMA procedure of the SPSS time series module allows estimating the coefficients of the models that we have previously identified by providing the parameters p,q, and d, using a fast maximum likelihood estimation algorithm.

The execution of the procedures adds new time series representing the values adjusted or predicted by the model, residuals (adjustment errors) and confidence intervals of the adjustment at a 95% confidence level. The best model is as simple as possible and minimize, certain criteria, namely AIC, SBC, variance and maximum likelihood. The chosen models is that of ARIMA (0,1.1)

Table 2 summaries the values of the different models and proves the choice of the model on which, we will base our predictions. It is clear from table 2 that the ARIMA model (1,0,1) is selected because all the coefficients are significantly different from 0 according to the sales test (IT-RATIO/>, 1.96) with

an acceptable level of adjustment

Table 2: coefficient of different models

Table 2. Coefficients of different models.

Characteristics	Models	ARIMA (1, 0, 2)	ARIMA (2, 0, 2)	ARIMA (1, 0, 1)	ARIMA (1, 0, 0)	ARIMA (0, 0, 1)	ARIMA (1, 0, 1) without constant
AR (1)	α_1	0.92913	0.71371	0.90792	0.49434	−0.41704	0.99755623
	SEB	0.104616	0.761758	0.094852	0.1074471	0.1119989	0.00444769
	T value	8.8813204	0.9369292	9.571955	4.600820	−3.723567	224.28617
	p Value	0.00000000	0.35216008	0.00000000	0.00001823	0.00039384	0.0000000
MA (1)	θ_1	0.52269	0.31779	0.63880			0.71392452
	SEB	0.167073	0.741595	0.161531			0.08579173
	T value	3.1284995	0.4285186	3.954655			8.32160
	p Value	0.00258711	0.66964815	0.00018319			0.0000000
AR (2)	α_2		0.19759				
	SEB		0.659442				
	T value		0.2996279				
	p Value		0.76538859				
MA (2)	θ_2	0.17062	0.30202				
	SEB	0.142258	0.409353				
	T value	1.1993429	0.7377864				
	p Value	0.23455708	0.46322050				
Constant	Cte	124.42969	124.52640	125.53260	128.53887	129.22650	
	SEB	12.608189	12.601296	11.785537	6.5715235	4.8971088	
	T value	9.8689581	9.8820312	10.651411	19.559981	26.388326	
	p Value	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	
AIC		688.86593	690.82312	688.77347	689.37103	693.59055	692.04831
SBC		697.9726	702.20645	695.60347	693.92437	698.14388	696.60164
Log likelihood		−340.43297	−340.41156	−341.38674	−342.68552	−344.79527	−344.02415
Error		28.034898	28.221721	28.214812	28.576249	29.443759	28.461048

SBC: Schwarz Bayesian criterion; AIC: Akaike criterion; ARIMA: autoregressive integrated moving average; SEB: Standard Error of B (B: Regression Coefficient).

SBC: Schwarz Bayesian criterion; AIC: Akaike criterion , autoregressive integrated moving average(ARIMA);
SEB: Standard Error of B (B :regression coefficient)
The model residue is stationary and follows a white noise process in the range of ±40. The residue histogram shows whether the distribution of residues approximates a normal distribution. In our case, we have residues that distribute relatively normal around zero and with a relatively low dispersion at a 5% risk.
The chosen model parameters are presented in Table 3.

Table 3· ARIMA Model parameters

Table 3. ARIMA model parameters.

				Estimate	SE	*t*	Sig.
Sales (tons)-Model_1	No transformation	Constant		125.524	12.466	10.069	0.000
		AR	Lag 1	0.908	0.095	9.537	0.000
		MA	Lag 1	0.639	0.162	3.938	0.000

ARIMA: autoregressive integrated moving average.

ARIMA : autoregressive integrated moving average.
The developed model is given by equation (4)
$y_t =. d+\grave{\alpha}_1\ y_{t-1}-\Theta_1\sum_{t+1} + \sum_t$..... (4)
with :

- y_t, y_{t-1}: sales at period t and t-1, respectively

- $\sum_t$, $\sum_{t-1}$: residuals at period t and t-1, and constitute a white noise
- $\grave{\alpha}_1$, Θ_1: coefficients of autoregressive and moving average process, respectively.

From table 3, we can extract the coefficients of autoregressive and moving average processes. Therefore, equation (4) becomes as follows:

$y_t = 125.524 + 0.90792\ y_{t-1} - 0.6388 \sum_{t-1} \ldots .$ (5)

Accuracy of ARIMA (1,0,1) model

The accuracy of the developed model was evaluated by comparing the experimental and the simulated sales in the same period. Figure 4 reports this comparison and reveals that the selected model has a high accuracy and ability to simulate the dynamic behaviour of sales. Therefore, this model can be used to analyze and model the demand in this aforementioned company.

Figure 4: Sales, fit, LCL, and UCL, LCL : lower control limit; UCL : upper control limit.

From the graph, we notice that the model is validated since the predicted demand fluctuates around the fit. We also note that the predicted demand stayed between the upper limit and the lower limit.

Forecast

After we have defined the most appropriate model of demand in our case, we have to make the forecasting; to do this and so to predict trends and develop forecast, we used the IBM SPSS forecasting. Table 4 and figure 5 present the results of the sales forecasts that we obtained by applying our model ARIMA(1,0,1) for the next 10 months from January, 2010 to October, 2015.

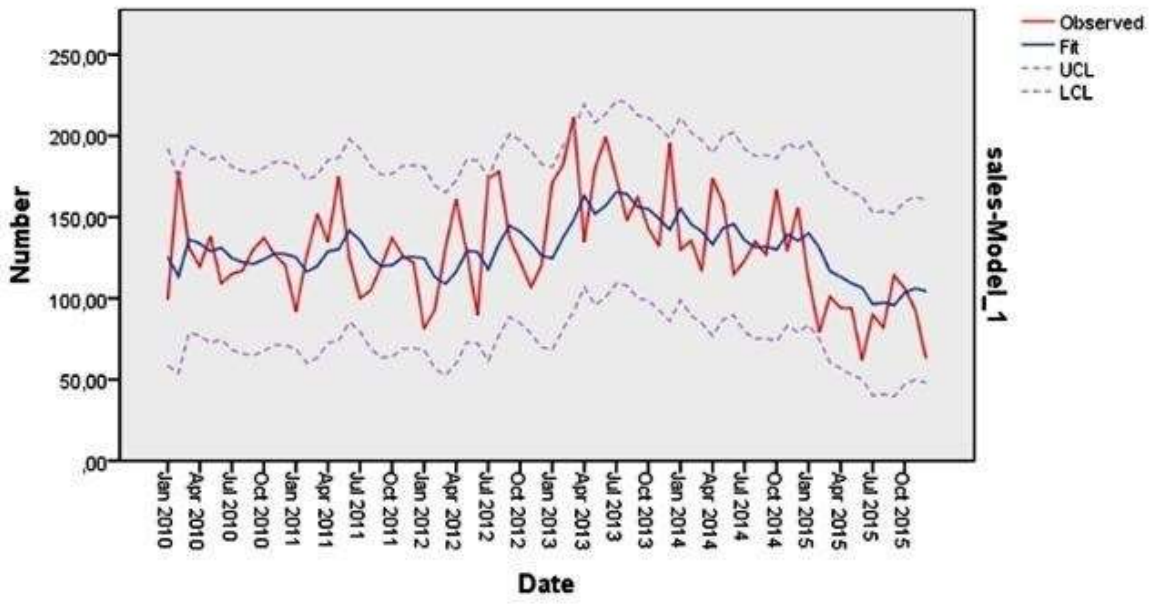

Table 4. Forecast sales from January 2016 to October 2016

Table 4. Forecast sales from January 2016 to October 2016.

Model		73	74	75	76	77	78	79	80	81	82
Sales-Model_1	Forecast	95.12	97.92	100.46	102.77	104.86	106.77	108.49	110.06	111.49	112.78
	UCL	151.41	156.21	160.35	163.95	167.08	169.83	172.25	174.38	176.26	177.93
	LCL	38.83	39.63	40.57	41.59	42.64	43.70	44.74	45.75	46.71	47.63

LCL: lower control limit; UCL: upper control limit.

LCL: lower control limit; UCL : U pper control limit.

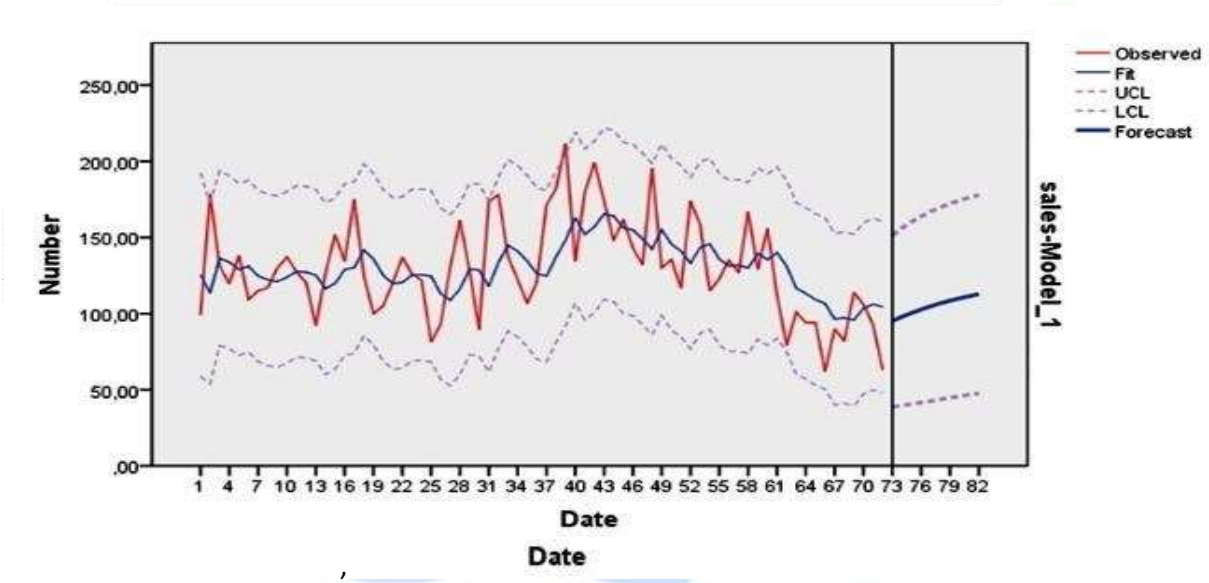

Figure 5: Sales, fit,LCL, UCL and forecasting.
LCL: lower control limit; UCL: Upper control limit.

We can clearly see that the model chosen can be used for modeling and forecasting the future demand in this cassava processing company, but each time we need to feed the historical data with the new data to enrich it, in order to improve the new model and forecasting.

The forecasts obtained after modeling facilitated the decision on the production in this company. Infact, the model enabled us to forecast the demand and make accurate predictions. Once we obtain a demand forecast, it will be much easier and very clear to make the right production planning and thus eliminate big cost losses

Conclusion

Demand or sales forecasting is an important function of managing supply chain. It's integration with other business functions makes it one of the most important planning processes business can deploy for future. In this context, we developed an ARIMA model to model the demand forecasting of the finished product in a cassava processing company by using Box-Jenkins time series approach. The historical demand data were used to develop several models and the adequate one was selected according to four performance criteria: SBC, AIC, standard error and maximum likelihood. The model that we selected and which minimizes the four previous criteria was ARIMA (1,0,1). The results obtained proves that this model can be used for modeling and forecasting the future demand in this cassava processing

company; these results will provide to managers of this company reliable information in making decision

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EVALUATION OF PATHOGENS TRANSMITTED FROM DRINKING WATER AND ITS PUBLIC HEALTH IMPLICATIONS

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Abstract
Microbial contaminant of water has been a great challenge to public health. These microbial agents such as bacteria, protozoa and fungi are capable of causing diseases and affect the drinking water quality. This study was carried out to assess pathogens transmitted through drinking water from two selected boreholes in the study areas. Water samples were tested for five characteristics using APHA analytical techniques and results were compared with WHO standard. Microbial quality analysis was done by preparing samples into different dillution factors and culture on different agar. Biochemical test were used for the identification of isolated bacteria. Pathogens encountered were E.coli, S. aureus, Klebsiella aerogenes, Serratia marcescens, Bacillus cereus and Salinococcus roseus. All isolated organisms were present with few colonies above <1cfu/ml WHO permissible limit of water quality. The detection of medically important pathogens in this present study indicates infection to the public health. Hence, water should be treated for microbial safety before drinking.
Keywords: Pathogens, borehole water, Igboora and public health.

Introduction

The dependability on water has a vital and essential constituent of protoplasm for the existence and wellbeing of man and other living creatures as stressed the need for its portability. Water is said to be among the drivers of disease causing pathogens. Waterborne diseases are consequences of infection by infective stages of parasite (protozoa), bacteria, metazoan and viral pathogens in human transmitted through contaminated water. Hence, the consumption of unsafe water may lead to waterborne related infections such as cholera, hepatitis and amoebiasis among others that are dangerous to human health. The infections affects the human host by causing severe diarrhea in affected people and devastating effect in immune compromised host. The public health challenge of waterborne illnesses comes due to continued engagement in practices that contaminate drinking water sources which represents an ever-present risk of human infection. However, the quality of drinking water should indicate a healthy level of alkaline mineral with pH ranged 7.0-9.5, absent of contaminants, tasteless, colourless and devoid of odour.

Recent happenings in the adaptive changes in the pathogens, immunological status of the host, environmental and demographic change have served to illustrate the need to re-evaluate and further strengthen research on the importance of water in the transmission of new pathogens strains which has made advances in Science, Technology and Epidemiology. Effective disease prevention requires an insight to environmental factors that exposes human and animal population to infection. Factors that influence the prevalence of waterborne transmission include lack of water supplies and sanitation, poor water management, resistant to chemical treatment of some infective stages of pathogens. The prevalence of waterborne diseases has been reported in some countries like United States, India, Bangladesh and in comparison to Nigeria with the prevalent waterborne disease of Dracunculiasis, Hepatitis, cholera and Thyhoid (Adeyinka, *et al.*, 2014, Nwabor, *et al.*, 2016). In 2015, it is estimated that about 68% of people had access to basic sanitation with 4.5 million people are at risk of poor sanitation globally.

According to (Lim, *et al.*, 2012), poor water and sanitation is responsible for 0.9 percent of global disability-adjusted life years (DALY) or 300,000 mortality per year. Food and water borne infectious diseases according to the world health organization (WHO) currently had a loss of 6.64 million DALY with children under 5 years of age and population in low-income countries bearing the most burden. Hence, it is imperative to fight against these diseases that have become an area of concern all around the world due to contamination of different sources of drinking water and their surrounding area. An update on contaminations at small scale is inevitable about the pathogenic contaminants of borehole water source in Igboora, Ibarapa Central Local Government area Oyo State in order to improve the health standard of the people in the community. Hence, the study aim to assess water borne pathogens from two selected bore hole in Igboora for water quality.

Material and methods

Sampling techniques

This study was conducted using borehole water in Ibarapa Central Local Government Area council in Igboora including: Olorunsogo and Igboora market area respectively. Sampling of borehole water was based on convenience in the selected areas. Each selected bolehole water in the area was visited for water sample collection. The water was allowed to waste for some minutes before collection into a sterile bottle with fitted screw cap. After each collection, water from each site was correctly labelled and transported carefully to the department of Science Laboratory Technology Oyo State College of Agriculture and Technology Igboora for laboratory analysis..

Laboratory description and analysis of the samples

Water quality characteristics

Water quality characteristics such as appearance, temperature, biochemical oxygen demand (BOD), hydrogen ion concentration (pH) and turbidity of the sampled borehole water were determined using the standard methods of American Public Health Association (APHA) (1985).

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Microbial examination

Each sample was examined for microbes. The inoculation of 0.1ml of serially diluted samples was cultured on various selective agar at 37^0C for 24 to 48hrs. Sub-culturing was done to obtain pure isolates and plates with significant growth were selected for identification based on their biochemical properties as described by Cheesbrough,(2006).

Results and Discussion

Water samples of the bolehole water that constitute sources of drinking water to people in the study area were investigated. Table 1 gave the result of quality analysis of the sample water. The general observation of the result revealed that 4(80%) of the water quality properties measured (appearance, Temperature, pH, Biochemical Oxygen Demand (BOD) were within the WHO Standard Limit of clear, < 40^oC , 6.5-8.5 and 50mg/l respectively. The turbidity value for sample A and sample B ranged from 4.83NTU to 7.96NTU respectively. Hence, the values of both samples was above the recommended WHO standard permissible limit of 1NTU for water quality. The relatively high turbidity value observed in sample A could be due to related abattoir activities around the bore-hole water. Also the values recorded for temperature was considered to fell within the mesophilic range of temperature for most pathogenic microbes whose optimum temperature for growth is 37^oC (Arora, 2004).

Table 1: Water quality analysis in relation to study bore-hole water.

Parameters	Sample A	Sample B	WHO Standard
Appearance	Clear	Clear	Clear
Temperature (^{O}C)	24.0	26.0	<40^{O}C
pH	7.90	7.40	6.5-8.5
BOD(mg/ml)	8.67	13.58	50
Turbidity (NTU)	7.96	4.83	1

The summary of the microbial analysis as presented in table 2 showed the distribution of microbial isolates of the bore-hole water in different sample locations. The result of this present study indicated that all the samples were positive for at least one pathogenic organisms with each strain present as biocontaminants in the samples. Thus, the recovery of diverse bacteria pathogenic species from sampled water indicated that microbed are also found in water.The counts obtained for each isolate from all the water samples exceeded the World Health Organization permissive limit of <1CFU/mL which suggest that the borehole water is not safe for drinking.The distribution of the result indicated that *E. coli, S. marcescens, Klebsiella aerogenes and Staphylococcus aureus* were present as biocontaminants of sample A while one strain each of *Bacillus cereus and Salinococcus roseus* form a characteristics colonies at 37^{o}C in sample B (Table 2). Reviewing the literature, findings from this study support previous claim by (Iroha *et al.,* Agwu *et al.,* and Adekoyeni and Salako) which have consistently shown that contaminated drinking water habours different pathogenic microbes of medical importance.

Table 2: Distribution of microbial isolates from the borehole water

Sample	*Microbes*					
	Escherichia coli	*Staphylococcuss aureus*	*Bacillus cereus*	*Klebsiella aerogenes*	*Serratia marcescens*	*Salinococcus roseus*
A	+	+	-	+	+	-
B	-	-	+	-	-	+

- means organisms is missing
+ means organisms present with few colonies

According to Encyclopedia Britannica, Coliform bacteria serve as critical indicators of water quality. The isolated microbes, were present as coliform bacteria and other indicated that microbes other than coliform bacteria were present as disease causing bacteria indicating a contamination route exist into the water source and thereby polluting the water. The isolation of *E.coli* from sample A suggested that feacal pollutants from animal waste is entering the water source. This could be connected to the proximity of the drinking water to abbatoir waste water activities near the borehole thereby given the disease-causing bacteria chance to enter the water source. Poor land uses and absence of proper maintainance due to indiscriminate activities that contaminate ground water around the bore hole could also make water to lose its quality from the source. Some of the isolated bacteria from this study, *klebsiella aerogenes and Escherichia coli* are capable of producing endotoxin harmful to human host and are able to predispose human health to severe illnesses of Urinary Tract Infection (UTI), diarrhea, sepsis , bacterial blood infection and Staphylococcus aureus with associated pneumonia and bone infection among others The severity health risk of these pathogens are detrimental to the immune system of lmmune compromised to water containing microbial contaminants.

Conclusion

The outcome of this study revealed that the sampled borehole water harbored some pathogenic contaminants of medical importance. The occurrence of this pathogens implied that people who drink contaminated water are at risk of water-borne illnesses. Hence, effort should be made to boil and treat water before consumption to avoid the danger involve danger in public health.

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INFLUENCE OF HOME ON SECONDARY SCHOOL STUDENTS ACADEMIC PERFORMANCE IN MATHEMATICS.

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Abstract
This review work was carried out to evaluate the influence of home factors on students' academic performance in Mathematics in some secondary schools. It was found that the parental occupation, family size and parental motivation are the factors influencing students' academic achievement in Mathematics. It was recommended that students should pay serious attention to their studies at home, in addition to other works done because the amount of effort they put in their studies influence academic achievement. Parents should create more conducive learning atmosphere for their wards, such as provision study space, adequate reading condition and time for children to engage in reading and learning activities. The home should be stimulating such that children would naturally develop an undying interest for Mathematics. Parents should be more interested in the various aspects of their children education especially Mathematics. This can be achieved by collecting more information about their children and seeking adequate guidance about the subjects offered in the school. This is essential because students impression about their parents concern is likely to be relevant for their academic attainment. Also, it is recommended that parents should diversify their sources of income so as to be able to provide funds for their wards in school for better academic performance. All education materials like journals, text books, and mathematics laboratory equipment among others should be provided in order to improve students' performances by the parents.
Keyword: Parents, Academic performance, secondary students, Mathematics, Home factors

Introduction

Globally, mathematics is regarded as one of the most important subjects in the school curriculum worldwide. It is seen as subject that has direct correlation with other subjects, particularly with science and technology (Federal Republic of Nigeria, 2013; Umameh, 2011). The subject cuts across primary and secondary levels of education. Mathematics remains one of the most difficult subjects in schools as perceived by students. There is general impression that mathematics is difficult by its nature and this impression was perceived by majority of students which made them phobia for its learning (Ale, 2007; Ampadu, 2012; Ojimba, 2012; Onah, 2010; Ozochi, 2007; Saad, Adamu and Sadiq, 2014).
However, much concern has been expressed on the decline in students performance in Mathematics at the secondary school level in the Nation. The foundation of Mathematics learning as aware is from both Primary and Secondary Schools levels of education.
Education is primarily concerned with the tools, methods and approaches that facilitate its practice. It has become an area of great importance not only for government or voluntary agencies but also for individuals, families, and communities in all facets of life. Parents who are in more lucrative jobs would have more or enough fund to caring on the basic needs and academic requirement of their children essentially in the subjects that are core in secondary education, particularly mathematics. Parents are likely to provide different needs for their children and inhabit different aspects of cognitive, emotional and motivational development. Individuals in the society as well as families are different in all aspect of life; determining factors of such are the education at all level, occupation and income of the family.

A home environment is viewed as consequential for child developmental outcomes such as cognitive ability, school readiness, academic achievement and emotional adjustment (Fantuzzo *et al.*, , 2000)

Historically, examinations of the influence of home environments on developmental outcomes have focused on distal variables as the primary measures of home experience, such as the family income, parents educational level, parents occupational status, parental involvement and parenting styles of (authoritarian, demanding and permissive parenting styles) . Homes may exist in triplets (Muola, 2010) the non-sufficient, middle and sufficient families. What determines the stratum could be the position ones occupy, the job which one engage in his territory, the privileges and prestige receives, which in turns help to realize one's style of life (Havingust *et al.*, , 2003 and Keeves, 2000).

Types of home may also affect the performance of students in mathematics and also has a far reaching implication on child's life and academic achievement. Home appears to have a considerable influence on the performance of students in Mathematics. Other factors such as the teachers, environment of the school setting, needed materials may be controlled if the background has the wherewithal, other factors outside home has very little role to play, since home forms the first unit of existence where a child found himself (Fantuzzo *et al.*, 2000).

(Ayeni, 2008 and Musgroove, 2000) stated that child from higher socio-economic background has advantages over the child from lesser status. In a higher class there may be a television sets, radio, picture, home teacher, home library, computer, reading and writing materials all of which help to prepare a child for learning in school. Hence, it is hypothesized that parents of upper classes of socio-economic have more positive attitudes towards their children's schooling and have high expectations and standard for the children. Also, (Fraser, 2001) in his findings stated that such children are given high motivations for success in school. The parents' ability to provide books and other reading materials in order to bring about a positive attitude stimulates children to learn more. Furthermore, the upper class child took a balance diet and belonging to a comfortable social school environment and thus, help in its preparations for learning.

Similarly, Musgroove, (2000) argued that the family exerts powerful influence on the prospect capacity for development and life – chances of the young. One of the parameters through which the home background of a student is measured is the socio – economic status of the student's family. According to (Boocock, 2001 and Olagbuyiro, 2007) the socio – economic status is the most powerful home characteristic that predicts students' performance. He stated further that the higher the socio – economic status of the parents, the higher the student academic performance or achievement. Thus, socio – economic status can be viewed as academic qualification of parents or the educational attainment of the parents, the occupation of the main bread winner, the income of the family and the position or status in the society and believes that all or combination of some of these account for the differences in students' academic performance or achievement in schools.

Keeves, (2000) stated that socio – economic background of the parent is crucial in the final grades of the students, the achievement scores, retention at grade level, course failure, truancy and suspension from school, drop - out rate, college plans and total amount of formal schooling, the type of academic honours and awards distribution by school; the election of officers to run the school affairs, the extent of participation in the external curricular activities and other indicators of success in the informal structure of the student society and determines the totality of the students' schooling. Uche, (2008) Opined that what the child learns at home, how he's motivated by his family towards education goes a long way to influence the child's success or failure in school. He further stressed that child's family greatly influence

the ease or otherwise with which he can gain a place in school and total length of time he is willing to devote to school and study.
Obanya, (2007) stated that conditions which facilitate learning includes, the home and school which are the two sides of learner's environment. Out of these two sides, "the home is usually the more important out of the two factors because it is the child's first school" (the place where the foundation learning is laid). The environment (home) has to be stimulating with toys, books, newspaper radio and television. Children from polygamous home are not likely to have the same sound academic footing and mathematics oriented with their colleagues from the monogamous homes. (Olagbuyiro, 2007, Linddert, 2007 and Muller, 1995) families' morale fosters academic achievement among adolescents. This is because the children develop positive interest in the teachers, the school and mathematics activities. It is likely children from most polygamous homes to have negative attitude towards their school activities as well as their teachers.

Fantuzzo *et al.,* 2000 and Esyench *et al.,* 2003) reported that "the number of children of the same parents in the family was a significant prediction of student's achievement in mathematics" In spite of the inconsistent results, it is assumed that the number of children affect the attention given by teacher, academic motivation and support by parents. This is because, parents with relatively few number of children will be able to cater for them in all aspects, either by way of provision of food, necessary infrastructure and reading materials. It has been observed that many times, children who are not well cater for feel inferior among their peers. This may affect the performance of students, not only in academics but in other areas of life especially where they have to relate with their peers. On the other hand, parents with large number of children often find it difficult to cater for their needs. In another study conducted by Linddert, (2007) discovered that the family size and birth play a vital role in influencing the children's educational attainment. This is because the parental "input" in terms of money, time and other resources invested in children decrease with size of the family. For instance, in a large or extended families the amount of time spent with each child is limited. It is believed that there is little control and child's concentration in the large families but in small or nuclear families, they are much more concerned about educational achievement and welfare of the few children they have.
The parents with the small families ask question from their children concerning progress in the school, the subject they choose, their marks and what they will become in future but in large families, little attention is paid to all these. The attitude, motivation and aspiration together with the support given to the children determine the success of the children in the school and later in life. This is a potent factor accounting for the variation in the academic performance of student in mathematics in our secondary schools nation – wide. Parental encouragement may at times be informed to ruthless and inflexible demand for achievement. This factor has been seen through various studies as it associated with student success or failure in schools, or interest as popularized by Izundu , 2005, Musgroove , 2000 and Uka, 2002) in their findings. "The family education and society" are constancy to parent visit to schools for accessing the performance of their children, the age at which the parent wish children to start and finish school career and the type of subject wish their children offers plus the type of institution they to attend .

Conclusion and reccommendations
From the study, family background gave a great influence on academic achievement of students in secondary schools. Prominent among the factors includes; parental education level, income and motivation. Educational statuses of the parents and students' academic achievement had close relationship. This is because parents themselves had realized the

importance of mathematics.. They stand better chance to supporting their children for better academic achievement. On motivation, it was also observed that students who received encouragement and motivation from the parents performed better in school than their counterparts from non encouraging families. The major reasons for the differences in performance are the motivation and the positive attitude of the parents towards their children's academic progress.

Hence, it can be recommended that students should be given serious attention towards their studies at home, in addition to other works done, since the amount of effort put in their studies influence academic achievement. Parents should create a conducive learning atmosphere for their wards, by providing study space, adequate lighting and time for children to engage in academic activities. The entire home should be stimulating so that children would naturally develop an undying interest for Mathematics. Parent should developed more interest towards their children education especially Mathematics. This can be achieved by collecting more information about their children and seeking adequate guidance about the subjects taken in the school. This is necessary because student impression on their parents thought likely to be relevant for their academic attainment. Also, parents should diversify their sources of income to enable them provide funds for their wards in school for better academic performance.

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EVALUATION OF CASSAVA FLOUR TO DETERMINE THE LEVEL OF ITS POLLUTANT

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Abstract
This study evaluates the heavy metals and pollutants in cassava flour (lafun) produced from Ibarapa East local government, Oyo State. Five zones of Ibarapa East local government were used. Each dried cassava flour collected was subjected to microbial analysis for heavy metals in the laboratory. The result showed that the moisture ranged from 0.64 to 0.72%, ash from 1.03 to 1.64%, Crude protein from 1.54 to 2.73%, Carbohydrates from 1.91 to 2.94%, and Hydrogen cyanide from 4.75 to 15.40%. The bacteria consist of seven species ranged from Stretococcus to Clostridium specie with partial population to heavy dense population. While fungi consist of four species ranged from fusarium to aspergilus niger specie with non/partial population to densely microbe population. The elements determined are K (4.84-6.71%), Ca (1.18 - 1.53%,) Mg (1.37 -1.96%), Fe (0.66 - 1.27%) and Pb (0.03 - 0.06%). There exist significant difference (P < 0.005) among the samples analyzed. Base on the study Sample C had highest record of all bacteria microbes while sample D recorded the number of microbes. The sample C had highest fungi pollutants followed by sample A compared to all others. The proximate analysis result of sample D indicated the highest toxic hydrogen cyanide value followed by sample C and sample B with the least.
Key words: dried cassava flour, microbial pollutants, heavy metals, proximate analysis.

Introduction

Cassava flour is a common based carbohydrate food product usually consumed in global sector. The flour (lafun) is commonly consumed in Yoruba tribe of Nigeria and across African countries (Akingbala and Ogunjobi, 2011). The food substance contains variety of nutrients beneficial to mankind. Cassava flour involves a lot of processes at post harvesting during seasonal production for finer consumable products. In processing the toxic and harmful substances are expunged with different cookery processing. When processing cassava flour some processors are dirty and with uncare attitude in handling the food product (Aniedu and Omodamiro, 2012). During drying with sunshine after fermentation, on ground, drying mat, road side just to mention few are exposed to lot of harmful environmental objects. At drying cassava flour are exposed to animals as feed, saliva split by road side passengers, exhaust of automobiles, faecal and urine released by animals with other dangerous habit (Ferner, 2001). These detrimental habits made the cassava flour had higher heavy metals and some pollutant substances which is dangerous to body system when consumed. The heavy metal and pollutants in high quantity in the body system creates infections and diseases that can eventually leads to death. Lot of awareness had been created through media and journals on effective hygienic handling of food processes by the health regulating body known as World Health Organisation (Duke, 2000). The body educate society on various ways of handling food products and best food products with reasonable nutrient to eat (Holum, 2003). Based on scientific research heavy metals with pollutants penetrate raw food samples through planting soil and also during processing period after harvesting. Heavy metals are naturally occurring elements that have atomic weight and

density at least five times greater than that of water. The heavy metals are needed in minimal quantity in the body for metabolic process but not exceeding the body requirement. In educating consumers of cassava flour on regulating limited consumption of heavy metals and effective handling premix during processing develop this research of proximate analysis of heavy metals and pollutants of cassava flour in Ibarapa East Local Government as a case study (Habashi, 2002). Ibarapa East local government of Oyo state, is having ten wards and about twelve villages in her environs. The sundried cassava flours were collected randomly in selected five villages for proximate analysis to determine heavy metals and pollutants present in the food product (Ogwuegbu and Ijioma, 2003).

Materials and method

Study Area: The research was carried out in the Research Laboratory of Food production unit, in the Department of Home and Rural Economics, Oyo State College of Agriculture and Technology, Igboora.

Design of the Study: The study was on proximate analysis of cassava flour (lafun) to determine the level of its contaminants in Ibarapa East Local government. The different cassava flour (lafun) samples from five selected villages in Ibarapa East Local government were collected and taken to reputable food chemical laboratory for proximate analysis.

Procedure

- The cassava flour (lafun) were sorted in selecting the best raw material for sample product
- The cassava flour (lafun) were weighed, grinded into powdery form and packaged in separate clean well labelled cellophane nylon.
- All the five samples were taken to laboratory for analysis

Sample size and sampling techniques: A random sample technique was used to select respondents of five samples in five different villages in Ibarapa East Local government. The villages chosen were selected based on equilateral political voting wards.

Data collection: The data was collected through the use of cassava flour (lafun) samples. A well-structured labelled cellophane packaging material was used in packaging the sampling product and taking to laboratory for chemical analysis.

Method of data analysis: Data were collected and analysed in a reputable laboratory. The samples were analysed on the nutritional contents.

Statistical Analysis: Data were statistically analysed using a descriptive frequency, percentages and cumulative score with Duncan analysis SPSS tool (Duncan, 1955).

Proximate Analysis of dried cassava flour in Ibarapa East local Government

Moisture determination: 5grammes of sample was weighed into a Petri-dish of known weight. The weighed sample was put into an oven pre-set at 110 ^{o}C for 3hrs. The sample was removed and cooled in a dessicator's to room temperature and the weight was determined after which it was returned into the oven at 110^{o}C for 30 minutes until constant weight was obtained: AOAC (2004).

Ash determination: 5grammes of sample was weighed into a previously ignited and cooled silica dish. The dish was ignited gently first and then at 600oC for 3hours in a muffle furnace. The dish and its content were cooled in a desiccator's and reweighed, the .weight of the residue was recorded as ash content.

Crude fibre determination: The organic left after sequential extraction of food sample with ether can be used to determine the crude fibre, however a fresh sample may be used. The fat in it can be extracted by adding petroleum ether, stir, allowed to settle and decant. This was done three times and fat free material was then transferred into a flask/beaker, and 200mls of preheated 1.25% H_2SO_4 was added. The solution was gently boiled for about 30mins, maintaining constant volume of acid by the addition of hot water. The Buckner flask funnel fitted with what man filter was preheated by pouring hot water into the funnel. The boiled acid sample mixture was then filtered hot through the funnel under sufficient suction. The residue was then washed several times with boiling water (until the residue was neutral to litmus paper) and transferred back into the beaker. Then 200mls of pre-heated 1.25% Na_2SO_4 was added and boiled for another 30mins. Filter under suction and wash thoroughly with hot water and twice with ethanol. The residue was dried for about 24hours at 65^oC and weighed. The residue was transferred into a crucible and placed in muffle furnace (400- 600^oC) and ash for 4hours, then cool in dessicator and weigh.

$$\% \text{ Crude fibre} = \frac{\text{Dry weight before ashing - Weight of residue after ashing}}{\text{Weight of sample}} \times 100$$

Crude protein determination: Crude protein was determined by Kjeldahl method using Kjeltec T.M. model 2300, as described in Foss Analytical manual, AB, (2003). The method involved digestion of the sample at 420^oC for 1hr to liberate the organically bound nitrogen in the form of ammonium sulphate. The ammonia in the digest ammonium sulphate was then distilled off into a boric and receiver solution, and titrated with standard hydrochloric acid. A conversion factor of 6.25 was used to convert from total nitrogen to percentage crude protein (AOAC, 2004).

Biological Pollutant (Bacteria and Fungi Pollutants) of cassava in Ibarapa East Local government: The 10gram each of cassava dried powdery flour was collected separately from five different zones in Ibarapa East local government and well labelled. Immediately after collection, pH and temperature was measured using portable pH meter (HANNA instruments HI 98153) and thermometer. The samples were fermented for seven days, and taking to laboratory for microbiological analysis as describe by (Batista and Raymundon, 2013).

Results and discussion

Table 1: The biological pollutants (Bacteria pollutants/ cfu/g x10^6) of cassava flour in Ibarapa East Local government

Parameter	***Staphylococcus specie***	***Pseudomonas specie***	***Bacillus specie***	***Lactobacillus specie***	***E. coli specie***	***Streptococcus specie***	***Clostridium specie***
A	- -	+ -	++	+-	++	--	+-
B	+-	- -	- -	+-	+-	++	+-
C	++	+-	+-	--	+-	+-	+-
D	++	--	--	+-	++	+-	--
E	- -	++	+-	++	--	+-	+-

keys : A- Cassava flour sample collected in Eruwa, B- Cassava flour sample collected in Lanlate, C- Cassava flour sample collected in Okolo, D- Cassava flour sample collected in Obanese, E- Cassava flour sample collected in Idi Ope F- E. coli specie mean - Escherichia coli specie.

Keys : -- Not Present , +- Present, ++ Very Present

Table 2: The biological pollutants (Fungi pollutants/cfu/g x 10^3) of cassava flour in Ibarapa East Local government

Parameter	*Fusarium specie*	*Aspergillus specie*	*Mucor specie*	*Aspergillus niger specie*
A	++	+-	++	--
B	+-	--	--	+-
C	++	+-	+-	++
D	--	+-	--	+-
E	+-	--	+-	--

Keys : A- Cassava flour sample collected in Eruwa, B- Cassava flour sample collected in Lanlate, C- Cassava flour sample collected in Okolo, D- Cassava flour sample collected in Obanese, E- Cassava flour sample collected in Idi Ope.
Keys : -- Not Present, +- Present, ++ Very Present

Table 3: The proximate analysis (g/100mg) of cassava flour in Ibarapa East Local government

SAMPLES	MOISTURE (%)	PROTEIN (%)	CARBOHYDRATES (%)	ASH (%)	Hydrogen Cyanide (PPM)
A	0.64±0.11	2.34±0.24	2.94±0.24	1.03±0.13	7.92±0.25
B	0.67±0.11	1.86±0.22	1.91±0.22	1.04±0.12	4.75±0.18
C	0.69±0.17	2.05±0.13	2.55±0.13	1.47±0.11	14.70±0.13
D	0.72±0.10	2.73±0.12	2.82±0.12	1.64±0.17	15.40±0.11
E	0.70±0.11	1.54±0.19	1.94±0.19	1.26±0.20	8.20±0.17

Keys :- A- Cassava flour sample collected in Eruwa, B- Cassava flour sample collected in Lanlate, C- Cassava flour sample collected in Okolo, D- Cassava flour sample collected in Obanese, E- Cassava flour sample collected in Idi Ope PPM- means Part per million

Table 4: The elements of cassava flour.

SAMPLES	K (%)	Ca (%)	Mg (%)	Fe (%)	Pb (%)
A	6.71±0.11	1.42±0.24	1.96±0.24	0.66±0.06	0.04±0.15
B	4.84±0.11	1.18±0.22	1.37±0.22	1.12±0.23	0.03±0.15
C	5.64±0.17	1.53±0.13	1.75±0.13	1.27±0.14	0.06±0.13
D	6.14±0.10	1.36±0.12	1.71±0.12	1.01±0.11	0.04±0.17
E	5.70±0.11	1.44±0.19	1.62±0.19	1.16±0.09	0.05±0.13

Keys; A- Cassava flour sample collected in Eruwa, B- Cassava flour sample collected in Lanlate, C- Cassava flour sample collected in Okolo, D- Cassava flour sample collected in Obanese, E- Cassava flour sample collected in Idi Ope
K-Potassium, Ca- Calcium, Mg- Magnessium, Fe- Iron, Pb- Lead

Discussion

The table 1 shows the biological pollutants (bacteria pollutants) present in cassava. The bacteria sample are seven in numbers and revealed population micro organism in Sample C and D (++) had dense population of staphylococcus specie while the flours sample A and E were free of streptococcus specie and B (+-) had most densely population. Pseudomonas specie was most densely populated observed in E (++) followed by sample A and C (+-, +-) and not found in sample B and D respectively. It was observed that sample A (++) contain

mostly bacillus specie followed by samples C (+-) and E (+-) while samples B (--) and D (--) had no bacillus specie. Lactobacillus specie was densely populated in E (++) followed by A, B and D (+-) respectively while sample C (--) had no lactobacillus specie. The Escherichia coli specie was densely observed in A and D (++) followed by B (+-) and C (+-) respectively but E (--) had no Escherichia coli specie. Streptococcus specie had densely population of B (++) followed by C (+-), D (+-) and E (+-) respectively while B (--) had no streptococcus specie. Samples A (+-), B (+-), C (+-) and E (+-) had high dense population of clostridium specie respectively but absent in D (--).

The table 2 showed fungi pollutants in cassava flour produced. Sample A (++) and C (++) had densely population of fusarium specie while B (+-) and E (+-) also had fusarium specie while D (--) had no fusarium specie. Aspergillus specie observed in A (+-), C (+-) and D (+-) while B (--) and E (--) had no Aspergillus specie. Mucor specie was observed in A (++) in large quantities followed by C (+-) and E (+-) while B (--) and D (--) had no Mucor. Aspergillus niger specie was present in C (++), followed by B (+-) and D (+-) respectively while A (--) and E (--) contain no Aspergillus niger specie.

Table 3 showed the result of proximate analysis of cassava flour in Ibarapa East local government. In moisture content D had highest statistical value (0.72%) while A had least (0.64%). The protein had highest statistical value (2.73%) in D while least (1.54%) observed in E. The carbohydrates highest statistical value (2.94%) was observed in A while least (1.91%) identified in B. Ash recorded highest (1.64%) in sample D and lowest (1.03%) in A. Highest (15.40 ppm) was observed in D and lowest (4.75 ppm) observed in B.

Table 4 showed the result of elements in cassava flour evaluated. Sample A recorded highest value (6.71%) K. while B had lowest (4.84%). The Ca had highest (1.53%) in C and lowest (1.18%) recorded in B. Mg had highest (1.96%) in A while lowest (1.37%) was noticed in B, Fe had highest (1.27%) in C and lowest (0.66%) recorded in A. Pb had highest (0.06%) in C while lowest (0.03%) was recorded from B.

Conclusion

From the result the following conclusions were drawn;

1. There were variation of biological pollutants of both bacteria and fungi species in samples collected. Sample C had the highest number of microbes while D had lowest microbes.
2. The C had highest number of fungi followed by A compared to all others.
3. From the analysis D had the highest hydrogen cyanide content followed by C and B had least.
4. The elements in C had highest lead (Pb) while B had least of the toxic substance.

Recommendation

The following recommendations were made based on the findings;

1. Food processor and farmers should always handle food in hygienic way recommended by the regulating health body especially cassava flour (lafun). This essential so to prevent consumption of much toxic substance by individual.
2. Food processors and farmers should always processed their food products free from environmental hazards and toxic substances from polluting the food.
3. Food product must always be packaged effectively with quality packaging materials to Reduce pests and microbes infections.

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PROXIMATE COMPOSITION OF MAIZE GRAINS STORED IN CONTROLLED ATMOSPHERIC SILOS

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Abstract
Maize is a prominent cereal crop and is used as a major food source in many countries around the world; it is important to maintain the quality of the grain as it moves through the short-term storage process to avoid deterioration and extend its shelf life. The atmospheric conditions of the storage environment could affect the nutritional composition of the grains. This research investigated and compared the proximate composition of maize grains stored in controlled atmospheric silos. Each silo was constructed from concrete and clay and normal atmospheric conditions. Maize grains was stored in each silo for a period of three months, temperature and relative humidity in the storage silos was kept constant throughout the storage period using a DC Fan connected to GSM module, which automatically turn on the farm when aeration is required. Samples were collected from stored grains in the two silos and normal storage condition and proximate analysis was carried out in the laboratory using the samples before storage as control. The results were then compared to identify any changes in the composition that could be attributed to atmospheric control. The results showed that, overall, the samples of maize grains stored in a controlled atmosphere concrete silo had higher protein (6.73%) and carbohydrate (69.03%) with lower moisture contents (11.9%) than those stored in an uncontrolled atmosphere. These differences in proximate composition were found to be statistically significant at $p \leq 0.05$. It was concluded that grains stored in controlled atmospheric silos retained more nutrient and the storage moisture content was better maintained in concrete silo than clay silo.
Keywords: *maize, storage, nutrients, controlled atmosphere.*

Introduction

Maize is an essential crop that is useful for many things such as human consumption in form of various products, animal feed production among others. It makes for roughly 30-35 percent of the daily calorie intake in Nigeria (Economic and Work Sector Report, 2011). It must be stored so as to preserve its quality thereby reducing post-harvest losses. Among other things, post-harvest losses have been identified as one of the biggest dangers to food security in developing countries (Adejumo and Raji, 2007). Post-harvest losses are really estimated to be 10% in African countries, which is higher than the global average which is 5% (Olakojo and Akinlosotu, 2004). Storage varies with the length of time ranging from short-term storage on farm for drying to long-term storage for strategic reserves. That is, storage can occur on farm or at large commercial facilities (Bucklin *et al.*, 2013*).* The main kind of storage offered by typical tropical facilities is for short period of time. This is due to the enduring farming practices and the little output of individual farmers. The storage issue is additionally exacerbated by the bimodal pattern of rainfall (Olakojo and Akinlosotu, 2004) causing greater challenges in predicting the atmospheric conditions. During storage period, proper aeration of grains and regular inspection should be carried out to ensure safe storage (Mishra *et al.*, 2012*)*. Some moisture changes occur in grains when stored under normal storage

conditions which could affect the nutritional constituents such as proximate composition of the stored grains (Ezennaya, and Ezeigwe, 2023). However, if the humidity and temperature are not controlled in the environment, then the negative conditions such as mold germination, decay, rancidity which would have an adverse effect on the grains is likely to occur (Sharma *et al.,* 2007). This research was therefore, designed to compare the proximate composition of stored maize within a short-term period in both controlled atmospheric silos with normal storage condition with a view of providing a secure on-farm storage facility for small scale farmers.

Methodology

Silos Description

Two shallow Silos were designed and constructed at the Department of Agricultural and Bio-Environmental Engineering in Oyo State College of Agriculture and Technology, Igboora, Nigeria. Silo A was made of clay while Silo B was made of concrete and each has a capacity of four tonnes when fully loaded.

Sample preparation

Three hundred kilogram of maize grains was purchased and dried with a solar dryer to a safe moisture content of 11.4% dry basis. The dried maize was divided into three and 100Kg was stored in each silo for a period of three months, while the remaining 100Kg was stored at room temperature and relative humidity. The temperature and relative humidity in the storage silos were kept constant throughout the storage period using a DC Fan connected to GSM module which gives information about the temperature and relative humidity value and starts aerating in the silos when necessary.

Proximate composition

Proximate composition of maize grains was determined before and after being stored for a period of three months in each of the storage conditions according to AOAC (2010).

Determination of Protein Content

The samples were digested for 1 hour at 42^0C using a method by EN ISO 20483:2006, the racks of the tubes were ejected and were placed in a stand and were allowed to cool for 10-20minutes and the tubes were inserted into the distillation unit and the safety door was closed. 80ml of deionized water was added into the tubes and 25-30ml receiver solution was added into the conical flask and was placed into distillation unit and the platform was placed so that the distillate outlet is submerged into the receiver solution. 50ml of 40% NaOH was dispensed into the tubes and was distilled for 4 minutes. The percentage protein content was determined in (1).

$$\%\, Protein\ = \frac{(T-B)\ x\ N\ x\ 14.007\ x\ 100}{W_1(mg)} \times\ F \qquad (1)$$

where: W_1 = Sample weight (mg)
T = Titration volume of sample (ml)
B = Titration volume of blank (ml)
N = Normality of acid to 4 decimal places
F = Conversion factor for Nitrogen to protein = 6.25 for food and feeds

Determination of ash content

Ash content of a material refers to inorganic residue that is left behind after organic matter or the mineral content of the sample has been destroyed. For 4-6 hours, the silica dish was held in a muffle furnace set to 525°C. The weight of ash was taken and determined. The % ash by formula was given in standard method as shown in *(2).*

$$\%\, ash\ conten = \frac{weight\ of\ ash}{weight\ of\ sample} \times 100 \qquad (2)$$

Determination of crude fat

Using a Soxhlet extraction device, the ether-soluble substance found in the seeds was recovered from the dried sample. Ether was evaporated, and the leftover material was weighed. The sample was fully dried before being extracted with petroleum ether; thus, water-soluble components were not removed. The ash content was determined as shown in *(3).*

$$\%\ fat\ conten = \frac{weight\ of\ ether\ soluble\ material}{weight\ of\ sample} \times 100 \quad (3)$$

Determination of crude fibre

After a food sample has been processed under controlled settings with standardized boiling acid and alkali solutions, the residue left behind is known as crude fiber. The Fibro-tron was a highly advanced apparatus for analyzing sample crude fiber using conventional, boiled acid and alkali solutions. The amount of crude fibre present in the maize grains was determined by standard method as shown in (4).

$$\%\ Crude\ fiber\ = \frac{loss\ in\ weight}{weight\ of\ sample} \times 100 \quad (4)$$

Determination Carbohydrates Content

The Carbohydrate content (%) was determined by the difference method according to AOAC (2010) as shown in (5).

$$\%\ Carbohydrate\ = 100 - (\%\ moisture\ +\ \%\ fat\ +\ \%\ ash\ +\ \%\ protein\ +\ \%\ Crude\ fiber) \quad (5)$$

Statistical Analysis

The analysis was carried out in triplicate and values were expressed as mean ± standard deviation; results were considered significance at $p \leq 0.05$. T-test was used to compare the means of the different parameters measured before and after storage. Data was analyzed with Statistical Software for Social Sciences (SPSS Version 20) developed by International Business Machines (IBM).

Result

Table 1: Proximate Composition of the maize grains

	Protein (%)	**Fat (%)**	**Fibre (%)**	**Ash (%)**	**Moisture content (%)**	**Carbohydrate (%)**
Before storage	7.10± 0.00	3.40 ± 0.00	7.80 ± 0.00	1.40 ± 0.00	11.40 ± 0.00	68.90 ± 0.00
Concrete Silo	6.73 ± 0.12	3.40 ± 0.00	7.50 ± 0.20	1.43 ± 0.06	11.90 ± 0.10	69.03 ± 0.23
Clay Silo	6.70± 0.10	3.40 ± 0.00	7.60 ± 0.20	1.50 ± 0.00	12.43 ± 0.15	68.37 ± 0.12
Normal storage	6.13 ± 0.12	3.40 ± 0.00	7.17 ± 0.06	1.40 ± 0.00	13.73 ± 0.06	68.17 ± 0.06
p-value	0.00	0.00	0.00	0.01	0.00	0.00

Values are Mean ± Standard deviation

Discussion

The results of proximate analyses of maize grains are presented in Table 1. These showed the constituents in terms of protein, fat, fibre, ash, moisture content and carbohydrate, all in percentage.

The moisture content increased from 11.40 to 11.09 % in concrete silo, and to 12.43% in clay silo after 90 days of storage while in normal atmospheric storage, it increased to 13.73%. This shows that the moisture content was better maintained is controlled atmospheric conditions most especially, in concrete silo. It is generally believed that moisture maintenance retains concentration of nutrients (Aremu and Akintola, 2014). This implies that maize grains stored in concrete silo would have a greater shelf life due to its lower moisture accumulation and retention.

The carbohydrate content increased from 68.9 to 69.03 % in concrete and reduced to 68.37% in clay silo and to 68.17% in normal storage. It is possible that prolonged respiratory activity during storage at somewhat higher temperatures is responsible for the decrease in carbohydrate content (Ezennaya, and Ezeigwe, 2023). Despite the fact that the preserved sample's carbohydrate content had decreased, the value was still deemed sufficient, suggesting that it might still be a significant source of dietary calories (Godswill, 2019).

The ash content of the sample increased significantly ($p \leq 0.05$) from 1.40 to 1.43% in concrete silo, to 1.50% in clay silo. However, the ash content during normal storage remained constant at 1.40%. The increase in ash content may be due to the decrease in moisture content. The shelf life of food has been reported to improve with drying, along with an increase in dry matter (Osipitan *et al.*, 2012). An increase in ash content is also an indication of an increase in the mineral content.

There was a constant value for fat content before storage and after storage in clay, concrete and in normal storage which is 3.40%. The fat content represents a good index of storability. This means that stored maize had high resistance to lipids oxidation (Abiose and Ikujenlola, 2014).

The Protein content was observed to be significantly ($p \leq 0.05$) reduced from 7.1 to 6.73% in concrete silo, 6.7% in clay silo and 6.13% during normal storage at 90 days.

Conclusion

Maize grains stored in controlled atmospheric silos retained more nutrient in terms of protein than normal atmospheric storage. It was concluded that the grains maintain the storage moisture content in concrete silo better than clay silo.

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ENGINEERING AND BIOTECHNOLOGY

USING ENERGY CONSUMPTION MONITORING SYSTEMS TO REDUCE THE DAMAGES IN ELECTRONICS IN HOMES: A SOLUTION TO ELIMINATE POVERTY AND INSECURITY IN NIGERIA.

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Abstract
The Energy Consumption Monitoring System aims to improve load monitoring in homes, reducing power consumption and conserving energy for devices like televisions, radios, and light bulbs. Researchers consulted on theoretical frameworks and technologies, including strain gauge-based sensors, accelerometer-based systems, and wireless sensor networks. The assessment also identifies the benefits and drawbacks of each strategy, laying the groundwork for the suggested methodology. The system's components, such as the sensors, data gathering units, and central monitoring unit, are described in the methodology. The section also describes the data analysis and processing methods used to translate sensor readings into accurate load measurements. Overall, we were successful in designing and creating a system that informs users of the load capacity and energy usage of linked devices in a power source. This method is anticipated to be used in households to lower the cost of connecting to the national grid.
Keywords*: Energy Consumption, Monitoring, Energy Management, Data Acquisition, Data Processing, Visualization.*

Introduction

Due to its efficiency, affordability, and cleanliness, electrical energy (EE) is one of the most useful energies in the world. Energy meters (EMs) are commonly used to measure electrical energy consumption. An instrument called EM is used to evaluate energy consumption. The EM can be classified as either postpaid or prepaid. Real-time weight measurement errors with the Load Monitoring System result in safety risks, delays, and productivity losses. Additionally, it lacks information on weight distribution, which is essential for proper load balance and transportation. To guarantee the security, effectiveness, and productivity of transportation operations, a new system is required. Abdullah, *et al. (*2020) claimed that the POEM System of billing is prone to computation errors, consumer absence during billing time, and additional costs for the billing process. The smart energy meters, also known as prepaid energy meters (PREM) allow power utilities to collect energy bills from customers before the consumption of electricity. Knowing the capacity of energy source will help to manage abruptly breakdown of electric farm machineries and tools during operations.

For circuit switching, display, and storage, Kim *et al. (*2011) proposed a household electric load monitoring system. With the Zigbee standard, it could not, however, operate wirelessly or via wires. Using a smart energy meter to track power quality and safeguard customers in unexpected circumstances, Mubdir *et al. (*2013) presented a wireless energy monitoring system. Newman, J.L. *et al. (*2016) and Omijeh, B.O. *et al. (*2013) presented a real-time energy management (controlling and monitoring) system based on wireless sensor networks to automatically activate electrical appliances when the weather situation is unstable and fluctuating. A low-cost IoT-based system is presented for better, more efficient

use of load and water (Ragle *et al.,* 2011). Modules struggle to set daily electrical energy thresholds. Demand-side energy management system is suggested for South African Wits University by Abdullahi *et al. (*2011) to reduce consumption because the planned IoT system lacks an electrical energy threshold limit. An AC power monitoring system is suggested by Bautista-Villalon *et al. (*2018) to give real-time energy consumption data and a means for consumers to track their daily energy use. In this work, we designed, implemented and tested a model for energy consumption monitoring system. This design will save electrical devices from being damaged due to abruptly disconnection from power source.

Materials and Methods

Load monitoring systems provide real-time data for energy efficiency and help utilities and consumers make educated decisions by precisely assessing and managing electrical loads.

Description of the Monitoring Device Components

a. Arduino UNO (Atmega328P)

The Arduino is an ATMEGA328P-based microcontroller board having 14 digital inputs, 6 analog outputs, a 16MHz ceramic resonator, a USB connector, an ICSP header, and a reset button.

Plate 1: Arduino UNO Microcontroller

b. Storage Device (SD)

In order to facilitate future study of load monitoring and storage, power consumption values for off-pick point and on-pack period analyses were stored on a 16GB micro storage device.

Plate 2: Storage Device

c. Current Sensor (CS)

The module decreases the red terminal's input current by five times the initial voltage. It features a virtual reality resolution of 0.00489 V (5 V/1023) and complies with the 10-bit AD requirements of the Arduino AVR processor.

Plate 3: Current sensor

d. Human-machine Interface (HMI)

The HMI is a combination of electronic circuits to interact with the user in a high-level language. It is made up of buttons for inputting data into the system and a Liquid-Crystal Display (LCD) unit through which system information is communicated back to the user. The display unit consists mainly of a 4×24 LCD. The processed information and data in the proposed system are communicated to users using the HMI shown in plate 4.

Plat 4: Human Machine Interface (HMI)

e. Buzzer Unit

A buzzer also called beeper is an audio signaling device, which may be electromechanical, mechanical or piezoelectric. Plate 5 shows the schematic diagram and a picture of the buzzer used in the current study. In this study, the buzzer was used to give a beeping sound as soon as the set consumption threshold by a user elapses.

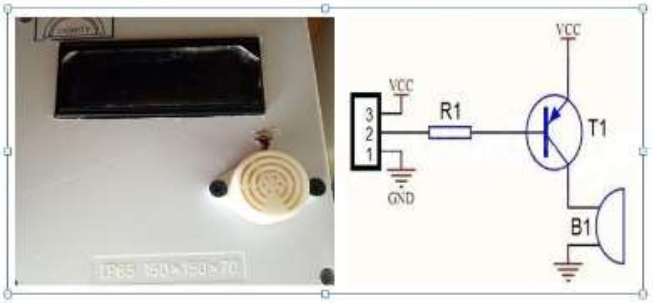

Plate 5: Show a schematic and picture of buzzer used

Result and Discussion

This section presents the results and discussion of the proposed system based on the study schematic diagram.

a. Final Circuit

Plate 6 shows the final circuit of proposed automatic load monitoring, control and alert system, based on Arduino (Atmega328) and other electrical and electronic components.

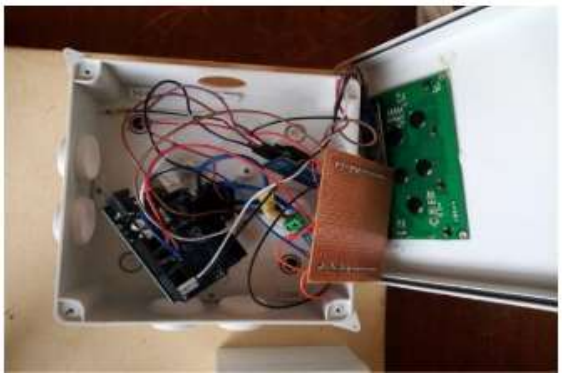

Plate 6: Final Design

b. Experimental setup

Plate 7 shows an experimental set up of the system with a 36W and 45W compact fluorescent lamp (CFL), to test how efficiently the proposed system can respond to overloading and energy wastage in a system.

Plate 7: System Testing 36W and 45W CFL

c. Empirical Results

Table 1 shows the test results of the proposed system with variable load at a preset threshold value of 0.016 kW. From Table 1, in order to prevent overconsumption and ensure safe overload and waste, the suggested system warns users if their power consumption exceeds predetermined values. The buzzer is in an ON state for 0.18–0.45kW and an OFF state for 0.01–0.15kW. The solution successfully lowers consumption while ensuring electrical installation safety.

Table 1 A test of the proposed system with variable load at a threshold of 0.16Kw

Threshold	Load (kW)	Buzzer status
0.16	0.01	0
0.16	0.02	0
0.16	0.11	0
0.16	0.15	0
0.16	0.18	1
0.16	0.19	1
0.16	0.26	1
0.16	0.33	1
0.16	0.37	1
0.04	0.45	1

d. System Flowchart

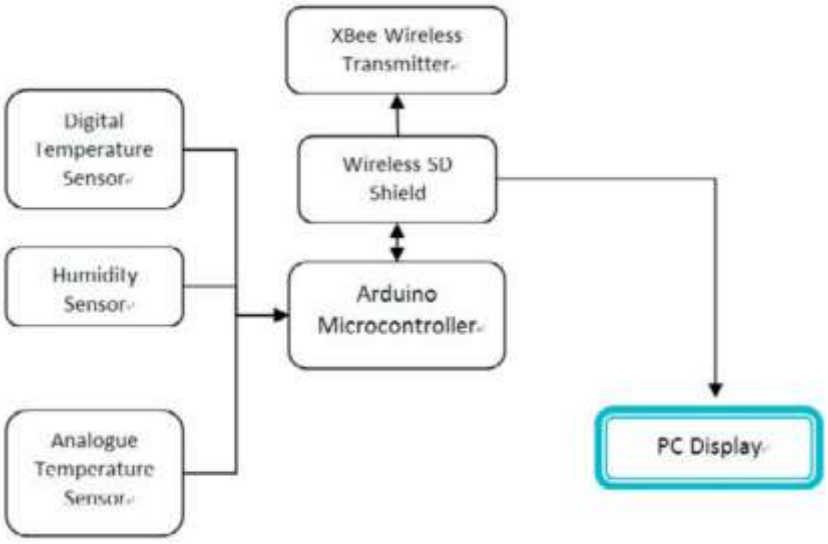

Figure 1: System Flowchart

e. System Architecture

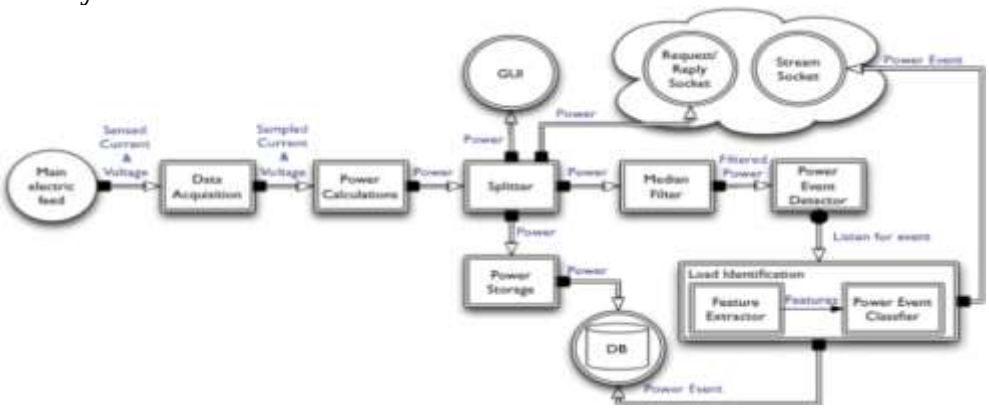

Figure 2: System Architecture

Conclusion

By assessing load characteristics and calculating consumption, an energy consumption monitoring system, which includes sensors and software, measures and records electrical power use. The study developed a system for automatically monitoring electrical loads and warning users via beeping when energy consumption exceeds predefined threshold levels using an Arduino UNO microcontroller. By avoiding abrupt power on and power down, electronic devices in various households can be protected. The money used for gadget maintenance and new device purchases can be used for other requirements. After accomplishing this, it will have a positive impact on citizens' lifestyles and eradicate poverty and insecurity.

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DESIGN AND FABRICATION OF A SOLAR POWERED EVAPORATIVE COOLER FOR FRUIT AND VEGETABLES STORAGE

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Abstract
A solar powered evaporative cooler of 0.343 m^2 capacity was designed, constructed and tested with the objective of increasing the shelf life of stored vegetables and fruits. The evaporative cooler was tested and assessed using fresh tomatoes. The system operates on the principle of evaporative cooling and thus increasing the relative humidity (RH %) in the storage chamber. The frame of the storage system was constructed out of metallic materials and sides of the system packed with jute pad which get moist by water flowing through a series of perforated piping system. The temperature dropped significantly in a range of 40 - 7°C with corresponding daily RH range of 73.4 to 82.9% unlike the ambient condition which showed a daily temperature variation of 22 to 26°C. However, the testing of evaporative cooler showed that the tomatoes can be stored for days as long as the system is perfectly working; there were negligible changes in weight, colour, firmness and rotten as compared to ambient condition which showed rottenness in a period of days stored. Hence, it is on this note that householders, farmers and tomatoes processing factories should make use of such evaporative coolers for temporal shortage of fresh tomatoes as this will increase the shelf life of tomatoes.

Keywords*: Evaporative cooling, storage, temperature, relative humidity, fruits and vegetables.*

Introduction

The use of evaporative cooling in lowering the temperature of ambient air and improving the relative humidity of the draft air is very old. Its application has generated a lot of research especially in the temperate region of the world mostly for house cooling (Atanda *et al.*, 2011). This is due to environmental friendliness and high energy efficiency ratio over compressed air-conditions (Xuan *et al.*, 2012). However, in the tropical environment with its high solar load it has not been fully exploited, despite the fact that any marginal decrease in the ambient temperature in a tropical environment will have a very great cooling effect.

Vegetables and fruits are best agricultural products for human diet worldwide and in Nigeria. They are rich in vitamins and minerals such as carotene (vitamin A), ascorbic acid, riboflavin, iron, iodine, and calcium. But the quantity of exports and domestic supply of the fruits and vegetables in Nigeria by fruit producing farmers is limited due to high post-harvest losses incurred. Where most of the post-harvest losses incurred are due to a lack of storage facilities (Taye and Olorunisola, 2011).

Because of defects and inadequacies in post-harvest handling, transportation, storage and marketing, post-harvest losses of perishable products have been estimated to be about 30–40% in developing countries (Atanda *et al.*, 2011).

This paper focuses on the design and fabrication a cost effective indoor solar powered evaporative cooling system for fruits and vegetables storage. Most of the post-harvest losses of agricultural perishable products, for example, fruits and vegetables in Nigeria are due to the lack of affordable storage facilities. The modern refrigeration and cooling storage facilities are the best methods of preserving the products but they are very expensive to buy and run (FAO, 2003). In Nigeria a less than about 7% of the population have access to electricity (IRENA, 2009). This makes the usage of typical modern refrigerators impossible for the farmers especially in rural areas where most of the agriculture is carried out.
Therefore, the designed and fabricated indoor solar powered evaporative cooler will be most applicable to reduce post-harvest losses of fresh fruits and vegetables and eradicate the cost of electricity since the storage facility will be solar powered.

Materials and Method

The fabrication was carried out at Oyo State College of Agriculture and Technology, Faculty of Engineering and Technology Workshop, Igboora. The designed and fabricated evaporative cooler in Plate 1 was tested using fresh tomatoes from a local market. The evaporative cooler has a capacity of 0.324 m^3 (324 kg). Figure 1 and Figure 2 shows the Isometric and Orthographic projections of the designed evaporative cooler.

Design Calculation

Volume of the Storage System chamber

The volume of the storage system was determined using;

$$V = L\ x\ B\ x\ H \qquad \text{.....1}$$

L=0.6m, B =0.6m, H =0.9m

$$V = 0.6\ x\ 0.6\ x\ 0.9$$

$$= 0.324\ m^2$$

Where; V= Volume of the storage system, L= Length of the storage system, B= Breadth of the storage system, H= Height of the storage system

Design of opening (door) of the Storage System

The design for the door of the storage system was done using Equation 2 with a hole of 240 mm diameter for insertion of suction fan.

$$A = L\ x\ H \qquad \text{.....2}$$

L=0.6 m, H=0.9 m

A= 0.54 m^2

Design and Selection of Suction Fan

The fan capacity was determined in accordance with Bartok, (2013) as given as

Fan Capacity=8cfm/sqft × Area in squared foot

Area $A = L\ x\ H$ 3

$$A = 0.54\ m^2 = 5.81\ sqft$$

Note:1m^2 =10.764 sqft

Where: A= Area of the side, L= Length of the side in ft., H = Height of the side in ft., and a given factor of safety (Fs) was used to cater for the loses

$$\text{Fan capacity} = 5.81\ x\ 8 = 46.48\ cfm$$

$$\text{Considering a factor of safety (Fs) of 10\%} = 0.1\ x\ 46.48 = 4.648\ cfm$$

$$\text{Required fan capacity} = 46.48 + 4.648 = 51.13\ cfm$$

Design of the Back Side (Pad Area) of the Storage System

The design for the left side of the storage system was done using Equation 4.

$$A = H\ x\ B \qquad \text{.....4}$$

A = 0.54 m^2

Heat Transfer Analysis of the System

The heat gained by the aluminum material used for the cabinet construction was estimated using Fourier's law of heat conduction.

The battery capacity was determined with reference to the suction fans specifications and this is in accordance with Linden, (2002) as given as;

$$C = Hn\ x\ A \qquad \ldots\ldots\ldots\ldots\ldots\ldots 5$$

$$C = 10\ x\ 15 = 150\ AH$$

Where: C = battery capacity, H_n= Hours from sunset to sunrise, A= Fan current rating. Based on the above findings, P= Pump power rating, the appropriate battery that was selected has the following specifications: Voltage= 12V, Capacity= 200 AH.

Selection of Solar Power Supply System

The installed suction fans and the aquarium pump on the evaporative cooling system have the following specifications respectively 12V (voltage ratings), 190W (power ratings) and 12V (voltage ratings), 10W (power rating). These specifications were considered in selection of the solar power source that will ensure the continuous functioning of the fans. The solar panel selected has the following specification: Voltage=12V, Power=250W

Volume of Reservoir

The volume of the reservoir was determined using Equation 6.

$$Vr = \pi r2H \qquad \ldots\ldots\ldots\ldots\ldots 6$$

Diameter of the reservoir = 0.20 m

Height of the reservoir = 0.4 m $\qquad Vr = 3.14\ x\ 0.12\ x\ 0.4$

$$Vr = 0.01256\ m3$$

= 13 litres

Where: V_r= Volume of reservoir, π=*3.14*, r=radius of reservoir, H= height of reservoir.

Results

Cooling Efficiency

Cooling Efficiency (CE)

$$\text{CE} = \frac{Ambient\ DB - Cooler\ DB}{Ambient\ DB - WB} \qquad \ldots\ldots\ldots\ldots\ldots\ldots 7$$

Table 1 shows the result of cooling efficiency of the preservation chamber with the tomatoes and the result showed the daily average cooling efficiency of the system which ranges between 78.4 to 82.9% which closely agree with the result obtained by Zakari *et al. (*2016) who reported daily cooling efficiency range of 71 to 90.6%. This shows that the designed evaporative cooling system is effective and hence it will increase the shelf life of fresh tomatoes.

Table 1: Cooling efficiency of the cooler for 5 days

Days	Ambient DB (^{0}C)	WB (^{0}C)	Cooler DB (^{0}C)	Cooling efficiency (%)
1	24.1	16.1	17.8	78.8
2	23.6	16.6	18.0	80.0
3	23.9	16.5	18.1	78.4
4	23.7	16.7	17.9	82.9
5	24.2	16.8	18.3	79.7
Average	**23.9**	**16.5**	**18.0**	**79.9**

Discussion

The discharge rate was found to be 9 litres in 32 minutes when the discharge was opened at 30 degrees compared to what was reported by Zakari *et al. (*2016) of 2 litres in 1 hour depending. The size and type of evaporative cooling pad used could be a factor. Also, the tomatoes stored in ambient started decaying after the third day while those stored in evaporative cooler was still fresh.

Conclusion

A solar powered evaporative cooling system was designed, constructed and evaluated by storing fresh tomatoes for a period. The performance of the evaporative cooling system gave daily temperature range of 7 to 20ºC with corresponding relative humidity of 73 to 90% and daily cooling efficiency range of 78.4 to 82.9% as against the ambient condition, the designed system highly recommended to be used for prolonging the storage shelf life of fruits basically tomatoes which require storage temperature of 13 to 21ºC better than keeping the tomatoes in ambient air conditions. Since tomato quality showed a delay in color change and firmness compared to tomatoes kept at ambient conditions, it is concluded that farmers, house holders and tomatoes processing factories should make use of an evaporative cooling system to preserve fresh tomatoes as it can help reduce postharvest losses and also generate more income to the users (farmers)

Plate 1: The Fabricated Evaporative cooler

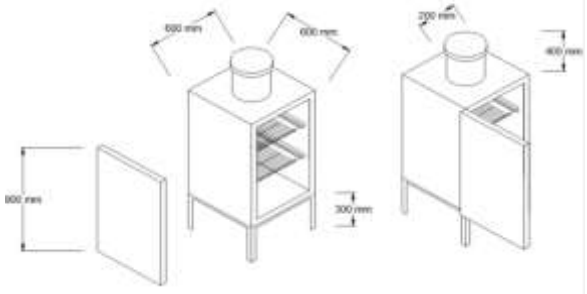

Figure 1: Isometric projection of the evaporative cooler

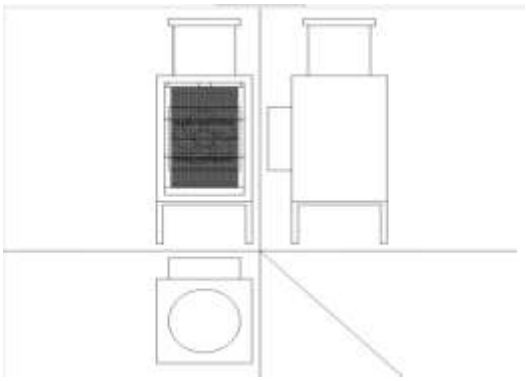

Figure 2: Orthographic projection of the evaporative cooler

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EFFECTS OF PARTIAL REPLACEMENT OF CEMENT WITH GLASS POWDER AND MIX PROPORTION ON ABSORPTION PROPERTY OF LATERIZED CONCRETE

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Abstract
Global warming and environmental devastation become manifest harms in recent years, concern about environmental issues, and changeover from the mass-waste, mass-consumption, mass-production society of the past to a zero emanation society is now viewed as significant. Glass does not harm the environment because it does not give off pollutants, but can harm humans as well as animals, if not dealt carefully and less friendly to environment because it is non-biodegradable. This paper study the effect of partial replacement of cement with glass powder and mix proportion on absorption property of laterized concrete. Waste glass from different refuse dump in Igboora were washed and sundried. The glass was grounded using hammer mill and later grounded to powder using Kenwood blender (SHB-3088). It was later sieved using 0.04mm sieve to get a fine powder. Laterite soil was collected in Oyo State College of Agriculture and Technology, Igboora premises, air dried and sieved. A mould size of 150mm × 150mm × 150mm was constructed in 36 pieces and grease using lubricant (oil) to allow for easy removal of the concrete cubes. The materials (Cement, Powdered glass, Granite and Laterite) were mixed thoroughly with water to achieve plastic form. Granite, laterite, cement and glass powder were mixed with water in the ratio 1:1.5:3, 1:2:4, and 1:3:6 with glass powder replacing cement in 0%, 10%, 20%, and 30% respectively. The cubes were immersed in water for 28 days curing and air dried for 60 days. The samples were weighed and immersed in water for 24 hours. The samples were removed and weighed again. The result of glass powder analysis showed the adequacy of SiO_2 content of 74.6% which met the minimum requirement of 70% as recommended by ASTM6.18(2005). Water absorption decrease moderately as the glass powder addition increased from 0 – 10%. The higher addition of glass powder from 20%-30% increased the water absorption capacity. The result after 28 curing days showed that all the specimen satisfied the maximum water absorption of 12% recommended by Nigerian Industrial Standard NIS (2004) and 12.5% water absorption recommended by the Nigerian Building and Road Research Institute NBRRI (2006).

Keywords: Water Absorption, Laterized Concrete, Curing, Mix proportion, glass powder

Introduction

Quest for housing for both man and animal is on the increase as the population increases. High cost of conventional materials for building construction make this basic amenity elusive to many people in a poverty ridden society like Nigeria. Sourcing for alternative materials of construction that are cheaper and readily available like lateritic soil and use of waste glass becomes inevitable. Laterized concrete is one which the fine aggregate has been partially or wholly substituted with laterite soil in its natural form (Adepegba, 1975; Olusola, 2005 and Ogunbode and Olawuyi, 2008). Laterite is a product of weathering of basalt under humid, tropic condition; laterite is a mixture of clayey iron and aluminum oxides and hydroxides (Raheem *et al.,* 2012 and Ukpata *et al.,* 2012) and it is abundantly available in tropical

regions including Nigeria. Recently, several researchers studied the ability of adding mineral materials to concrete mixtures to improve the mechanical properties, durability and increase the service life of concrete structures. These materials are used as cementitious materials or filler. Mehta and Montaro (2005) stated that mineral admixtures are finely divided siliceous materials that are added to concrete in relatively large amounts, generally, in the ranges of 20 to 70 percent by mass of the total cementitious material. Although, natural pozzolans in the raw state or after thermal activation are still being used in some parts of the world, due to economic and environmental considerations, many industrial by-products (wastes) have become the primary source of mineral admixtures in concrete. There are three types of waste materials that can be use in concrete admixtures: industrial, agricultural, and municipal solid wastes. Industrial waste includes fly ash, silica fume, blast furnace slag, etc. Agricultural waste includes rice husk ash, wheat straw ash, and olive waste, etc. Municipal solid waste includes plastic, glass, sludge etc. Use of by-products wastes as partial replacements of sand or cement give concrete many benefits such as; reduction in the clinker factor in the cement which helps to minimize CO_2 emissions; reduction in the environmental problems that resulted from these waste materials**;** improving the mechanical properties and durability of the concrete mixtures; reducing the amount of materials that are consumed rapidly like cement, aggregates, sand, rocks etc, due to construction development movement that are found in many countries of the world (Lasisi and Ogunjide 2004, Khatib *et al.,* 2012 and Onyeka, 2019). Glass is one of the most versatile substances on earth used in many applications and in a wide varieties of forms. The glass is a mixture of silica, sand, lime and other materials. Heat can convert the glass to liquid and workable form, making it easy to reuse and recycle (Olusola, 2005). The building materials such as laterized concrete are subjected to various loads and exposed to weather elements especially moisture. Sasikumar and Tamilvanam (2019) carried out an experiment investigating properties of glass powder as a partial replacement of cement. Main parameter investigated in the study is M30 grade concrete with partial replacement of cement by glass powder 0%, 5%, 10%, 20%, 25%. The optimum 7 and 28 days compressive strength was obtained in the 25% glass powder replacement level. Water cement ratio was at 0.43 in all the cases and 43.1 N/mm^2 was the maximum compressive strength. Kumar and Dhaka, (2016) wrote a reviewed paper on partial replacement of cement with glass powder and its effect on concrete properties, the main parameter investigated is M35 concrete with partial replacement of glass powder variiation in percentage (0, 5, 10, 15, 20, 25%) respectively by weight of the cement. Onyeka, (2019) investigated the effect of partial replacement of aggregate by crushed glass on the properties of concrete and discovered that water absorption decreases as percent replacement increases. Safiuddin, *et al. (*2013) noticed decrease in water absorption capacity of concrete when cement was partially replaced by palm oil fuel ash. Folagbade and Olatunji, (2020) study the effect of glass waste powder on the compressive strength and permeation properties of concrete containing Portland cement and sawdust ash, it was reported that permeation resistance was achieved better than in normal concrete. Information on effects of glass powder and mix proportions on absorption capacity of laterized concrete have not been properly documented. Hence this study reports the effect of partial replacement of cement with glass powder and mix proportion on absorption property of laterized concrete

Materials and methods

Materials and Equipment

The materials and equipment used in this study include: Laterite (Fine Aggregate), Ordinary Portland cement, Waste Glass, Curing can, water , Mould (150mm × 150mm × 150mm), Shovel, Head pan, Hand trowel, Plain Smooth surface, Black oil, Gravel, Set of sieves, Mechanical shaker and Compression testing machine.

Sieve analysis
A 1000g of laterite was placed inside the set of Sieves after being weighed, the sieves were weighed accordingly and shaken with Sieve shaker mechanically, and the sieves were weighed again with the laterites in accordance with BS 1377 (1990).

Preparation of Glass Powder.
Waste glass collected from different refuse dump in Igboora were washed and sundried. The glass was grounded using hammer mill and grounded to powder using Kenwood blender (SHB-3088). It was later sieved using 0.04mm sieve to get a fine powder.

Preparation of Concrete Cubes
A mould size of 150mm × 150mm × 150mm was constructed in 36 pieces and greased using lubricant (oil) for easy removal of the concrete cubes. The materials (Cement, Powdered glass, Granite and Laterite) were thoroughly mixed and cast as shown in Table 1 below. After the cubes were removed from the mould, they were fully immersed in water to cure for 28 days, Plate 1. The wet samples were removed and air dried for 60 days, Plate 2.

Table 1: Mixed proportion and glass powder percent replacement

S/N	Glass Powder Replacement (%)	Mixed Ratio 1:1.5:3	Mixed Ratio 1:2:4	Mixed Ratio 1:3:6
1	0	3	3	3
2	10	3	3	3
3	20	3	3	3
4	30	3	3	3

Absorption Test
Each sample was weighed before immersion in water for twenty four hours. The samples were removed and weighed again. The procedure was replicated three times. The absorption capacity was calculated using

$$\frac{Wetweight - Dryweight \times 100}{DryWeight}$$

Plate 1: Curing of Sample

Plate 2: Air-drying the Samples

Results and discussion

Soil Description

The soil sample identified to be Reddish brown gravely clay granular soil by visual observation and physical feeling as shown in Table1. The reddish brown colour is an indication of larger presence of iron which is one of the properties that make laterite structurally useful in engineering.

Table 2: Soil Description

Soil Sample	Physical Description
Sample	Reddish brown gravely clay Granular soil.

Sieve Analysis

Figure 1 showed particle size distribution of the laterite. The soil is well graded thus suitable for concrete production.

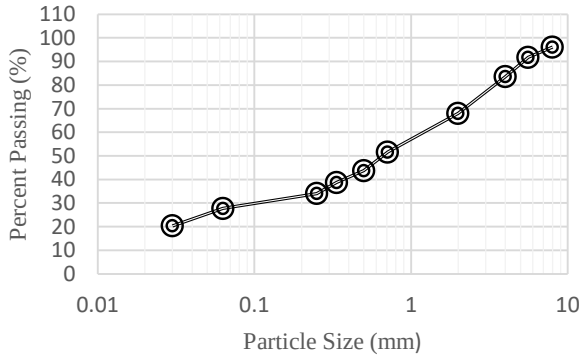

Figure 1: Particle size distribution of the laterite

Effects of glass powder and mix proportions on absorption capacity of laterized concrete

The result from Table 3 showed that water absorption decreased moderately from 6.69 to 6. 65% , 9.95 to 9.31% as the glass powder addition increased from 0-10% in the mixes 1:1.5:3 and 1:3:6 respectively, but the higher addition of glass powder from 20% - 30% increased the water absorption capacity. The decrease maybe due to the chemical reaction between natural and calcium hydroxide of hydrated cement paste (Bapat, 2012). Secondly, Stabilizing agent (Portland cement and glass powder) bond the laterite particles together thereby reduced the pores through which water flow into the block cubes. However, in the mix 1:2:4 there is increase in absorption from 5.12 to 7.38%, between 0 and 10% replacement. At the higher glass powder substitution (20%-30%) calcium hydroxide was insufficient to react with the excess glass powder thereby creating voids in the mixture, thus the increase in water absorption. The results also showed that the richer the mix the lower the absorption capacity. This is because particles are closely packed in a rich mix. Hence, the absorption capacity is lowest in 1:1.5:3 and highest 1:3:6 The results showed that all cubes produced satisfied the maximum water absorption 12% recommended by Nigerian Industrial Standard NIS (2004) and 12.5% water absorption recommended by the Nigerian Building and Road Research Institute NBRRI (2006).

Table 3: Water Absorption

Percent Replacement of glass powder	**Mix Proportion**		
	1 : 2 : 4	**1 : 1.5 : 3**	**1 : 3 : 6**
0%	5.12%	6.69%	9.95%
10%	7.38%	6.65%	9.31%
20%	9.76%	8.5%	10.19%
30%	9.58%	8.51%	12.07%

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Conclusions and Recommendations

Conclusion

Based on the findings of the study, it can be concluded that the use of glass powder at 0-10% will reduce water absorption capacity and above 10% i.e 20%-30%, will increase water absorption. Also, a richer mix proportion will produce lower absorption capacity. The replacement of cement by glass powder up to 30% within the mix proportion considered is satisfactory.

Recommendation

It is recommended that the addition of glass powder up to 10% can be used in the production of laterized concrete for buildings construction.

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A SURVEY OF SOLAR ENERGY AWARENESS AND ADOPTION FOR SUSTAINABLE DEVELOPMENT: A CASE OF IBARAPA RESIDENTS

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Abstract
Access to clean, affordable, and environmentally friendly energy is a condition for attainment of sustainable development. The Solar PV is a renewable source of energy that offers clean, everlasting, and environmentally friendly energy. This paper investigates energy literacy, use and adoption amongst residents of Ibarapa in Oyo State, Nigeria.Using the simple random sampling method, residents respond to the items on the variables of awareness and adoption in five different locations. Results show that the awareness of solar energy and its characteristics are high. Unimpressively, however, these do not translate to a *correspondingly high level of adoption or use among the residents. This situation puts on the media the responsibility of partnering with the government and private investors in developing aggressive campaign strategies to help transpose people's awareness of solar energy to that of use.*
***Keywords**: Renewable energy, awareness, adoption, solar energy*

Introduction
The importance of energy in achieving sustainable development cannot be over emphasized. Energy availability has been found to be closely related to sustainable development of a country (Awogbemi, and Asaolu, 2014). Real sustainable development is about the ability of a society to meet the needs of the present without compromising the ability of future generations to meet their own needs. These need include access to functional, affordable health care and educational systems, access to nutritious food, living in a comfortable house with the basic necessities of life, and living in a friendly environment or planet, to mention just but a few. To meet these needs, energy availability is central. It is required to drive the socioeconomic and industrial development of a nation. For example, energy is used in the agricultural sector for irrigation and preservation; in the household sector for lighting, heating, refrigeration, and cooking; in the industrial sector for turning raw materials into finished goods; and in the transportation sector to power cars, trucks, trains, airplanes, etc. Energy contributes in multiple ways to the Gross National Product (GNP) of a country (Awogbemi and Komolafe 2011).

At her independence in 1960, two of the things that made Nigeria stand out were her abundant energy and human resources. Paradoxically, since independence, the country has suffered energy crisis, exacerbated by poor leadership and management. As of 2018, an estimated 60 percent (about 95 million people) of the Nigerian population did not have access to electricity (Nnaji, 2017 and Asu, 2018). With an estimated population of between 180 and 200 million, Nigeria still has between 4,000 and 7,000MW of electricity, whereas South Africa, with 50 million people, produces about 50,000MW (Kane, 2017 and Adenirokun, 2018). Although Nigeria has an electricity generation potential of 93, 950MW (UN Economic Commission for Africa, 2017 and Sambo, 2010). The energy crisis has affected the

productivity and economy of the country with homes, banks and manufacturing firms relying endlessly on electricity generators.

Between 2010 and 2014, Nigeria imported 75 - 750 KVA generating sets worth $145,550,088 to power its factories, telecom towers, offices, and homes (Akinnosun, 2017). In 2014, a dominant Nigerian daily newspaper, Vanguard, reported over 14,000 Nigerian deaths through generator fumes. In May 2017, a widow and her three children died in their sleep from generator fumes. Many such occurrences had prompted the Nigerian government in 2017 to halt the importation of a notorious power generator brand (Akinnosun, 2017). The increase in generator use has added to the country's carbon emission, prompting the government's interest in other energy sources such as renewable energy.

Agbongiarhuoyi (2015) explains renewable energy as the energy that comes from resources which are naturally replenished on a human timescale such as sunlight, wind, rain, tides, waves, and geothermal heat. The recognized Renewable Energy (RE) in Nigeria includes solar energy, hydropower, wind energy, biomass, and biogas. Exploitation and utilization of these RE sources will not only help Nigeria to meet her energy targets, ensure energy sufficiency particularly solar energy, in achieving sustainable development in Nigeria, but also in stemming the tide of environmental degradation associated with exploitation of non-renewable energy sources.

Solar energy

Sun radiations are converted into electricity through photovoltaic (PV) cells. PV cells are composed of layers of semiconductors such as silicon. Energy is created when photons of light from the sun strike a solar cell and are absorbed within the semiconductor material. This excites the semiconductor's electrons, causing the electrons to flow, and creating a usable electric current. The current flows in one direction and thus the electricity generated is termed direct current (DC) (Oji *et al.*, 2014; Aldous, 2014 and Domkundwar *et al.*, 2010).

Structure of A Solar Cell

Solar PV cells are made of special materials called semiconductors such as silicon, which is most commonly used. Basically, when light strikes the cell, a certain portion of it is absorbed within the semiconductor material. This means that the energy of the absorbed light is transferred to the semiconductor. The energy knocks electrons loose, allowing them to flow freely (Oji *et al.*, 2014). A typical solar cell is as shown in Fig. 1.

Balance Of Solar PV System

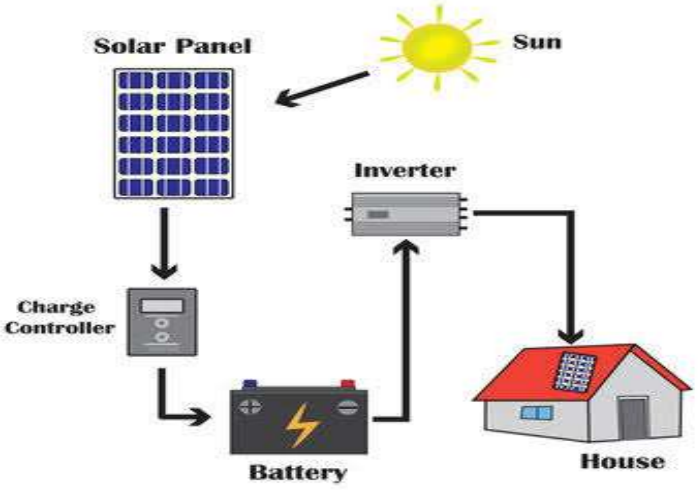

Fig. 1. Components of a solar cell

A PV installation needs several components other than the PV panels. These components are jointly referred to as the Balance of Systems (BoS) and include batteries, battery charge controller, inverters, supporting structures required for mounting the PV panels, etc. (Solanki, 2012). The basic components of the BoS are:

i. **Batteries**: Battery is an electrochemical device that converts the chemical energy contained in its active material directly into electrical energy. Batteries are used for storing energy and as a backup source when solar insolation is fluctuating, during cloudy conditions or at night. Commonly used batteries for solar PV include Lead-acid batteries, and Nickel-Cadmium (Ni-Cd) batteries (Solanki, 2012). Deep Cycle Batteries store electricity to provide energy on demand at night or on overcast days. They are designed to be discharged and then re-charged. These batteries are rated in amp hours usually at 20 hours and 100 hours. Like solar panels, batteries are wired in series and/or parallel to increase voltage to the desired level and increase amp hours (Oji *et al.*, 2014,).

ii. **Inverters**: Inverters are required to convert the Direct Current (DC) power produced by the PV module into Alternating Current (AC) power. Most solar power systems generate DC current which is stored in batteries while nearly all lighting, appliances, motors and so on, are designed to use AC power, so it takes an inverter to make the switch from batterystored DC to standard power (120VAC, 60Hz). Also, the grid connected applications require that the DC is converted into AC before power can be fed into the grid (Oji *et al.*, 2014 and Solanki, 2012).

iii. **Charge Controllers**: A charge controller monitors the battery's state-of-charge to insure that when the battery needs charge current it gets it, and also insures the battery is not over charged. In applications, where batteries are used, it is critical to prevent over-charging or deep discharging for the batteries to preserve their life and ensure good performance. This is achieved using a charge controller. Connecting a solar panel to a battery without a regulator seriously risks damaging the battery and potentially causing a safety concern (Oji, *et al.*, 2014, Solanki 2012). One PV cell produces only one or two watts which is not much power for most uses. In order to increase power, photovoltaic or solar cells are bundled together into what is termed a module and packaged into a frame which is more commonly known as a solar panel. Solar panels can then be grouped into larger solar arrays as shown in Fig. 2.

Fig. 2: Arrays of solar panels

Statement of the problem

Surveys on renewable energy around the world have established problems of unawareness, illiteracy, and lack of understanding of renewable energy and key issues therein

(Mercom Capital Group, 2011; Bamisile *et al.,* and Nadabo, 2010). Asu (2018,) lists the challenges facing renewable energy in Nigeria to include the negative perception and the limited awareness of the benefits of renewable energy. As part of the contribution to the global data on renewable energy and more so that fuel subsidy have been removed in Nigeria which has caused a hike in fuel price, the present study focuses on survey of solar energy awareness and adoption for sustainable development among the residents of Ibarapa Central local Government, Oyo State, Nigeria.

Objectives of the study

The objectives of the study were to:

1. Ascertain the awareness status of the residents of Ibarapa Central Local Government about solar energy.
2. Ascertain the extent to which these residents adopt solar energy.
3. Ascertain the factors affecting solar energy awareness and use among the residents of Ibarapa Central,Oyo State.

Methodology

Research type

The study adopted the survey research method. Members of the public were reached in their homes and tested primarily on their awareness, knowledge, experiences, and behavior towards solar energy. The population of the study was derived from five locations in Ibarapa central and 30 respondents from each location were selected using simple random sampling technique. The instrument used for data collection was a structured questionnaire. The questionnaire were personally administered by the researcher and waited to collect them; hence the rate of return was 100%. The questionnaire contained items on demographic characteristics of the respondents in Section A. Section B contained items testing solar energy awareness literacy and adoption.

Data analysis

The information supplied from the respondents as data were sorted out and tabulated sequentially and was analyzed using descriptive statistical tools such as frequency, cumulative frequency and percentage.

Result and discussion

Table 1: Frequency distribution of platforms for respondents' awareness of solar energy

Source	*f*	%	Cumulative%
Mass media	25	16.7	16.7
Informal communication with friends	50	33.3	50.0
Place of worship	35	23.3	73.3
Place of work	40	26.7	100.0
Total	150	100	

Source: Researchers' fieldwork

The sources through which the respondents obtained information and awareness of solar energy were explored. The results are displayed in Table 1. The table reveals that about (16.7%) of the respondent hear and receive information about solar energy through the mass

media, then (33.3%) receive information about solar energy through informal communication with friends, and (23.3 %) at place of worship, while (26.7 %) at place of work.

Table 2: Multiple response analysis of views of respondents on using solar energy

Perception of the use of solar energy	*f*	%	Cumulative %
I found it very efficient	95	18.2	18.2
It is costly to acquire	125	24.0	42.2
It is costly to maintain	115	22.1	64.3
I did not understand what was involved before installing it	84	16.1	80.4
I could not buy a new part of the device when it got bad	72	13.8	94.2
I will continue using it in the future if my own gets bad	30	5.8	100
Total	521	100	

Source: Researchers' fieldwork

Each respondent was expected to indicate at least one of the available options based on their experiences. The results show that (18.2%) of the respondents who used solar energy found it very efficient. Also, (24.0%) of the respondents indicate that solar energy equipment was costly to acquire while (22.1%) specify that the solar energy equipment was costly to maintain. However, the (16.1%) reveals that they did not understand what was involved before installing the solar energy equipment, while (13.8%) reveals they could not buy a new part of the equipment when their own were faulty. On the other hand, only (5.8%) indicated that they would continue to use renewable energy facilities in the future if their own were out of order.

Table 3: Reasons for not installing solar energy equipment.

	f	%	Cumulative %
I'm not sure whether it will work	58	20.7	20.7
My friends have had bad experience	62	22.1	42.8
I just want to continue with public power supply	80	28.6	71.4
It is costly to acquire	70	25.0	96.4
Regular power supply	10	3.6	100
Total	280	100	

Source: Researchers' fieldwork

Sticking with the status quo of continuing with the public power supply was the most cited reason for not adopting solar energy as shown in Table 3. Remarkably, however, the least cited option by only (3.6%) of the respondents indicates that regular power supply is one of the reasons for not installing solar energy. This implies that majority of the respondents about (96.4%) opted for solar energy because of irregular public power supply.

Conclusion

The issues affecting adoption and use such as fears and uncertainties surrounding the acquisition and installation of solar energy equipment should be a pointer to media, government, and investors on the areas of need in solar energy promotion. The government particularly should give attention to incentives to attract investments and competition in the market. This would

have helped largely in reducing the price of acquisition and maintenance of solar energy equipment.

Recommendation

The study makes the following recommendations

1. Adequate awareness strategies on solar energy have not been put in place yet. The government and private investors to partner the media in developing aggressive campaign strategies to promote solar energy. Seminars, workshops, and conferences should be conducted to bring solar energy awareness to the doorstep of every Nigerian.
2. The cost of acquisition and maintenance of solar energy equipment was reportedly very high, thereby discouraging investors and individuals from adopting solar energy. Also, inadequate and expensive spare parts are part of the problem. Appropriate incentives and competitions should be introduced in the solar energy market as research has shown that this could bring down the cost of solar energy equipment and make itS affordable.
3. Adequate spare parts for the solar energy equipment and technical professionals should be put in place and prompted through media campaigns to help make it easy for people who are having one problem or another with their equipment.
4. More sensitization needs to be undertaken by investors, government and the media on the main reason for alternative energy. This will help the country to prepare for the economic consequences of a major global shift from oil to renewable energy sources for sustainable development.

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STRENGTH CHARACTERISTICS OF LATERITE INTERLOCKING PAVEMENT BLOCK INCORPORATING GLASS POWDER

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Abstract
The high incidence and frequency of road pavement failures have been of great concern toroad engineers in developing countries like Nigeria. This has given rise to intensive research as a means of improving the strength and durability of the road bases. This paper reports the characteristics of cement stabilized laterite interlocking pavement blocks incorporating glass powder. Glass powder was used to replace 10% - 30% weight of cement in concrete. Cement and laterite were measured using 1:4 mix ratio. Concrete without glass powder served as control. The specimen were immersed in water for 28 days curing, the produced specimens were taken to the laboratory for compressive strength test and split tensile strength test. The average compressive strengths and Split Tensile Strength of laterite interlocking paver blocks are 8.30 N/m^2*(*$8.3\ x\ 10^6$ *MPa), 7.80* N/m^2*(*$7.8\ x\ 10^6$ *MPa), 4.92* N/m^2*(*$4.92\ x\ 10^6$ *MPa), 3.49* N/m^2*(*$3.49\ x\ 10^6$ *MPa) and1.19*N/m^2*(*$1.19\ x\ 10^6$ *MPa), 1.19* N/m^2*(*$1.19\ x\ 10^6$ *MPa), 0.79* N/m^2*(*$0.79\ x\ 10^6$ *MPa), 0.62* N/m^2*(*$0.62\ x\ 10^6$ *MPa) for 0%, 10%, 20% and 30% respectively. The compressive strength and split tensile of LIB tested are lesser than the standard requirement as specified by ASTM C936 – 0 and IRC: SP: 63: 2004. Hence can be used in places with less load carrying capacity i.e. walkways.*

Keywords: Hammer Mill Durability Incorporating Compressive Pavement

Introductions

Block paving is an attractive practice usually precast interlocking concrete paver block used for the purpose of exterior flooring. Paver blocks are used greatly in different countries for highways, airports, streets, local roads, parking lots, industrial facilities and other types of infrastructures (Bamikole and Olatunji, 2018) over past two decades. In order to overcome problems of providing paved path in areas where typical types of creating pavement is not workable or due to road congestion and geological functioning. They are available in various colours and shapes like square, rectangular, zig zag, dumbly, wavy, cosmic etc., with interlocking patterns so that it can be locked with the adjacent paving blocks. (Adepegba, 2005). Geometric increase in the price of construction materials has been a bottleneck for acquiring a quality and decent home, but with the use of locally sought construction materials such as laterite soil and waste glass powder, the solution is possible (Raheem *et. al.*, 2012). Laterite is one of the major materials used as sub base and base courses of pavements layers. Subgrade soil is an integral part of pavement structures, which support the pavement and hence, must give adequate support and stability under adverse loading conditions (Akanbi and Oyewumi, 2014). The high incidence and frequency of road pavement failures have been of great concern to road engineers in developing countries like Nigeria. This has given rise to intensive research to means of improving the strength and durability of the road bases (Eze-Uzomaka and Balogun., 2010).

Osinubi, (2005) referred to soil stabilization as the alteration or control of soil property. It covers not only the increase or decrease of soil property but also the variation of property with changes in environmental condition, namely moisture or pressure. The stability of structures founded on soil depends on the large strength of the soil and its interaction with water (Alhassan, 2008). It is, therefore, important to make soils deficient in strength, useful and meet geotechnical engineering design requirements. Over time, cement and lime have been the two main materials for stabilizing soils. The most commonly used additive for soil modification or stabilization is ordinary Portland cement (Chu and Kao, 2009), this material has rapidly increased in price due to the sharp increase in the cost of energy since the 1970s and immeasurable increase in the price of construction materials presently(Neville, 2000), resulting in high cost of stabilization. Hence, the search for effective industrial or agricultural waste materials that are locally available, as stabilizing agents in order to improve the properties of poor soils has come inevitable (Lasisi, 2004). Laterized concrete can be defined as concrete in which stable laterite fines replace sand wholly or partially, whole replacement is also referred to as terracrete. (Olusola, 2005) was the first to consider the possibility of replacing sand in concrete with laterite in Nigeria. He studied the effect of using laterite fines instead of sand in relation to the density, compressive strength, tensile strength, modulus of elasticity and resistance to exposure to high temperature. He concluded that their properties fared well in comparison with those of normal concrete, thereby offering laterite fines in place of sand can be used for structural members.

Glass is one of the most versatile substance on earth used in many applications and in wide variety of forms. Glass occurs naturally when rock high in silicates melt at high temperature and cool before forming a crystalline structure. Obsidian or volcanic glass is a well-known example of naturally occurring glass. When manufactured by humans the glass is a mixture of silica sand, lime and other materials. Crushed glass (CG) is a material obtained by crushing waste glasses and it is used in a wide range of applications. One of its most significant contributions in construction is its usage as a form of aggregates and glass powder as a partial substitute of cement. (Olusola *et al.,* 2005). Normally glass does not harm the environment in any way because it does not give off pollutants, but it can harm humans as well as animals, if not dealt carefully and less friendly to environment because it is non-biodegradable. Use of laterite and glass powder in the production of pavement stones, will bring reduction in the costs of purchasing of pavement material and make our environment friendlier. This paper reports the strength characteristics of cement stabilized laterite interlocking pavement blocks incorporating glass powder.

Materials and methods

Material and Equipment

The material used include: Glass powder, Laterite soil, Ordinary Portland cement, water, Plastic mould, Shovel, Head pan, Weighing balance, Wheel barrow, Set of sieves, Hammer mill, Black oil, Brush, Silver crest blender.

Preparation of Glass Powder

Waste glass was collected from different refuse dump in Igboora, washed and sundried. The glass were grounded into smaller pieces using hammer mill and further grounded into powder using silver crest blender (Model: Sc 2030B) and sieved using sieve number 0.362mm

Plate 1a: Blending of Glass powder **Plate 1b: Blended Glass powder**

Preparation of Pavement Block

Mix was measured for 0%, 10%, 20% and 30%.

Cement and laterite were measured using 1:4 mix ratio, the percentage of cement was varied. It was thoroughly mixed with water to achieve plastic form; the mixture was then poured into the plastic mould in 3 step and compacted manually by taping on a flat surface. The percentage of cement was varied to accommodate glass powder at 10%, 20%, and 30% respectively. After 24 hours, the samples were demoulded and weigh, then immersed in water for 28 days curing, after which it was wiped with clean cloth and weigh again. The produced samples were taken to the laboratory for compressive strength test and split tensile strength test.

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Plate 2a: Measuring of Materials **Plate 2: Mixing of Materials**

Plate 2c: Mixing the Materials **Plate 2d: Prepared LIPB**

Results and discussion

Compressive Strength of Laterite Interlocking Paver Block

Tables 1 – 4 showed the average compressive strengths of laterite interlocking paver blocks, 8.30 N/mm^2(8.3 x 10^6 MPa), 7.80 N/mm^2(7.8 x 10^6 MPa), 4.92 N/m^2(4.92 x 10^6 MPa), 3.49 N/m^2(3.49 x 10^6 MPa) for 0%, 10%, 20% and 30% respectively. It could be observed 10% incorporation of glass powder reduced the compressive strength by0.5$N/m2$. The reduction in strength is higher in 20% and 30% replacement which are 3.38$N/mm2$ and 4.81$N/mm2$ respectively. For solid concrete unit, the average, the average compressive strength of the test samples shall not be less than 55MPa with no individual unit less than 50MPa in accordance with ASTM C936 – 01 and for IS- 456:2000 minimum compressive strength of a single block should be above 30MPa.

Table 1: Compressive Strength for 0% Replacement LIB

S/N	% Replacement Samples	Weight of Blocks K_g	Crushing Value kN	Compressive Strength N/m^2	Average Compressive Strength N/mm^2
1	0	3.53	215.80	8.92	
2	0	3.64	194.20	8,03	**8.30**
3	0	3.48	192.30	7.95	

Table 2: Compressive Strength for 10% Replacement LIB

S/N	% Replacement Samples	Weight of Blocks K_g	Crushing Value kN	Compressive Strength N/m^2	Average Compressive Strength N/mm^2
1	10	3.57	191.10	7.90	
2	10	3.54	202.80	8.38	**7.80**
3	10	3.53	172.30	7.12	

Table 3: Compressive Strength for 20% Replacement LIB

S/N	% Replacement Samples	Weight of Blocks K_g	Crushing Value kN	Compressive Strength N/m^2	Average Compressive Strength N/mm^2
1	20	3.27	120,80	4.99	
2	20	3.18	122.90	5.08	**4.92**
3	20	3.33	113.20	4.68	

Table 4: Compressive Strength for 30% Replacement LIB

S/N	% Replacement Samples	Weight of Blocks K_g	Crushing Value kN	Compressive Strength N/m^2	Average Compressive Strength N/mm^2
1	30	3.42	91.50	3.78	
2	30	3.37	77.50	3.20	**3.49**
3	30	3.37	84.50	3.49	

Split Tensile Strength of Laterite Interlocking Paver Block

Tables 5 – 8 showed that the average tensile strengths of laterite interlocking paver block are $1.19N/mm2$ (1.19 x 10^6MPa), $1.19N/mm2$ ($1.19\ x\ 106MPa$), $0.79N/mm2$ ($0.79\ x\ 106$), and 0.62N/mm^2 (0.62 x 10^6) respectively. It was observed that from 0% - 10% partial replacement, the tensile strength are the same. However, at 20% - 30% partial replacement, there is decrease of $0.4N/mm2$ and $0.57N/mm2$ respectively. The average strength is less than the standard average strength of $3.6Mpa$ and individual strength of $2.9Mpa$ according to IS: 15658:2006.

Table 5: Tensile Strength for 0% Replacement LIB

S/N	% Replacement Samples	Weight of Blocks K_g	Crushing Value kN	Tensile Strength N/m^2	Average Compressive Strength N/mm^2
1	0	3.49	26.30	1.09	
2	0	3.45	34.50	1.43	**1.19**
3	0	3.49	25.40	1.05	

Table 6: Tensile Strength for 10% Replacement LIB

S/N	% Replacement Samples	Weight of Blocks K_g	Crushing Value kN	Tensile Strength N/m^2	Average Compressive Strength N/mm^2
1	10	3.55	3750	1.55	
2	10	3.45	24.40	1.01	**1.19**
3	10	3.51	24.30	1.00	

Table 7: Tensile Strength for 20% Replacement LIB

S/N	% Replacement Samples	Weight of Blocks K_g	Crushing Value kN	Compressive Strength N/m^2	Average Compressive Strength N/mm^2
1	20	3.38	18.80	0.78	
2	20	3.49	21.90	0.91	**0.79**
3	20	3.31	16.40	0.68	

Table 8: Tensile Strength for 30% Replacement LIB

S/N	% Replacement Samples	Weight of Blocks K_g	Crushing Value kN	Tensile Strength N/m^2	Average Compressive Strength N/mm^2
1	30	3.28	17.50	0.72	
2	30	3.32	13.60	0.56	**0.62**
3	30	3.17	14.10	0.58	

Conclusions and recommendations

Conclusions

Based on these findings, it can be concluded that;

ii the compressive strength of LIB tested are lesser than the standard requirement as specified by ASTM C936 – 0 and IRC: SP: 63: 2004, this may be due to non – addition of coarse aggregate in the mix ratio of the LIB produced

ii the split tensile strength test also showed that the specified strength requirement for solid concrete was not met which may be due to non – inclusion of coarse aggregate in the mix ratio of the LIB produced.

Recommendations

Since the required strength was not achieved for both split tensile strength test and compressive strength, it is recommended that:

i the LIB can be used in places with less load carrying capacity i.e. walkways

ii the research can be improved on by the addition of coarse aggregate.

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CONSTRUCTION OF A GSM CONTROLLED HOME AUTOMATION MODULE

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Abstract
This paper focused on the construction of a home automation module that is controlled by Global System for Mobile Communications (GSM). The module consists of a GSM module connected to a microcontroller board, various sensors, and actuators. The GSM module provides access to message through a mobile SIM card connection to a module enables remote monitoring and control of various systems. Controlling of home appliances simply involves switching on or switching off electrical appliances. The process that has been largely manual requiring more of physical human effort than automated, but as society advances automation is gradually replacing jobs that naturally would have necessitated human activity. This construction incorporates a GSM modem, and a microcontroller interfaced together with assembly language in a step for automation. The paper discusses the design and construction of the GSM-controlled home automation module. The system architecture of the module is outlined, including the GSM module, microcontroller board and various sensors. The circuit diagram and source code of the module are provided, as well as the communication between the GSM module and microcontroller board. The GSM controlled house automation controls the state of a six-relays by switching any of them either ON or OFF. Each of the relays is connected to six AC sockets. The aim of the project is to interface a microcontroller circuit to a GSM modem and 6 relays. The GSM modem has an internal sim such that any other mobile can send SMS to it. SMS the microcontroller, reads it, decodes it and activates an appropriate relay.
Keywords: Home automation, GSM module, microcontroller, relays

Introduction

One of the most popular topics is a home automation system because it has many advantages. Automation plays an increasingly important role in everyday experience and the global economy (Malik and Bodwade, 2017). Home automation refers to the remote monitoring and control of home devices. With the endless growth of the Internet and its applications, there are many options and possibilities for remote access and control of such network devices. Home security has been a big issue because crime is on the rise and everyone wants to take proper measures to prevent intrusions. The use of mobile phones is very common nowadays. Although the primary purpose of a mobile phone is to enable communication between two mobile phone users, recent developments in embedded technology have enabled mobile phones to be used to control home and office appliances, monitor and control vehicles, and control many other applications (Pathik *et al.,* 2014). The development of technology has made life more efficient and comfortable. Managing devices from one place has become important because it saves a lot of time and effort. Over the years, with the development of technology and breakthroughs, people's lives have become more complicated and thus faster. (Ohajianya *et al.,* 2014). This article focuses on building a GSM-controlled home automation system. Sometimes people use electricity as one of the main sources of power to operate any

electrical appliance or device. Most people leave their lights on for 24 hours when away from home, which wastes energy. Thus, saving electricity in daily life can be more effective and efficient. With the advancement of technology, SMS technology has become a widely accepted means of communication. The purpose of using text messages is to provide the widest possible coverage at the lowest possible cost. Therefore, the use of text messaging would facilitate remote control of electrical devices at home, with little maintenance and regardless of physical geographical boundaries. Therefore, the goal of this project is to develop a system that facilitates the homeowner's optimization of electricity use through remote communication.

Materials and method

A GSM-controlled home automation system cannot operate without a power source. The power supply activates all units and subunits before they can perform the expected function. The electrical diagram of the design system is shown in Figure 1. In order to operate some important parts of this structure, it is therefore necessary to generate the voltage necessary for the operation of these components (relays, microcontrollers and liquid crystal displays). A diode transformer was used to generate the voltage needed to power these components.

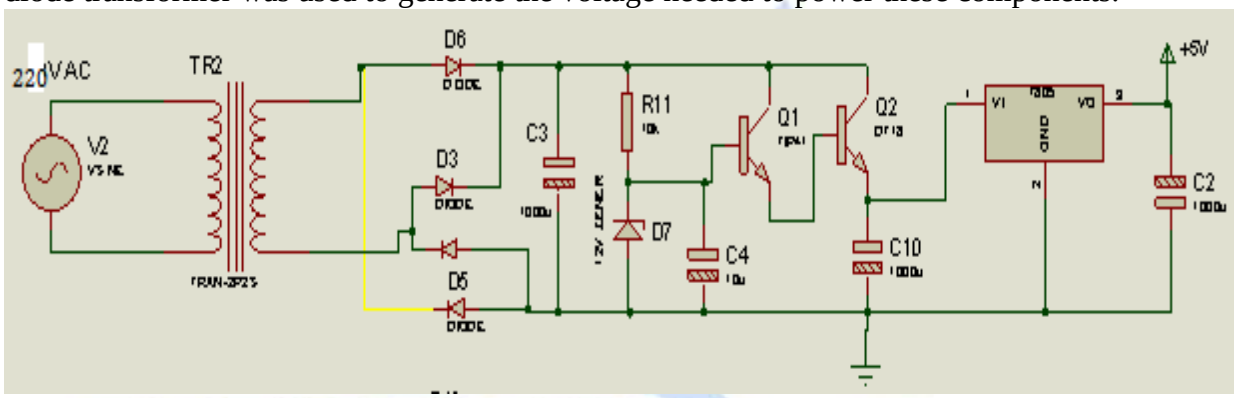

Figure 1: Circuit diagram for power supply

Relay Section

Relay is an electromagnetic switch based on electromagnetic induction used to control the switching of an electrical device. The relays are six in number, each of them to control an appliance socket outlet per time. They are used as a switch to put on/off the desired appliance/ appliances as the need be as shown in Figure 2.

The relay's switch connections are labeled COM, NC and NO. **COM** = Common, it is the moving part of the switch. The relays operate

NC = Normally Closed, when the relay coil is off then the COM is connected to the NC.

NO = Normally Open, when the relay coil is on then the COM is connected to the NO.

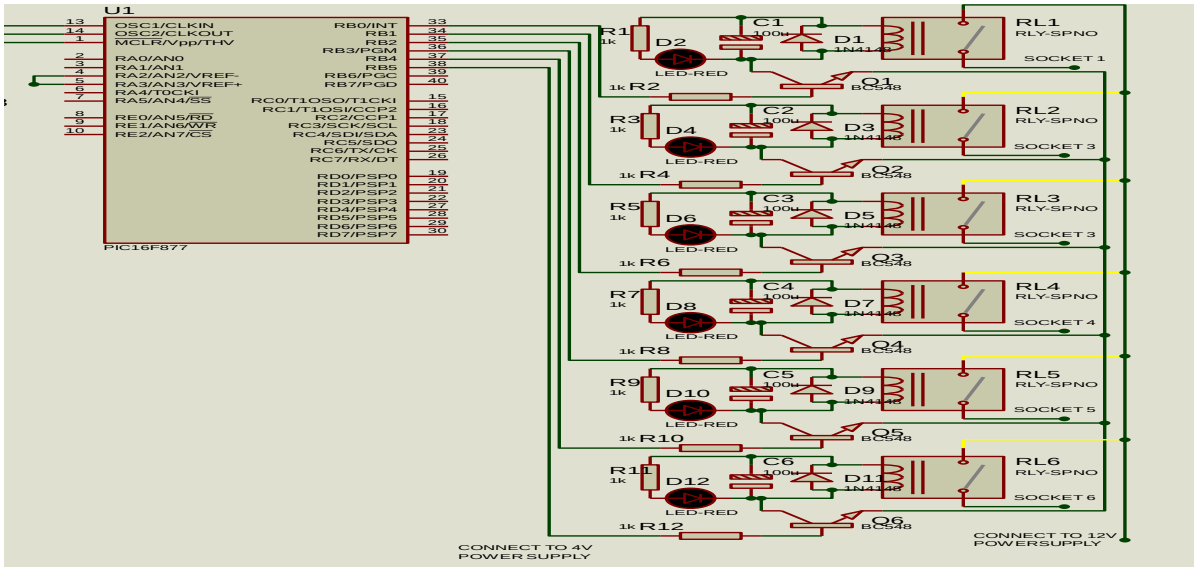

Figure 2: Circuit diagram for relay section connected to microcontroller

PIC16F877A Microcontroller

The heart of this construction is the control unit which uses a PIC16F877 microcontroller. A microcontroller is a computer control system on a single chip. It has many electronic circuits built into it, which can decode written instructions and convert them to electrical signals. The microcontroller will then step through these instructions and execute them one by one. The list of these instructions given to the microcontroller is called programs.

Mobile Phone

Mobile Phone allows a subscriber to make or receive calls. It also allows a subscriber to send and receive SMS. To achieve this, a subscriber Identity Module (SIM) is inserted into the mobile phone. Each key pressed on the phone generates two tones of different frequencies, known as Dual Tone Multi Frequency (DTMF). This feature of the mobile phone was employed in the design and construction.

SIM

SIM abbreviates as Subscriber Identity Module. It is a chip-on small card consisting of user's information as well as phone book. User can alter the operator on the same handset as per convenience. The SIM unique number is the number messages will be sent to, this is process by the GSM module and sent to the microcontroller, which in turn displays it on the digital display board for everyone to see.

Liquid Crystal Display

Figure 3 shows a Liquid Crystal Display commonly abbreviated as LCD is basically a display unit built using Liquid Crystal technology. LCD is used to display output values and messages processed by the microcontroller

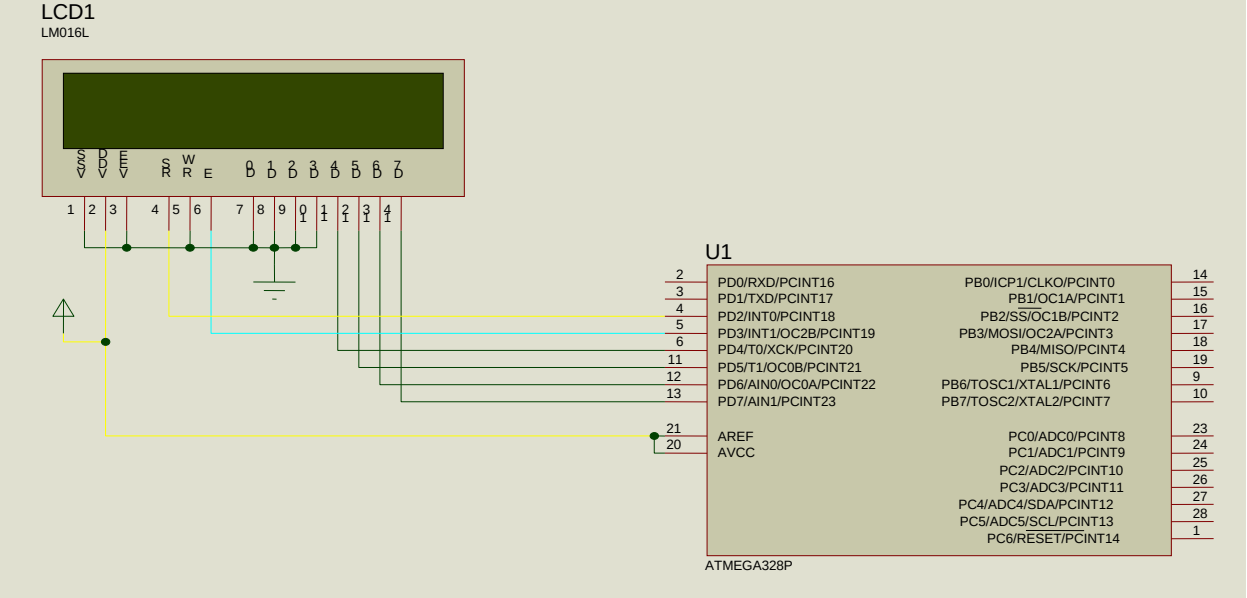

Figure 3: Circuit Diagram of the LCD connection to the microcontroller

GSM Home Automation

The GSM home automation controls the state of six relays by switching any of them either ON or OFF. Each of these relays is connected to six AC sockets. The GSM modem has an internal SIM such that any other mobile can send an SMS to it, upon receiving an SMS the microcontroller reads, decodes and activates an appropriate relay. Figure 4 shows the circuit diagram of home automation using GSM module.

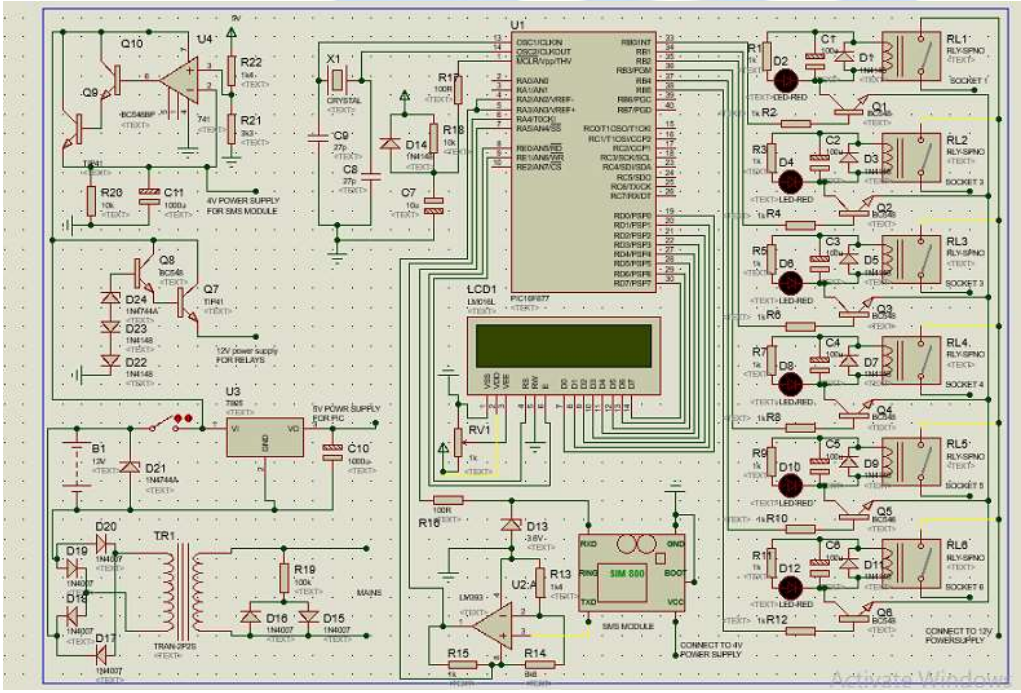

Figure 4: Circuit Diagram of a Home Automation using GSM module

Results

The test was carried out using 32-inch LED TV, Home theater, GOTV decoder, standing fan, lighting point and rechargeable lamp, the home automation module was switch ON and OFF

using a mobile phone to send message to the home automated module with a password to activate the microcontroller. The Relays are numbered according to the socket connection: Socket 1 for 32-inch LED TV, Socket 2 for home theater, Socket 3 for GOTV decoder, Socket 4 for standing fan, Socket 5 for lighting point and Socket 6 for rechargeable lamp.

The message from the mobile phone will reads PASSWORD followed by state of the socket ON/OFF, for example 1234 ON1 ON2 ON3 ON4 ON5 ON6 these shows ON all the SOCKET. The home automation GSM module will receive the message and the microcontroller will read, decode and activate the relays to switch ON the Sockets 1 to 6.

Also, some of the Sockets could be ON or OFF depending on the message sent. Another example reads; 1234 OFF1 ON2 OFF3 ON4 ON5 OFF6 this shows that the microcontroller will switch ON Sockets 2, 4 and 5 while Sockets 1, 3 and 6 will be OFF.

Discussion

The first section that was carried out were the six RELAYS arrangement and workability which was tested and found working by the supply output voltage of standard value 220V A.C. Also, the workability of the GSM module to give instruction by controlling the status of the six appliances by switching them ON or OFF was achieved.

The information being displayed and relayed to the user's phone number was ensured to be display as well on the LCD.

Conclusion

The module technology is to control home appliances with microcontroller being used in the system to receive the message, decode and interpret. The module is tested and working perfectly.

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BIOFIL TREATMENT OF LOCUST BEAN EFFLUENT

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Abstract
Biofill is a compact onsite structure with solid-liquid separation of wastewater by filtering medium and decomposition by macro-organisms (earthworms) to degrade the solids whiles the liquid undergoes bio-filtration through a sand media before final discharge via a drain field in the subsurface soil. The efficacy of this on locust bean wastewater has not been fully established. This study was designed for biofil treatment of locust bean effluent in Igboora to meet standard for environmental discharge and evaluating the efficiency of the BIOFIL as a treatment system. A 1200 x 1200 x 1800mm biofill was constructed with blocks. The wastewater collected were fed into the constructed biofill and digested for 48 hours. Sample before and after treatment were taken to the laboratory for analysis. These were analyzed in laboratory using APHA-AWWA-WEF,2001) (APHA, 1995) for Nitrate, Sulphate, Biochemical oxygen demand (BOD), Electrical conductivity, Chemical oxygen demand (COD), Ammonia, Nitrogen, Phosphate, Chloride, Sodium (Na), Potassium (K), Total dissolve Solid (TDS), Suspended solids (SS), Dissolve Oxygen (DO), Color, Odour. The results revealed that control effluent and treated effluent 3.55 and 5.95 pH, 99.26mg/l and 99.26mg/l Chloride, 1.9mg/l and 36.3mg/l of Bicarbonate, no presence of carbonate, 25.796mg/l and 39.6mg/l Nitrate. 0.02µs/cm and 0.00002µs/cm Electric conductivity, 0.017mg/l and 1.9mg/l dissolved oxygen, 0.03mg/l and 3.405mg/l COD, 7.45mg/l and 923mg/l TSS, 9.91mg/l and 1283.5mg/l total dissolved solid, 385.294mg/l and 288.5mg/l Sodium, 187.512mg/ml and 10.605mg/l Potassium, 241.4mg/l and 40.9mg/l Calcium, 188.246mg/l and 183.5mg/l Manganese respectively. The statistical analysis showed significant difference at p(0.05) in pH, Cl, Ec, TSS, TDS, Na, K, Ca, but no significant difference at p(0.005) in HCO3, CO3, NO3, DO, COD, Mg. From the physicochemical properties determined, it was discovered that treated and untreated effluent had no significant difference in electrical conductivity, Nitrate but in pH, Sodium, Potassium, Calcium and Manganese, dissolved oxygen, COD, total suspended solid and total dissolved solid within the 48hrs of treatment. Biofil treatment system had effect on locust bean effluent chemical and physical composition. Therefore, it can be recommended that locust bean effluent should be treated before discharge into the society and Biofil could be used as a treatment system to treat locust bean effluent.
Keyword: Biofil, Locust Bean, Effluent, Physicochemical, treatment, reusable.

Introduction

African locust bean is a leguminous plant that has an outstanding amino acid composition and protein quality (Alabi *et al.*, 2005; Elemo *et al.*, 2011). This is known as Iru in southwestern Nigeria and Dawadawa in Ghana (Ojewumi *et al.*, 2016b), kinda in Sierra Leone, Afintin and sonru in Benin Republic (Azokpota *et al.*, 2005), while in Japan it is known as natto (Azokpota *et al.*, 2005; Beaumont 2002). Africa locust bean, *Parkia biglobosa* was reported

by Dike and Odunfa, (2003) to be high in commercial values as food, medicinal substance, flavour intensifier for soups and stews. Alkaline fermented foods condiment (Aderibigbe and Odunfa, 1990) processed from vegetable protein seeds constitute a significant proportion of the dietary requirements of large human populations in West Africa; they are added to various dishes to supplement protein intake, enhance nutritive value and impact sensory attributes (Achi, 2005). In Nigeria, the rapid growth in population has led to increase in the demand for *P. biglobosa* which has led to establishment of many processing centres for traditional and mechanical methods of processing are adopted.

Processing of agricultural produces has waste water as bye product and *P. biglobosa* is not an exception. The industrial effluent discharge leading to the contamination of agricultural soils and aquatic environments has always been an issues considered as a critical challenge in ecosystem (Faruk *et al.,* 2006). In Nigeria agricultural practices along river banks includes washing of pods of *P. biglobosa* off the seeds during processing which could lead to a buildup of toxic chemical in fresh water, causing mass mortality of fish and affecting non-target organisms (Ayoola, 2008). Waste products from P. biglobosa range from the fruit pods, fruit pulp, and seed coat. The dried fruit pods of *P.biglobosa* contains heavy metals (Henry *et al.,* 2016), with potential hazardous effect not only on plants and aquatic animals but also on human health (Das *et al.,* 1997) depending on the dose and duration of exposure (Yusuff and Sonibare, 2004). The other toxic aspects of the plant identified to contain piscicidial properties comprise the bark, pods, fresh seeds and the pulp (Bonkoungou, 1986) and this plant has also been known to contain alkaloids and tannins (Akintobi *et al.,* 2016), The Plant is also poisonous to fish (Fafioye *et al.,* 2005) and motality increases with increase in effluent concentration (Amusat *et al.,* 2020).

Biofil actively use both micro and macro-organisms to break down human waste into safe end products with high re-use potential as compost or soil amendments. The use of biofilms spawn the development of other technologies like the trickling filter, intermittent filter, contact bed systems, and the suspended growth process; biofilm systems that have dominated the technology of wastewater treatment for several decades (Henze *et al.,* 2008 and Alleman, 1982). Sinha *et al. (*2010) and Bajsa, *et al. (*2003) reported that earthworms were able to remove BOD by over 90%, COD by 80-90%, TDS by 90-92% , TSS by 90-95% as well as chemicals including heavy metals and pathogens from wastewater by the general mechanism of ingestion and biodegradation of organic wastes and also by their absorption through their body walls. The development of the biofil concept comes in two major forms; one to take exclusive advantage of the activities of micro-organisms to clean wastewater and the other to use the synergic effect of both micro and macro-organisms to treat wastewater. Whereas the first uses exclusively liquid substrate, the second uses both solid and liquid substrates. This makes the second concept more versatile compared to the first. Treatment is the process of treating waste water to curb pollution and to recycle it for re-use (Audu *et al*, 2014).

The Biofil is a chamber constructed with bricks which digest organic materials biologically (Henze *et al*. 2008 and Alleman, 1982). This system is a compact onsite structure with solid-liquid separating medium (porous concrete filter (PCF)) and macro-organisms (earthworms) decomposition of solids and bio-filtration of the liquid through a sand media before final discharge via a drain field in the subsurface soil. The system also has a layer of bulking material made from coir as a bedding material for the activities of the earthworms and microbes. Under the aerobic conditions, the end product of decomposition is water (and the nutrients it carries) and carbon dioxide, both of which are odorless, harmless, and economically valuable.

Discharge of untreated locust bean effluent from processing centers causes menace and pollution to the environment and toxicity to plant development. Treatment of this discharge

into the society under standard recommendation limits, safeguard the environment, plant, animal, human and reduce the usage of fresh/ portable effluent water in the environment.
This study was therefore designed for biofil treatment of locust bean effluent from locust bean processing centres in Igboora to meet standard for environmental discharge and evaluating the efficiency of the system.

Materials and methods

Study Area

This research work was carried out in Oyo State College of Agriculture and Technology, Igboora, Oyo state. Locust beans effluent were sourced from four Stationary Local Processing Centres in Igboora. Igboora is geographically located at 7.438N and longitude 3.2885E and situated 32km north of Abeokuta, the capital of Ogun State share boundary with Ogun State in the South and West, Ibarapa North local Government Area.

Materials

The materials used for the construction includes Blocks, Cement, Water, Sand, PVC pipes, Fittings, Wire mesh (1½), Mosquito Net, Manure (cow dung), Saw dust

Methods

Construction of Biofil digester

- Chamber: a 1200 x 1200 x 1800mm digester was constructed with the use of brick. A trench of 150 x 2250mm was dug for the laying of the foundation, followed by the erection of blocks. After setting the blocks, cement was mixed with sand in ratio 1:5 for plastering the wall and floor of the digester as shown in Figure 1.

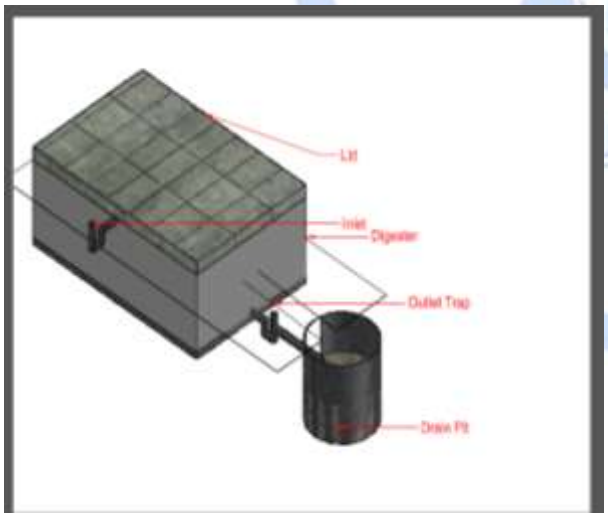

Figure 1: 3D Drawing of the Biofil.

- Slab: a 1300 x 1300 x 100mm concrete slab was constructed to cover the chamber of the digester, because the treatment is aided anaerobically.
- Soak Away: a soak away of 200mm x 600mm was dug 1.5m away from the digester, where the digested water was collected for laboratory analysis.

Installation of PVC Pipe into the Digester:

A 100mm PVC pipe of length 1000mm was attached to a 100mm elbow as inlet. A 100x 50 reducers was attached to the elbow. A 50mm S-shaped pipe was used as Air trapper, attached to the end of the reducers as shown in Figure 2.
A 100mm pipe of length 2000mm was attached to a 100mm gate valve as outlet. A 50mm S-shaped pipe was used as Air trapper, attached to the end of the outlet.

Installation of the filtration materials:
Four 150mm blocks were laid at the corner of the digester where the wire mesh was rested, then saw dust was applied on top of the wire mesh followed by mosquito net and finally a bowl of manure to aid the bacteria for digestion.

Collection of Effluent
Effluent of locust bean were sourced from four local processing centres in Igboora, Ibarapa local Government Oyo, state. The effluent collected from four local processing centres was feed into the digester through the inlet and allow to digest, before collecting the digested effluent through the outlet.

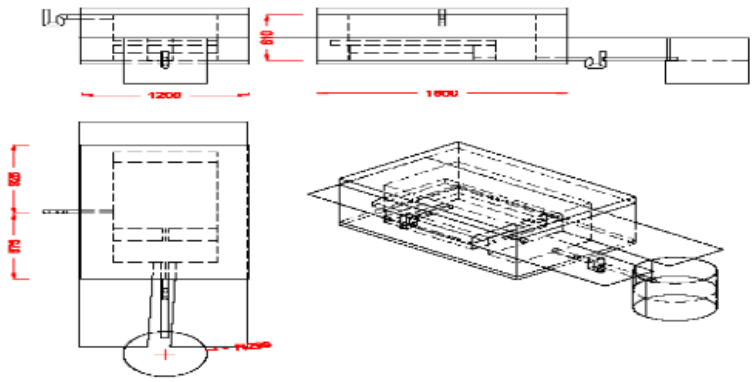

Figure 2: Orthographic projection of the Biofill

Operation of Biofil Digester
Locust bean effluent was feed into the digester through the inlet and allow to digest anaerobically for 48hours. After digestion, the digested effluent were collected through the outlet for laboratory analysis.

Sample Collection
Samples were taken to laboratory before and after the treatment to determine the composition of the effluent. The digested effluent was collected through the outlet and then taken to the laboratory for chemical properties Analysis.

Analysis
The physicochemical parameters determined in the laboratory using APHA-AWWA-WEF,2001) (APHA, 1995) were: Nitrate, sulphate, Biochemical oxygen demand (BOD), Electrical conductivity, Chemical oxygen demand (COD), Ammonical nitrogen, Phosphate, Chloride, Total hardness (TH). Sodium (Na), Potassium (K), Total dissolve Solid (TDS), Suspended solids (SS), Dissolve Oxygen (DO), Color, Odour. The mean differences between composition before and after the treatment were statistically analyzed using the paired t test at 95% confidence level ($\alpha = 5\%$)

Results and Discussion

Chemical Properties of the Locust Bean Effluent

Table 2 shows chemical properties of untreated and treated locust beans effluent. The properties tested were pH, Chloride, HCO_3, CO_3 and NO_3 with the control and treated effluent having 3.55 and 5.95 of pH, 99.26mg/l and 99.26 of chloride, 1.9mg/l and 36.3mg/l of bicarbonate, no presence of carbonate, 25.796mg/l and 39.6mg/l nitrate respectively. The results show that the pH of untreated sample (3.5) were not within the National Standard (6 - 9) but otherwise after treatment. The Chloride, HCO_3, CO_3 and NO_3 were not within the standard value both before and after treatment.

Table 3 showed the mean value of physicochemical properties of untreated and treated locust beans effluent. The result showed that the physicochemical properties determined were Electric conductivity (EC), Dissolved oxygen (DO), COD, Total Suspended Solid (TSS) and Total Dissolved Solid (TDS). The control effluent and treated effluent had 0.02µs/cm and 0.00002µs/cm Electric conductivity, 0.017mg/l and 1.9mg/l DO, 0.03mg/l and 3.405mg/l COD, 7.45mg/l and 923mg/l TSS, 9.91mg/l and 1283.5mg/l TDS respectively. The value of analysis for the control/untreated showed that it is within the standard in DO (5.9) but not TSS (500), TDS (500). Table 4 showed the mean value of chemical properties of untreated and treated locust beans. The result showed that control effluent and treated effluent had 385.294mg/l and 288.5mg/l of Sodium, 187.512mg/ml and 10.605mg/l Potassium, 241.4mg/and 40.9mg/l Calcium, 188.246mg/l and 183.5mg/l Manganese respectively. The analysis shows that control/untreated is not within the standard for agricultural re-used in Calcium (50), and Magnesium (50).

Table 1: Chemical Properties of Untreated, Treated Locust Beans Effluent and National Standard.

Parameters	Control	Treated	Standard
Ph	3.55	6.0	6 – 9
Chloride(mg/l)	99.26	99.26	250
HCO3(mg/l)	1.9	36.3	
CO3(mg/l)	0	0	
NO3(mg/l)	25.79	39.6	40
EC (µs/cm)	0.02	0.00002	0.1
DO(mg/l)	0.017	1.9	Minimum of 4
COD(mg/l)	0.033	3.405	30
TSS(mg/l)	7.45	923	0.75
TDS(mg/l)	9.91	1283.5	500
Na(mg/l)	385.294	288.5	200
K(mg/l)	187.512	10.605	
Ca(mg/l)	241.4	40.9	50
Mg(mg/l)	188.246	183.5	50

Table 2: Chemical Properties of Untreated and Treated Locust Beans Effluent

	Ph		**Chloride(mg/l)**		**HCO_3(mg/l)**		**CO_3(mg/l)**		**NO_3(mg/l)**	
	Control	***Treatment***	***Control***	***Treatment***	***Control***	***Treatment***	***Control***	***Treatment***	***Control***	***Treatment***
Mean	3.55	6.0	99.26	99.26	1.9	36.3	0	0	25.796	39.6
Variance	0.005	0.01	402.145	402.1448	0.18	79.38	0	0	20.2885	1.62
t Stat	-12.000		0.000		-5.7333		0		-6.0411	
P(T<=t) one-tail	0.026		0.000		0.0550		0		0.0522	

P(T<=t) two-tail	0.039	0.000	0.1099	0	0.1044
	6-9	250			40

*mean with significant difference at p<0.05

Table 3: Physicochemical Properties of Untreated and Treated Locust Beans Effluent

	EC (µs/cm)		**DO(mg/l)**		**COD(mg/l)**		**TSS(mg/l)**		**TDS(mg/l)**	
	Control	***Treatment***	***Control***	***Treatment***	***Control***	***Treatment***	***Control***	***Treatment***	***Control***	***Treatment***
Mean	0.02	0.00002	0.017	1.9	0.033	3.405	7.45	923	9.91	1283.5
Variance	0	5E-13	8E-06	0.72	9.8E-05	0.31205	0.2178	242	0.005	5100.5
t Stat	39961		-3.1488		-8.6907		-85.806		-25.245	
P(T<=t) one-tail	0.0000		0.0979		0.0365		0.00371		0.0126	
P(T<=t) two-tail	0.0000		0.1958		0.0729		0.00742		0.0252	
	0.1		4		30		0.75		500	

*mean with significant difference at p<0.05

Table 4: Chemical Properties of Untreated and Treated Locust Beans Effluent.

	Na(mg/l)		**K(mg/l)**		**Ca(mg/l)**		**Mg(mg/l)**	
	Control	***Treatment***	***Control***	***Treatment***	***Control***	***Treatment***	***Control***	***Treatment***
Mean	385.294	288.5	187.512	10.605	241.4	40.9	188.246	183.5
Variance	1862.57	2812.5	236.0095	9.63605	331.2738	38.72	18.678272	144.5
t Stat	13.861		20.409		23.672		0.8718	
P(T<=t) one-tail	0.0229		0.0156		0.0134		0.2718	
P(T<=t) two-tail	0.0458		0.0312		0.0269		0.5435	
	200				50		50	

*mean with significant difference at p<0.05

From the properties determined, it was discovered that there was significant($p<0.05$) difference in pH values of treated effluent and untreated effluent, this showed that the biofil treatment had effect on the pH level of locust bean effluent. pH for treated was 5.95 (slightly acidic) and untreated 3.55 (strongly acidic) effluent this fall within the range reported by Amusat *et al. (*2020). This might be due to evolvement of carbon base methane gas from the effluent as a result of the decomposition. As the presence of carbon dioxide triggers the increase in concentration of hydrogen ion which makes the pH value to decrease which might have been added through the processing of the Locust bean. This is in accordance with Nasr and Moustafa (2014) but slightly lesser (6.9-7.2) and Anyawu *et al. (*2013). There was no significant difference in Chloride between treated effluent and untreated effluent, this showed that biofil treatment had no effect on Chloride level of locust bean effluent within threshold of period and system used. The treated effluent and untreated effluent showed significant difference ($p<0.05$) in Bi-carbonate, this shows that biofil treatment had effect on the Bi-carbonate level of locust bean effluent. This followed the same trend as pH value, as there is

established relation between the pH of wastewater in various stage of its purification with the equilibria of carbonic acid. Nitrate indicates the presence of fully oxidized organic matter. The treated effluent and untreated effluent showed significant difference ($p<0.05$) in Nitrate, this showed that biofil treatment had effect on the Nitrate level of locust bean effluent. The treated effluent and untreated effluent showed significant difference ($p<0.05$) in Sodium, Potassium, Calcium and Manganese. This showed that biofil treatment had effect on Sodium, Potassium, Calcium and Manganese level of locust bean effluent at 5% significant level.
It was discovered that treated and untreated effluent were not significant different in electrical conductivity while the treated and untreated effluent were significant different in dissolved oxygen, COD, total suspended solid and total dissolved solid. This agrees with the revelation of Anyanwu *et al. (*2013).

Conclusion and recommendation

From the research above it can concluded that Biofil treatment system had effect on locust bean effluent chemical and physical composition. Therefore, it can be recommended that locust bean effluent should be treated before discharge into the society and Biofil could be used as a treatment system to treat locust bean effluent.

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PERFORMANCE EVALUATION OF PELLETIZING MACHINE

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Abstract
A feed pelletizing machine was modified and incorporated with an easily detachable die plate (4mm, 6mm and 8mm) capable of extruding different sized feed. Performance evaluation of the machine was carried out using a non-conventional feed and with a moisture content of 15% wet basis. Three processing parameters (die size, pulley diameter and operating time) at three levels were considered. The performance indices considered in the evaluation of the pelletizer were pelleting efficiency and throughput capacity. The maximum machine efficiency was obtained to be 80.0% at 6mm die size, 6min machine operating time and 250mm pulley diameter. While, the minimum value of 40% was obtained at 8mm, 4min and 150mm, die size, machine operating time and pulley diameter respectively. The effect of the processing variables were studied using regression model and it was revealed that the process variables considered had a significant effect ($p \leq 0.05$) on the machine efficiency and throughput capacity. The study concludes that the pelletizing machine efficiency obtained increased as the dependent variables that is, die size, pulley diameter and time increased and vice versa. The study recommends that further operating parameters such as moisture content of feed, binding ratio and machine operating speed should be considered.

Keywords*:* Pelleting; Efficiency; Throughput capacity; Performance evaluation; operating time; die size; pulley diameter.

Introduction

Feeding livestock with pellets is advantageous to the livestock and the farmer as it is economical and supplies the required nutrients to the livestock. Pelleted feeds yield positive effects on growth of livestock fish inclusive and production efficiency (Greenwood *et al.*, 2004). The processing methods of fish feed pelleting include sourcing of feeds, grinding and mixing with other materials to obtain desired ration, pelleting with the addition of water or preferably steam, drying, cooling and storing which is very crucial as it determines bioavailability of nutrients, feed acceptability, palatability and durability which ultimately reflects in the performance of fish (Gabriel *et al.*, 2007). The raw materials formulated in mixing of these feeds were mostly imported (BAS, 2009). This led to the high cost of commercial feeds in the country. This high cost of input has led to formulation of feeds traditionally. (Cabarles and Dusaran, 2006). Traditional method of processing fish feed is extremely strenuous; causes great discomfort to the operators and cannot predict grinding time. These result in the production of low quality feeds (Malgwi *et al.*, 2020). The modern method is by the use of pelletizing machine.

Pelletizing machine is an equipment used for making mainly powdery materials and some solid of variable sizes into pellets (Ikebudu, 2015). Pelletizing machine is a machine that can be used to create and extrude desired shapes of pellets from a mixture of components. It consists of a screw pump similar to a screw press or screw conveyor in which feed is compressed and worked to form a semi-solid mass (Ikedudu *et al.*, 2015). Pelleting machines can perform the function of moulding of feed meals like soft capsules for animals (Fasakin, 2005). The factors that most influence the nature of the pelletized product are basically

classified into operating conditions (temperature, pressure, diameter of the die aperture, operating speed and the share rate) of the machine and the rheological properties (moisture content and the physical state) of the feed amongst others (Okewole and Igbeka, 2016). Several published studies have shown that moisture content and die sizes of the pellets are significantly affected by the durability of the pellets (Nelson, 2002; McMullen *et al.,* 2005). However, the feed pelleting machines are not favourable to the local farmers due to its high cost (Ikedudu *et al.,* 2015).Therefore, this research work is to modify an existing local fish feed pelleting machine and investigate the effect of some operating parameters including (die diameter, operating time and operating speed) on evaluation parameters for producing pellets from a pelleting machine. The main aim of this study is to carry out performance evaluation of pelletizing machine.

Materials and methods

Sample sourcing and preparation

Compounded fish feed was prepared by locally sourced materials. The ingredients were soya bean meal, groundnut cake, maize, fishmeal, palm kernel, cottonseed, leguminous crops, green plant meals, and premix. Some starch (gari) and little water that serve as binders were added to the compounded feed, and it was thoroughly mixed manually and processed to produce fish feed pellet as in Plate1a and b.

(a) (b)

Plate 1: (a) Pellet feed production, (b) pellet feed

Test procedure

The compounded feed mix was fed through the machine hopper after the machine is switch on. The pelletized feed was collected through the outlet and observed in case the machine required further modification or adjustment. Different die size, operating time and pulley diameter were used as independent variables while machine efficiency and throughput capacity were observed as dependent variables using Design Expert 12.0 software package.

Performance analysis

To evaluate the performance of the pelleting machine, three factors (Die size, pulley diameter and machine operating time) at three levels was designed with the aid of Design expert software. The design consisted of seventeen (17) experiments conducted in triplicates with two independent factors (die size and operating speed).

Pelleting efficiency (P.E)

It is the ratio of the quantity of actual feed pellet obtained at the main die orifice to the total feed input per unit time (Ojomo *et al.,* 2010; Davies *et al.,* 2011). This was determined using the following Equation 1.

$$P.E = \frac{Wp}{Wm} x\ 100 \qquad (1)$$

where:

W_p is the quantity of actual feed pellet (kg).

W_m is the total feed input mass (kg).

Throughput capacity (T.C.)

This is the ratio of the quantity of actual feed pelleted to the time taken (Ojomo *et al.*, 2010). The weight of pellets was measured by weighing a sample of pellets after the pelleting process with respect to the time taken to produce that sample using the stopwatch. The throughput capacity was therefore estimated as the weight of the sampled pellets per time of production of a particular sample as defined in Equation 2.

$$T.C = \frac{Wp}{T}\ (kg/h) \qquad (2)$$

where:

W_p = the weight of the pellets (kg)

T = the time taken to pelletize the specified feed in hours.

Statistical Analysis

The data obtained from performance analysis of the pelleting machine was studied to know if there are any significant differences in the fish feed production rate (kg) of the pelletizing machine between the three pellet die size, pulley diameter and operating speed. The data was subjected to ANOVA and the effect of the responses was determined using regression model. The P-values was used as a tool to check the level of significance ($p \leq 0.05$) of each of the coefficients, which, in turn are necessary to understand the pattern of the mutual interactions between the test variables.

Results and discussion

Results

The results of design matrix for the performance evaluation of the pelletizing machine is presented in Table1, while the ANOVA results for the machine efficiency and throughput capacity are as presented in Tables 2 and 3 respectively.

Table 1: Design Layout and Results for Machine Efficiency and Throughput Capacity

		Factor 1	Factor 2	Factor 3	Response 1	Response 2
Std	Run	A:Die Size	B:Time	C:Diameter	Efficiency	Throughput Capacity
		Mm	Min	Mm	%	kg/hr
2	1	8	2	200	66.7	30
3	2	4	6	200	47	18
13	3	6	4	200	75.3	33.9
8	4	8	4	250	73.7	33.1
17	5	6	4	200	75.3	33.9
10	6	6	6	150	46.7	14
15	7	6	4	200	75.3	33.9
6	8	8	4	150	40	18.15
9	9	6	2	150	43.3	19.5
7	10	4	4	250	43	17
4	11	8	6	200	77.5	31
12	12	6	6	250	80	24
1	13	4	2	200	42	15
16	14	6	4	200	75.3	33.9

11	15	6	2	250	56.7	25.5
5	16	4	4	150	45	16.5
14	17	6	4	200	75.3	33.9

Table 2: **ANOVA for machine** efficiency

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Model	3811.92	9	423.55	19.54	0.0004	significant
A-Die Size	818.10	1	818.10	37.74	0.0005	
B-Time	225.78	1	225.78	10.41	0.0145	
C-Diameter	768.32	1	768.32	35.44	0.0006	
AB	8.41	1	8.41	0.3879	0.5531	
AC	318.62	1	318.62	14.70	0.0064	
BC	99.00	1	99.00	4.57	0.0699	
A^2	569.01	1	569.01	26.25	0.0014	
B^2	121.64	1	121.64	5.61	0.0497	
C^2	739.21	1	739.21	34.10	0.0006	
Residual	151.76	7	21.68			
Lack of Fit	151.76	3	50.59			
Pure Error	0.0000	4	0.0000			
Cor Total	3963.68	16				

Statistical Parameters : $R^2 = 0.9617$ Adj $R^2 = 0.9125$
Pre $R^2 = 0.3874$ Adeq Precision = 11.1520

Table 3: **ANOVA for throughput capacity**

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Model	976.74	9	108.53	26.85	0.0001	Significant
A-Die Size	261.63	1	261.63	64.72	< 0.0001	
B-Time	1.12	1	1.12	0.2783	0.6141	
C-Diameter	123.64	1	123.64	30.59	0.0009	
AB	1.0000	1	1.0000	0.2474	0.6342	
AC	52.20	1	52.20	12.91	0.0088	
BC	4.00	1	4.00	0.9896	0.3530	
A^2	104.48	1	104.48	25.85	0.0014	
B^2	123.63	1	123.63	30.59	0.0009	
C^2	251.67	1	251.67	62.26	< 0.0001	
Residual	28.30	7	4.04			
Lack of Fit	28.30	3	9.43			
Pure Error	0.0000	4	0.0000			
Cor Total	1005.03	16				

Statistical Parameters: $R^2 = 0.9718$ Adj $R^2 = 0.9356$
Pre $R^2 = 0.5495$ Adeq Precision = 12.5162

Effects of processing variables on the efficiency and throughput capacity of pelletizing machine

The results show the effects of die size, pulley diameter and operating time on the pelletizing machine efficiency and throughput capacity.

Effects of processing variables on pelletizing machine efficiency

The design matrix and results of the machine efficiency for fish feed is presented in Table 1. The software presented a model and regression analysis to correlate the machine efficiency with the independent variables of die size, pulley diameter and time considered for the study using a second order polynomial equation for the fish feed as presented in Equation 3 which shows A, B, C, AB, AC and BC as significant model terms, having synergetic effect on machine efficiency while A^2, B^2 and C^2 antagonistic effect as shown in Table 2.

$$Eff\ (\%) = 187.38750 + 20.63125A + 1.28125B + 1.58150C + 0.362500AB + 0.089250AC + 0.049750BC - 2.90625A^2 - 1.3437B^2 - 0.005300C^2 \quad (3)$$

where:

Eff = Pelletizing Machine Efficiency (%)
A= Die Size (mm)
B= Time (min)
C = Pulley Diameter (mm)

The ANOVA results and statistical parameters of the analysis which describes the relationship between the independent variables and the dependent variable, machine efficiency is as presented in Table 2. The probability of the P-value and F-value of 0.0004 and 19.54 of fish feed pelletizing machine efficiency indicates that the model suggested by the software for the material was significant at 95% confidence level. The R^2 is 0.9617 meaning 96.17% of the variability can be accounted for and showing the regression model was satisfactory for the prediction of the machine efficiency. The ANOVA results of the model terms presented in Table 2 shows A, B, C, AC, A^2, B^2 and C^2 are significant model terms.

The three-dimensional surface graph (3D) in Figure 1 a, b and c respectively show the effect of die size, operating time and pulley size on the machine efficiency. The combined effect of die size and time shows in figure 1a that machine efficiency increased with increase in die size and time up to a certain level before decreasing. The maximum and minimum machine efficiency was obtained to be 80.0% and 40.0% at 6mm, 6min and 8mm and 4min respectively. While it is shown in figure 1b for the combined effect of die size and pulley diameter shows that machine efficiency of 80.0 and 40% were obtained at 6mm and 200mm and 8mm and 150mm respectively. Figure 3.1c shows the combined effect of pulley diameter and time on the machine efficiency which results to increase in pulley diameter and time as machine efficiency is increase and vice versa. The similar increase in machine efficiency of the pelletizing fish feed from 40-80% at 4-8mm die size and 150mm-200mm was reported by Okolie *et al,* (2012).

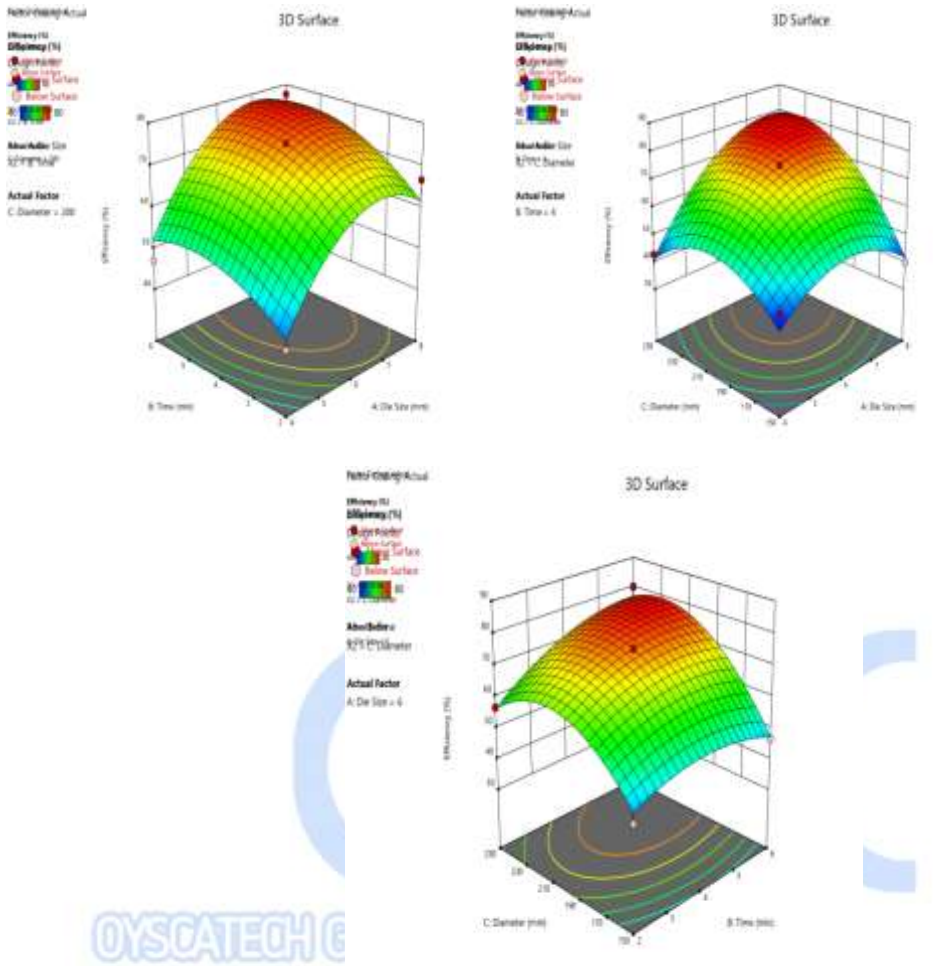

Figure 1: Response surface of machine efficiency as influenced by (a) die size and operating time, (b) die size and pulley diameter, (c) operating time and pulley diameter

Effects of processing variables on pelletizing machine throughput capacity

The design matrix and results of the throughput capacity for fish feed is presented in Table 1. The software presented a model and regression analysis to correlate the throughput capacity with the independent variables of die size, pulley diameter and time considered for the study using a second order polynomial equation for the fish feed as presented in Equation 4 which shows A, C, AC, BC having significant terms which have synergetic effect and B, AB, A^2, B^2, C^2 having antagonistic effect on the pelletizing machine throughput capacity.

$$TC(kg/hr) = 33.90 + 5.72A - 0.3750B + 3.93C - 0.05000AB + 3.61AC + 1.00BC - 4.98A^2 - 5.428B^2 - 7.73C^2 \quad (4)$$

where:

TC = Throughput capacity, kg/hr
A = Die size, mm
B =Time, min
C =Pulley diameter, mm

The ANOVA results and statistical parameters of the analysis describe the relationship between the independent variables and the dependent variable machine throughput capacity is as presented in Table 3. The probability of the P-value and F-value of 0.0001 and 26.85 of the machine throughput capacity shows that the model suggested by the software was significant at 95% confidence level. The R^2 is 0.9718 meaning 97.18% of the variability can be accounted for and showing the regression model satisfactory for the prediction of the machine throughput capacity. The ANOVA results of the model terms presented in Table 4.3 shows A, C, AC, A2, B2 and C^2 are significant model terms.
The 3D surface graph in figures2 a, b and c respectively show the effects of die size, pulley diameter and time shown in figures2a,2b and 2c that throughput capacity increased with increase in die size, pulley diameter and time and vice versa. The maximum and minimum throughput capacity of 33.9 and 14kg/hr were obtained at 6mm, 4min, 200mm and 6mm, 6min and 150mm. Diarra *et al. (*2015) obtained similar results.

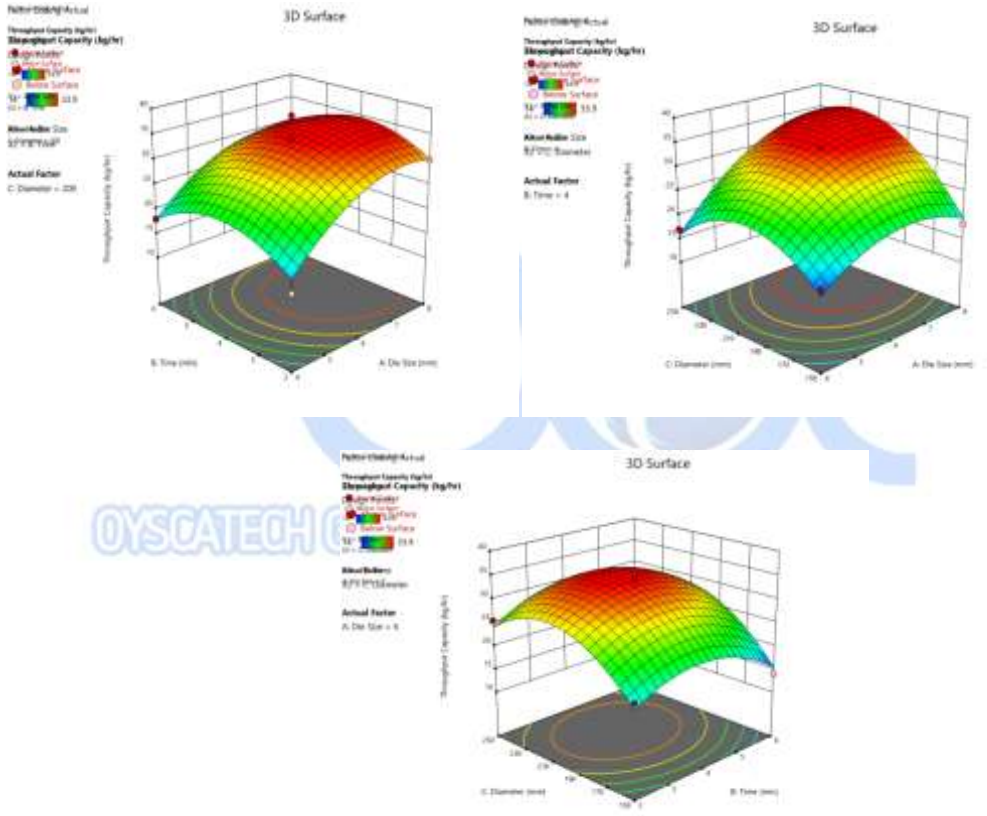

Figure 2: Response surface of throughput capacity as influence by
(a) die size and time, (b) die size and pulley diameter, (c) time and pulley diameter

Conclusions

The pelletizing machine efficiency obtained increased as the dependent variables that is die size, pulley diameter and time are increasing and vice versa. The pelletizing machine throughput capacity is increased as die size, pulley diameter and time are increasing and vice versa. That die size and pulley diameter gives more synergetic effects on the two responses (machine efficiency and throughput capacity).

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ASSESSMENT OF INFILTRATION RATE OF SOILS AT OYO STATE COLLEGE OF AGRICULTURE AND TECHNOLOGY, IGBOORA

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Abstract
This study assessed the infiltration rate of soils at Oyo State College of Agriculture and Technology, Igboora with the aim of obtaining useful information for the design of irrigation and drainage system and for effective soil management techniques. Three locations were selected for the experiment, namely: Faculty of Engineering and Technology (Site A), Information and Communication Technology Centre (Site B) and Works and Services Department (Site C). The soil texture of the experimental sites was sandy loam with 68 % sand, 18 % silt and 14 % clay. A pycnometer was used to determine the particle density of the soils. Bulk density of the experimental sites was determined using core samplers to collect soils in each of the experimental sites while moisture meter was used to measure the moisture content and pH of the soils determined using pH meter. The total porosity (P_t) was calculated using the relationship between particle density (P_d) and bulk density (B_d). A double ring infiltrometer was used to measure the infiltration rate of the soils at various sample points within the premises of the institution under study. The fall of the water level in the inner ring was recorded with intervals as 2, 5, 10, 15 and 20 minutes. It was observed that high values of infiltration rate were experienced during the firpst 8 minutes of the experiment. Also, the Infiltration rate decreased as time increased. Constant values of infiltration rate were obtained at the 95^{th}, 80^{th} and 95^{th} minutes at Sites A, B and C respectively. There was no significant difference ($p < 0.05$) in the infiltration rate of the three sites considered. Results also indicated the infiltration capacities of the sites with Site A giving the highest infiltration capacity of 156 cm/hr, followed by Site B (147 cm/hr) and the lowest at Site C (135 cm/hr). These results were generally high and soils with high infiltration rates are not susceptible to ponding and run-off. Therefore, the soils in the area examined have good potentials for farming.
Keyword: Assessment, characteristics, soil, infiltrometer, infiltration rate

Introduction

The soil is an integral component of the hydrological cycle, directly influencing infiltration, storm runoff, evapotranspiration, interflow and aquifer recharge. Infiltration is the process by which water on the surface penetrates the soil. It refers to the vertical movement of water downwards from the soil surface to replenish the soil water and moisture deficiency, with the excess percolating down to build up the water table by gravitational flow (Diamon, 2004). Infiltration rate is the velocity with which water seeps into the soil profile. It is a measure of the rate at which soil absorbs rainfall or irrigation, measured in inches per hour or millimeters per hour; it decreases as the soil becomes saturated (Osuji, 2014). Infiltration capacity is the maximum rate at which water can enter a particular soil; different soil types have different Infiltration capacities. If the water that arrives the soil surface is less than the infiltration capacity, all the water will infiltrate. It is a known fact that the use of heavy machines on soil leads to soil compaction; compacted soils tend to have low infiltration rates and thus encourage high run off (Chancellor, 2003). The rate of infiltration can be measured using an

infiltrometer, a relatively simple and accurate method (Barrow, 2003). The movement of water into the soil by infiltration may be limited by restriction to the flow of water through the soil profile. The major factors affecting the infiltration of water into the soil are the initial moisture content, condition of the soil surface, hydraulic conductivity of the soil profile, texture, porosity, degree of swelling of soil colloids and organic matter, vegetative cover, duration of ponding and viscosity of water, ease of entry, storage capacity, soil texture; soil structure, vegetation types , water content of the soil, soil temperature, and rainfall intensity, all play a role in controlling infiltration rate and capacity. (Saxton *et al.,* 1998; Sharma, 2007). The study of soil-water movement has interested scientists from diverse disciplines such as soil science, hydrology, agriculture, civil engineering, and the environmental sciences for several years. Therefore, monitoring infiltration rates under different soil management regimes is a good indicator of how the practice will influence the rate with which water can move into the soil (Oosterbaan *et al.,* 2000). This study therefore, investigated the infiltration rates of Oyo State College of Agriculture and Technology (OYSCATECH), Igboora soils in order to solve the challenges posed by ponding and surface runoff in the area.

Materials and method

Experimental Site

The experiment was carried out at Oyo State College of Agriculture and Technology, Igbo-ora, south western Nigeria located between longitude 30ºE and 30.3ºE and latitude 70.16ºN and 70.55ºN with an average rainfall of 1240 mm and average annual minimum temperature range of 22 - 25 °C and maximum of 26 and 35 °C. Three locations were selected for the experiment, namely: Faculty of Engineering and Technology (Site A), Information and Communication Technology Centre (Site B) and Works and Services Department (Site C). Soils at the experimental sites were randomly sampled from five different locations before the commencement of the experiments using soil auger. These samples were bulked and air dried for one week before taking it to the laboratory for analysis. The soil texture of the sites was sandy loam consisting of 68 % sand, 18 % silt and 14 % clay. A pycnometer was used to determine the particle density of the soils. Bulk density of the experimental sites was determined using core samplers to collect soils in each of the experimental sites while moisture meter was used to measure the moisture content and pH of the soils determined using pH meter. The total porosity (P_t) was calculated using the relationship between particle density (P_d) and bulk density (B_d) as indicated in equation 1 below (Dibal *et al.,* 2011).

$$P_t = 100\left(1 - \frac{B_d}{P_d}\right) \quad (1)$$

Infiltration Rate Measurement

The soil where infiltration rate test was carried out were thoroughly pre-wetted 72 hours before the start of the measurement and covered with polythene to prevent surface drying. The pre-wetting allowed the rings to be inserted easily and helped to reduce variations in rates caused by differences in initial moisture status. The test was made on bare cultivated soils at all sites. The vegetation was clipped down so as to prevent breaking of the water surface and loose materials were cleared off. A large diameter (60 cm) and a small diameter (30 cm) double ring infiltrometer were used to measure the infiltration rate of the soils at various sample points within the premises of the institution. This was hammered concentrically into the ground up to a depth of about 15 cm using hammer and leveled. Water was supplied in the rings manually. When filling up the rings the outer ring was filled first, this was done to prevent lateral flow of water in the infiltrometer. When filling the inner ring, water was poured on a jute cloth to prevent the soil surface pores from being disturbed during the introduction of water in the ring. Once the desired amount of water was in the ring, the

cloth was removed quickly. The level of the water was recorded with a ruler and the commencement of infiltration noted on the stop watch. The height of the water level in the inner ring was allowed to fall about 5 to 10 cm before refilled up to its original level. The fall of the water level in the inner ring was recorded starting with 2, 5, 10, 15 and 20 minutes of interval.

Results and discussion

Tables 1, 2 and 3 show the infiltration rates obtained from Sites A, B and C. It was observed that high values of infiltration rate were experienced during the first 8 minutes of the experiment. This might be as a result of high organic matter content of the soil thereby increasing pore spaces in the soil or as a result of presence of coarse soil particles at the top soil level. This also indicated that the soil was not yet saturated thereby causing more water infiltrating into the soil much more rapidly at the initial stage of the experiments than after 8 minutes. It was also observed that the Infiltration rate decreased with time increase. This might be as a result of the soil reaching its saturation level as the quantity of water increased. This result was in line with the result obtained by Dibal *et al.,* 2013. Constant values of infiltration rates was obtained from the 95^{th}, 80^{th} and 95^{th} minutes at Sites A, B and C respectively as shown in Tables 1, 2 and 3. This may be attributed to the fact that the soils have reached the saturated points and water would no longer infiltrate into the soil because all soil pores would have been occupied by water and pouring in more water would result into water logging. Also, this may be attributed to the presence of hard pan in the soil which may not allow water to infiltrate into the soil. There was no significant difference ($p < 0.05$) in the infiltration rate of the three sites considered. Results from the field also indicated that the infiltration capacities of the sites with Site A (Faculty of Engineering and Technology soil) had the highest infiltration capacity of 156 cm/hr, followed by Site B (ICT soil) (147 cm/hr) and the lowest at Site C (Work and Services soil) (135 cm/hr). These results were generally high and soils with high infiltration rates are not susceptible to ponding and run-off. Therefore, the areas investigated have good potentials for farming activities. Table 4 shows the soil physical properties of the experimental sites. Highest value of bulk density was obtained in site C followed by site A and the least obtained in B. Particle density had the highest value in site A and the least in site B while highest porosity values was obtained in site A and the lowest in site C. Moisture content value was highest in site C and have the lowest in site B. In the same vein, highest pH value was obtained in site B while the lowest was obtained in site C. However, there was no significant difference ($p < 0.05$) in all the physical properties of soil examined.

Table 1 Infiltration Rate in Faculty of Engineering and Technology Soil (Site A)

Time of Infiltration (cm)	Depth of Infiltration (cm)	Cum. Infiltration (cm)	Infiltration Rate (cm)	Cum. Infiltration Rate (cm/hr)
2	5.2	5.2	156.0	156.0
4	4.4	9.6	66.0	144.0
6	3.7	13.3	37.0	133.0
8	3.1	16.4	23.3	123.0
10	2.5	18.9	15.0	113.4
15	2.2	21.1	8.8	84.4
20	1.9	23	5.7	69.0
25	1.7	24.7	4.1	59.3
30	1.3	26	2.6	52.0
35	1.1	27.1	1.9	46.5

40	0.9	28	1.4	42.0
50	0.7	28.7	0.8	34.4
60	0.5	29.2	0.5	29.2
70	0.3	29.5	0.3	25.3
80	0.2	29.7	0.2	22.3
95	0.1	29.8	0.1	18.8
110	0	29.8	0.0	16.3
130	0	29.8	0.0	13.8

Table 2 Infiltration Rate in ICT Soil (Site B)

Time of Infiltration (cm)	Depth of Infiltration (cm)	Cum. Infiltration (cm)	Infiltration Rate (cm)	Cum. Infiltration Rate (cm/hr)
2	4.9	4.9	147.0	147.0
4	4.2	9.1	63.0	136.5
6	3.6	12.7	36.0	127.0
8	3.4	16.1	25.5	120.8
10	3	19.1	18.0	114.6
15	2.5	21.6	10.0	86.4
20	2	23.6	6.0	70.8
25	1.5	25.1	3.6	60.2
30	1.1	26.2	2.2	52.4
35	0.9	27.1	1.5	46.5
40	0.7	27.8	1.1	41.7
50	0.6	28.4	0.7	34.1
60	0.4	28.8	0.4	28.8
70	0.3	29.1	0.3	24.9
80	0.1	29.2	0.1	21.9
95	0.1	29.3	0.1	18.5
110	0.1	29.4	0.1	16.0
130	0	29.4	0.0	13.6

Table 3 Infiltration Rate inWorks and Services Soil (Site C)

Time of Infiltration (cm)	Depth of Infiltration (cm)	Cum. Infiltration (cm)	Infiltration Rate (cm)	Cum. Infiltration Rate (cm/hr)
2	4.5	4.5	135.0	135.0
4	4.1	8.6	61.5	129.0
6	3.8	12.4	38.0	124.0
8	3.2	15.6	24.0	117.0
10	2.9	18.5	17.4	111.0
15	2.7	21.2	10.8	84.8
20	2.4	23.6	7.2	70.8
25	2.1	25.7	5.0	61.7
30	1.7	27.4	3.4	54.8
35	1.4	28.8	2.4	49.4
40	1.1	29.9	1.7	44.9
50	0.8	30.7	1.0	36.8

60	0.5	31.2	0.5	31.2
70	0.4	31.6	0.3	27.1
80	0.2	31.8	0.2	23.9
95	0.2	32.0	0.1	20.2
110	0.1	32.1	0.1	17.5
130	0	32.1	0.0	14.8

Table 4 Soil Properties of the Experimental Sites

Soil Property	Site A	Site B	Site C
Bulk Density (kgm^{-3})	1.62	1.60	1.65
Particle Density (kgm^{-3})	2.65	2.58	2.64
Porosity (%)	38.9	38.0	37.5
Soil Class	Sandy loam	Sandy loam	Sandy loam
Moisture Content (% w.b)	34.3	32.4	35.8
pH	6.2	6.4	6.1

Conclusion

The study revealed that infiltration rate of the soil was high during the first eight minutes of the experiment but later decreased with time. The physical properties of soil in the area were found to have bulk density (1.60 – 1.65 kgm^{-3}), particle density (2.58 - 2.65 kgm^{-3}), porosity (37.5 – 38.9 %), moisture content (32.4 – 35.8 %) and pH (6.1 – 6.4), which indicated that the soils were acidic. Infiltration capacity of site A was (156.0 cm/hr), site B (147.0 cm/hr) and site C (135.0 cm/hr). These results were generally high and soils with high infiltration rates are not susceptible to ponding and run-off. Therefore, the soils in the area examined have good potentials for farming.

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DESIGN AND CONSTRUCTION OF A POWER AMPLIFIER CAPABLE OF DRIVING A 200 W LOUDSPEAKER

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Abstract
It was observed that the use of ordinary voice to teach a large crowd of students in the classroom has a negative impact on their academic performances because the teacher's voice may not be audible enough to cover the crowd. As a result, this research focuses on the design and construction of a power amplifier capable of driving 200W to a loud (speaker). It was developed through four stages. The first stage was the amplifier, which increases the amplitude of audio electrical signals from the microphone that were connected to the power supply which was fed into loudspeaker to increase the volume of sound produced. It was also connected to the drivers, which convey or transfer the audio electrical signals to the output stage. A power supply of about 230V, 50Hz was applied to the system. The output receives its audio electrical signals from the amplifier to give out the desired audio electrical signals, which are transmitted to the loud speaker. A clear and audible sound was heard from the device when tested after the development. It was concluded that the audio amplifier works effectively to meet its purpose. It was recommended that the amplifier should be used in classroom, seminars, workshops and offices especially where there are a large number of students.
Keywords*:* Amplifier, Audio, Microphone, Signals, classroom, large crowd, Loudspeaker

Introduction

Amplifiers, as the name implies, are electronic devices that boost or strengthen an input signal. Amplification is defined as the process of increasing the size (magnitude) of a variable quantity especially the magnitude of a voltage or current, without substantially changing or altering any other quality (Wade and Drukier, 2000). The nature of the signal could be of any type such as voltage, current or power of a circuit (Wade and Drukier, 2000). Real amplifiers (e.g. transistor) are not linear and the output will only approximate the input. Non-linearity is the origin of distortion within an amplifier.

Amplifiers are basically used to superimpose the audio signal which should have the capability to drive a loudspeaker whether it is live audio or Recorded Audio (Steve and crips, 2005).

The rapid progress in wireless communication systems necessitates the development of wireless nodes that can achieve the operation according to various technology standards. The term audio means the range of frequencies which the human ear can hear. The range of human hearing extends from 20 Hz to 20 kHz. Therefore, audio amplifiers amplify electrical signals that have a frequency range corresponding to the range of human hearing, i.e. 20Hz to 20 kHz to a level suitable for driving loud speakers (Sano, 2009).

An amplifier is an electronic device that increases the power of a signal. With that being said, the purpose of every power amplifier is to take a relatively small signal from a source device (input device) and make it suitable for driving a loudspeaker (output device) by increasing its magnitude. For example microphone won't have enough strength to drive a loudspeaker directly, and no sound would be heard without using proper amplifier. An amplifier is an

electronic circuit that boost or strengthens an input signal, they provide amplification (Rashid, 2004).

Amplifiers are electronic devices that boost or strengthen an input signal, in other words, they provide amplification. The nature of the signal could be of any type such as voltage, current or power of a circuit. There are many forms of electronic circuits classed as amplifiers, from operational amplifiers and small signal amplifiers up to large signal and power amplifiers (McFarlane *et al.*, 2002).

Amplifiers can be thought of as a simple box or block containing the amplifying device, such as a Transistor, Field Effect Transistor or Operational amplifier (op amp), with the output signal being much greater than that of the input signal. Therefore, an amplifier's performance can be defined by the quality of its output, it can be said to be high only if the amplified signal contains none or minimum number of distortions or alterations compared with the original input signal (McNealy, 2003).

Audio amplifiers boost low power electronic audio signals to a level that is strong enough for driving loud speakers, and they receive low signal from input sources such as phones, laptops, radio etc. and amplifies was to give a higher output signal through the speaker (Tiwari *et al*, 2008).

Nowadays there are a lot of electrolytic components built-in to avoid overload occurrences. Many amplifiers have a number of features to help monitor the status of the amplifier and also to protect speakers (and the amplifier itself) in the case of an overload condition. Some features include power meters, clipping indicators, thermal overload shutdown, over current protection (Tiwari and Shukla,2009).

The benefits of electronic amplification cannot be overemphasized as it enables the designer to detect, manipulate and control small signals which in most cases constitute the signal of interest. For example, a dynamic microphone that is picking up a loud voice or instrument may produce an electrical signal somewhere in the neighborhood of 0.1 volt. This will require some pre-amplification to a line level signal (usually about 1 volt) before further processing can be done (Agasako *et al.*, 2005).

It has been observed in the recent time that the used of amplifier with microphone in the classroom aids teaching and learning rather than ordinary voices. The teaching and learning in the classrooms and laboratories with ordinary voice have some negative impacts especially with large class on academics performance of students. The more audible the voice the more understanding. Many students fail due to lack of proper understanding of the courses taught in the classrooms and this may be as result of to non availability of electronic gadgets such as Amplifier, Microphones. Speakers e.t.c.

Today there are many categories of amplifiers used for different purposes. It is widely used in several devices to boost electrical signals. Radios, televisions and telephones are a few examples to mention. Some of the common types of amplifiers are used in electronic gadgets and audio systems. These are also used in musical instruments, guitar, conferences, seminars and classrooms

The main aim of this work is to design and develop a power amplifier usable in driving 200W to a loud (speaker)

The objectives of the study are;

(i) To develop a 200W Audio amplifier for teaching and learning
(ii) To develop an instrument adaptable for teaching and learning.

Methodology

The approach adopted in this study is to develop an amplifier of 200W with the acquisition of necessary materials and components which was purchased from international market through

shipping with relevant agents. To confirm the experimentation of this project, necessary and temporary prototype of the project was done on the veroboard and bread boards which involve all the soldering techniques later fastened into the veroboard for permanent soldering

Construction Site

The construction was carried out in Physics laboratory of the department of Science Laboratory Technology, Oyo State College of Agriculture and Technology, Igboora. It is a very essential tool for designing and test-running the circuit before the main and permanent construction process can take place.

Materials and components

The following are materials and components used for the construction;

Inductor L1, Capacitors (C1…C10), Light emitting Diodes (LD1…LD2) ,Diodes (D1…D2)

Transistors (TR1…TR13),Resistors (R1…R30), Integrated circuit ,potentiometer, board Rechargeable battery, Buzzer Speaker (4.8 ohms) ,Connecting wires and Switch,

CIRCUIT DIAGRAM

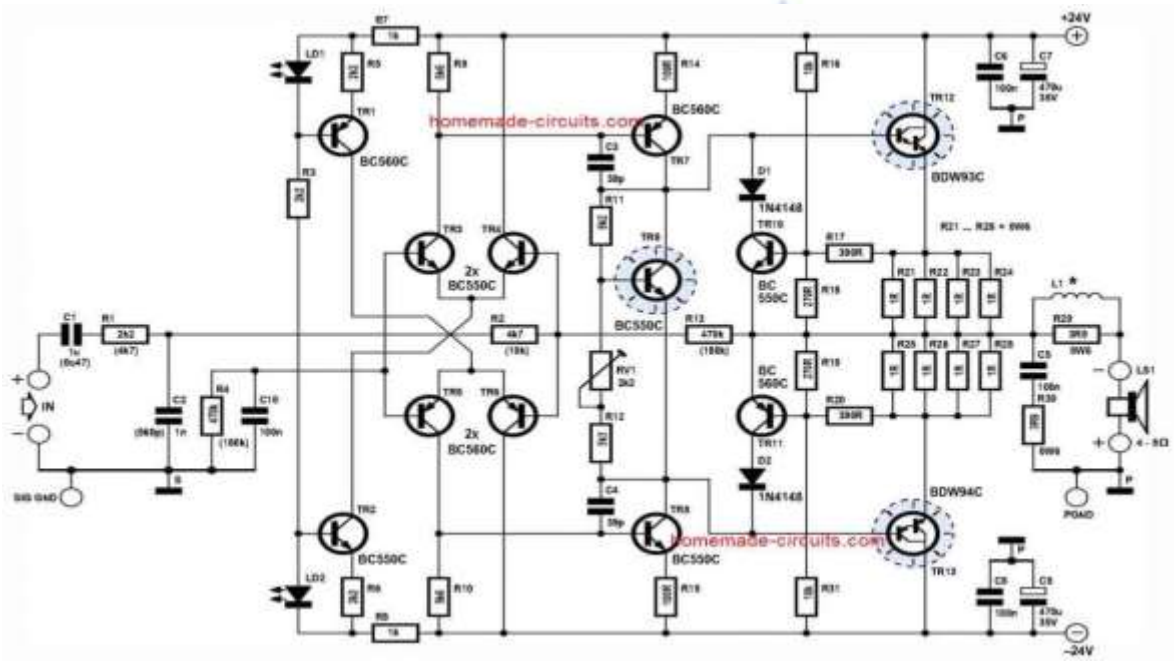

Fig.1: Shows the circuit diagram

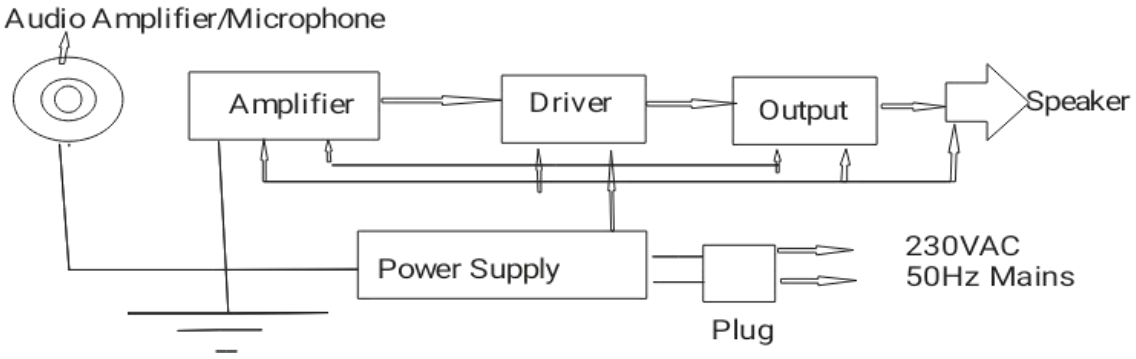

Fig.2: Shows the block diagram of the Audio amplifier

The 200w audio amplifier was developed through four stages or sections. The first section was Amplifier which increases the amplitude of audio electrical signals as the output from the audio input signals or microphone that was connected to power supply which was fed into loudspeaker to increase the volume of sound produced. It was also connected to second section which is drivers, this is to convey or transfer the audio electrical signals to the output section produced by amplifier and it was connected to power supply to supply the needed current and voltage to the system rated about 230V, 50Hz.
The third section is output which receives its Audio electrical signals from Amplifier section to give out the desired audio electrical signals and this signal was transmitted to loud speaker.
The fourth section is Speaker which is transducers that convert audio electrical signals to sound waves. It gives out the clear and audible sound from the system.

RESULT

Fig.3: Audio Amplifier Constructed

The device was equally connected to a wired microphone, the thin sound energy from the speaker resulted into a very well amplified sound from the loudspeaker
A clear and audible sound was heard from device when tested after the construction, however when compared with the Automatic imported audio amplifier of the same range, it was able to give more clear audible sound than imported audio amplifier.
The 200W Audio Amplifier has been successfully developed. It has also been tested and its performance matches the specified objectives and has been used for lecturing in the classroom.
The above results are experimental actualization of the set-out aims and objectives for this work.

Conclusion

It could be deduced that the 200W Audio amplifier developed works effectively from the practical performance in the classroom. It gives out the clear and audible sound which meets up with desired outcome Based on the outcome of classroom with carry capacity of 200 students. It has been concluded that the Audio Amplifier works as itemized on the objectives of the study.
The device can be used for classroom academic purposes such as seminars, workshops e.t.c.

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FABRICATION OF A LOW-COST TEMPERATURE CONTROLLED GAS COOKER WITH AN OVEN

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Abstract
This paper focuses on the fabrication of a low-cost temperature-controlled gas cooker with an oven with dual purposes of cooking or grilling and simultaneously cooking with controlled temperature. The fabrication procedure includes marking the materials, cutting into the required sizes, drawing and specifications of materials and fabrication. By using cheap and readily available materials, the cost of the fabricated gas cooker with oven was reduced, allowing a large number of people to get the gas cooker with oven easily, and by popularizing the use of gas cooking, baking, and grilling as a clean source of energy rather than kerosene, firewood and charcoal used in urban and rural households, due to some environmental and health challenges associated with the latter. This fabricated gas cooker with an oven can be used simultaneously and is also reliable.
Keywords: Burner, Temperature Sensor, Cooker, Oven

Introduction

Household energy need is one of the biggest issues in the daily lives of people around the world. Most households' most important energy-consuming activities are cooking lighting, and the use of electrical appliances. Cooking accounts for 91 % of household energy consumption, lighting uses up to 6 % and the remaining 3 percent can be attributed to the use of basic electronics such as televisions and pressing irons (Temilade, 2008).

gas stove is a stove fueled by combustible gas such as syngas, natural gas, propane, butane, liquefied petroleum gas, or other flammable gas. Before the advent of gas, cooking stoves relied on solid fuels such as coal or wood. The first gas stoves were developed in the 1820s and a gas stove factory was established in England, in 1836.

This new cooking technology had the advantage of being easily adjustable and can be switched off when not in use. However, the gas stove was not commercially successful until the 1880s, when supplies of pipe gas were available in large and small cities in England. The stoves became widespread on the European Continent and the United States in the early 20th century (Krieth *et al.*, 1996).

An oven is a thermally insulated chamber used for heating, baking, or drying of substance. Kilns and furnaces are special-purpose ovens used in pottery and metalwork respectively.

An oven is an enclosed cavity or tunnel where dough or batter is surrounded by hot environment and becomes baked and transformed into bread, cookies, or other products. In order to bake the products, ovens use energy generation sources. Example of combustion of fuels such as; gas or oil or electricity.

Gas oven is one which works with liquefied petroleum gas to bake bread, cakes, and biscuit. The main operational principle of the gas oven is the heat transfer process. The transmission

of heat tends to occur whenever there is a temperature difference and the way in which heat can be transferred in gas oven is convection. (Bizzaco and Evans, 2021).
The fabrication of low-cost temperature-controlled gas cooker with an oven is necessary and cost-effective for food producers and bakers, as the cost of electricity-powered cookers and ovens is high. Local materials were used in the fabrication of the gas cooker.

Materials and methods
Materials used for the fabrication of a low-cost temperature-controlled gas cooker with oven
Table 1: Materials selection

S/N	Oven component	Functions	Reason for selection
1.	Galvanized steel	For the outer casing of the gas cooker with oven	Suitability, low cost
2.	Aluminum sheet (Gauge 450)	For the inner casing of the gas cooker with oven	Suitability, not easily damaged and available
3.	Gas burner	For burning the hydrocarbon gas in heating of the baking chamber	Suitability
4.	Gas hose	Connects the burner to the external gas cylinder	Suitability
5.	Fiberglass	Prevents heat transfer from the oven chamber to the outside.	Low cost and availability
6.	Door handle	For the opening of the oven chamber	Suitability, durability
7.	Stand (2mm angular steel iron)	For rigid support and suspension of the oven for a good supply of oxygen	Durability and High Strength

Temperature Controlled knob: This control the amount of heat supplied to the food in the gas cooker and the oven chamber; thermostat is also installed in the control system as control/regulator that controls the gas supply.
Gas cylinder: This is the gas tank that supplied gas burner and the oven. It is manufactured in various sizes, such as 3, 6, 12.5, 25 and 50 kg, depending on the customer' choice.
The pipe line/hose: This is a gas supply line for the oven and gas burner. It consists of reinforced fiber and rubber to ensure maximum leak free, and also provides more strength to withstand a very high gas pressure without damage.
The gas cooker is at the top while the oven is located under the fabricated gas cooker and the heating element is attached on side of the baking chamber near the inner base of the oven. The outer layer of the oven is made up of galvanized steel sheet, coated with emulsion paint, and the inner layer of aluminum. Inside and outside fiberglass is an insulating material used to hold the heat and prevent heat loss in the oven chamber.
The multipurpose gas cooker with oven is rectangular in cross-section and had vent at the top of the oven connected from the inner cooking room to remove the hot and humid air continuously from the baking process.

Result and Discussion
The fabricated gas cooker with oven in Plate 1 was tested at the Department of Mechanical Engineering, Oyo State College of Agriculture and Technology, Igboora. The device was

tested using gas source from a gas cylinder, and the gas burners produced blue flames. Both the cooker and the oven compartment were tested.

Plate 1: Fabricated Multipurpose Gas Cooker With Oven

This results has evidently shown that the gas cooker with an oven is effective, serviceable and repairable. Due to its advantages, it can be use without electricity. Although, the gas portion of the oven is having the advantage of controlling the temperature within the baking chamber.

It can also be used by small entrepreneurs and can be used in both rural and urban areas by

small and medium scale businesses.

Conclusion

From the result, an oven fabricated with low-cost readily available materials like aluminium and steel. The fabricated gas cooker with oven involved analysis of the flow of gas from gas cylinder to the burner. Using safety measures and precautions, a simple, light-weight gas cooker with oven was done aimed at reducing the production cost of the cooker, thus, making cooking, baking and grilling gas readily available, cheaper and most stable source of cooking fuel for both rural and urban households. Thus, it will help in addressing the environmental and health challenges like deforestation associated with conventional sources of fuel (firewood and charcoal).

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DESIGN AND FABRICATION OF AN AUTOMATED LIFT JACK

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Abstract
The design and fabrication of an automated lift jack have been explored in this study to address the need for an efficient and reliable lifting mechanism in various industrial and automotive applications. The objective of this research was to develop a lift jack that eliminates the manual effort typically required for lifting heavy loads and provides enhanced safety features. The automated lift jack is fabricated using high-strength low-alloy steel and the following Engineering fabrication methods were adopted: welding, sheet metal forming, Electrical wiring and assembly, Surface finishing and packaging. The prototype underwent extensive test to evaluate its performance and functionality. The lift jack demonstrated satisfactory results in terms of load capacity, lifting speed, stability, and safety. It successfully lifted and supported a load of 4000N within a height range of 88.9mm -304.8mm at speed of 0.15m/s, meeting the desired design objectives and offers a viable alternative to traditional manual lifting methods, enhancing productivity, reducing physical strain on operators, and improving workplace safety.
Keywords: Screw jack, D.C Motor, Gear drive, Scissors mechanism, Design, Automated lift jack.

Introduction

Jack is a mechanical device used to lift heavy loads or apply great forces. A mechanical Jack employ a square thread for lifting heavy equipment (Ivan *et al.*, 2014). In the world of modern engineering and manufacturing, automation has revolutionized various industries, providing enhanced efficiency and convenience. One such application is the design and fabrication of an automated lift jack, a crucial tool used for lifting heavy objects, primarily vehicles, for maintenance, repair, or tire replacement. Changing a flat tire is not a very pleasant experience. Nowadays, a variety of car jacks have been developed for lifting an automobile from a ground surface. Available car jacks, however, are typically manually operated and therefore require substantial laborious physical effort on the part of the user. Such jacks present difficulties for the elderly and handicapped and are especially disadvantageous under bad weather conditions (Ali, 2017). In response to these challenges, the development of an automated lift jack aims to streamline the lifting process, improve safety, and increase overall productivity.

The automated lift jack is designed to incorporate various mechanical, electrical, and electronic components, creating a sophisticated system that can be controlled and operated with minimal effort. By automating the lifting mechanism, this innovative device eliminates the need for manual cranking or pumping, allowing users to lift objects effortlessly and efficiently.

Methods

Material selection

The number of materials available to the engineer is vast: something over 120,000 are at his disposal. And although standardization strives to reduce the number, the continuing appearance of new materials with novel, exploitable, properties expands the options further. (Michael, 2005)**.** The automated lift jack is fabricated using High-Strength Low-Alloy Steel because of the following reasons: Good Machinability, Good Ductility, High Strength, Wear Resistance, Ease of delivering confounded parts and relatively cheaper Cost. Aluminum alloy components, which provided a balance between robustness and weight reduction.

Table1 : Components of Automated lift jack

S/N	Name	Quantity
1	Screw jack	1
2	DC Motor	1
3	Control switch	1
4	Links	10
5	Base	1
6	Battery connection cable	2
7	Cigarette Lighter Receptacle	1
8	Plastic plate (for packaging)	1
9	Gear	2
10	Screw	30

Screw jack

The screw jack consist of the lead screw which is used as a linkage in a machine to convert rotary motion into linear motion.

Direct Current Motor

It is a machine which converts electrical energy into mechanical energy. It works on the principle of electromagnetic induction i.e. when current carrying conductor placed in a magnetic field it experiences a magnetic force whose direction is given by Fleming right-hand rule.The main advantage of DC motor is that its direction of rotation can be changed by changing the polarity of the power supply.

Control Switch

This is the switch used to operate the DC motor by which the entire operation of the jack is to being controlled.

Links

This enables the Transmission of forces, Stability and Structural support by distributing the loads evenly and preventing excessive bending or deformation. It also helps in articulation and flexibility by making the jack adjusted to different angles and position making them suitable for different lifting application.

Base and frame

It is a rigid construction on which all the parts of the jack are assembled, it serves as a support structure.

Battery Connection Cables

These cables are used to provide electrical connection to a various part of the system with the battery.

Ball bearing

This is a type of rolling element bearing which reduces rotational friction, supports radial and axial loads.

Cigarette Lighter Receptacle:

Also known as a car charger or car adapter, is a device that allows charging of electronic devices using the cigarette lighter socket in a vehicle. The main function of a cigarette receptacle cable charger is to provide power to devices. The charger converts the 12-volt DC power from the car's electrical system into the appropriate voltage and current required by Automated lift jack system **.**

Prime mover/ DC Motor

The drive arrangement of the jack make use of a dc motor as its prime mover. The motor transmits a decently low speed at high power.Power of a Prime Mover: Direct Current Electric Motor of 2.34 kW/276 rpm

Gear

Spur gears These are designed to transmit motion and power between parallel shafts which are the most economical gears in the power transmission industry. Two types are used in the fabrication work:

Internal spur gear These spur gears are turned inside out. In other words, the teeth are cut into the inside diameter while the outside diameter is kept smooth.

External spur gear Perhaps the most often used and simplest gear system, external spur gears are cylindrical gears with straight teeth parallel to the axis. They are used to transmit rotary motion between parallel shafts and the shafts that rotate in opposite directions.

Screw

The primary function of a screw is to fasten and join two or more objects together. By rotating the screw into a threaded hole, it creates a secure connection, holding the objects firmly in place.

Design Considerations:

According to EPA'S (2022) Environmental protection Agency Data, the average weight of an automobile was around 4,094 Pounds, while smaller vehicles usually weigh around 2,500 pounds (1133.98 kg) and cargo automobiles about 4,200 pounds. The assumption should be taken that the ground clearance should be of 200mm and the jack supports the load of ¼ of car weight i.e. 300 to 1000 kg for safety it should be taken as 400 kg. (Choudhary *et al.,* 2016).

Design Calculations:

Load Capacity

Smaller vehicles with an average of 2500 pounds = 1133.98kg = 1.25 tons

The load acting on the jack is of ¼ of a total load of the vehicle. Therefore load acting on one wheel is from 300 to 500 kg. For safety consideration the load assumes to be 400 Kg. Load (W) = 400 Kg = 4000 N

Observed data:

Nominal diameter of screw, d = 13.2 mm
Core diameter of screw, dc = 12 mm
Pitch of screw thread, p = 2 mm
Load W = 400 kg
Assume Coefficient of friction, μ = 0.15

Mean diameter of screw, dm

$$dm = do - \left(\frac{p}{2}\right) \qquad \text{……(i)}$$

Lead Screw pitch (l) =3mm

$$\therefore lead\ angle(\alpha) = \tan\alpha = \frac{l}{\pi dm} \quad \text{……..……..(ii)}$$

$$\tan\alpha = \frac{3}{\pi \times 12}$$

$$\tan\alpha = 0.0795$$

Helix angle of screw $\alpha = 4.5455$

Tangential force required at the circumference of the screw to raise the load

$\mu = \tan\theta = 0.15$

P = Effort required to raise the load

$$P = W \times \tan(\alpha + \theta) \quad \text{…….(iii)}$$

$$P = W \times \left(\frac{\tan\alpha + \tan\theta}{1 - (\tan\alpha + \tan\theta)}\right)$$

$$P = 4000 \times \left(\frac{0.0795 + 0.15}{1 - (0.0795 + 0.15)}\right)$$

$$P = 929.08N$$

For lowering the Load

$$P = W \times \tan(\alpha + \theta) \quad \text{……..…(iv)}$$

$$P = W \times \tan\alpha + \tan\theta$$

$$P = 4000 \times 0.0795 + 0.15$$

$$P = 4000 \times 0.2295$$

$$P = 918N$$

Torque required for operating the Screw

$$T = P \times \left(\frac{dm}{2}\right) \quad \text{…… (v).}$$

$$\mathrm{T} = \mathrm{P} \times \left(\frac{\mathrm{dm}}{2}\right)$$

$$\mathrm{T} = 723.75\mathrm{N} \times \left(\frac{12}{2}\right)$$

$$\mathrm{T} = 723.75 \times 6$$

$$\mathrm{T} = 434.2\mathrm{N}mm$$

Power Required to drive the motor

$$P = T \times \omega \quad \text{……(vi)}$$

$$P = T \times \omega$$

$$P = 4.342 \times \left(\frac{2\pi N}{60}\right)$$

$$P = 4.342 \times \left(\frac{2\pi 60}{60}\right) (Since\ N = 60rpm)$$

$$P = 4.342 \times 2\pi$$

$$P = 27.282N$$

Fabrication Methods:
Boring: This was carried out with the aim of accommodating the bolts.
Welding: The joining operation was done so as to achieve the purpose of keeping the motor in the appropriate place.
Grinding: This was done to acquire a good surface
Painting: This was done to improve the surface finishing and aesthetic look.
Packaging: This was achieved by concealing the electrical components in the control panel by using plastic material screwed together to house the components.

Results and discussion
The automated lift jack demonstrated impressive lifting capabilities. It was able to lift loads ranging from 1000N to 4000N without showing any signs of mechanical strain or failure, it consistently lifted loads at an average speed of 0.15m/s which is significantly faster than the traditional manual jack. During testing the safety mechanisms responded effectively to sudden changes in load and power supply, preventing any potential accidents.

Conclusion
The Design and fabrication of Automated lift jack have been explored in this study to address the need for an efficient and reliable lifting mechanism in various industries most especially the automotive industry. The jack is portable, with the remote controlled switch it can be easily operated by the elderly and women who are presented with difficulties when operating the conventional jack. Based on testing, the torque provided by the framework is all that could possibly be needed to lift an automobile weighing around 4000N within height range of 88.9mm - 304.8mm. It can be upgraded and used even in the heavier vehicles with slighter design modifications and positioning features.

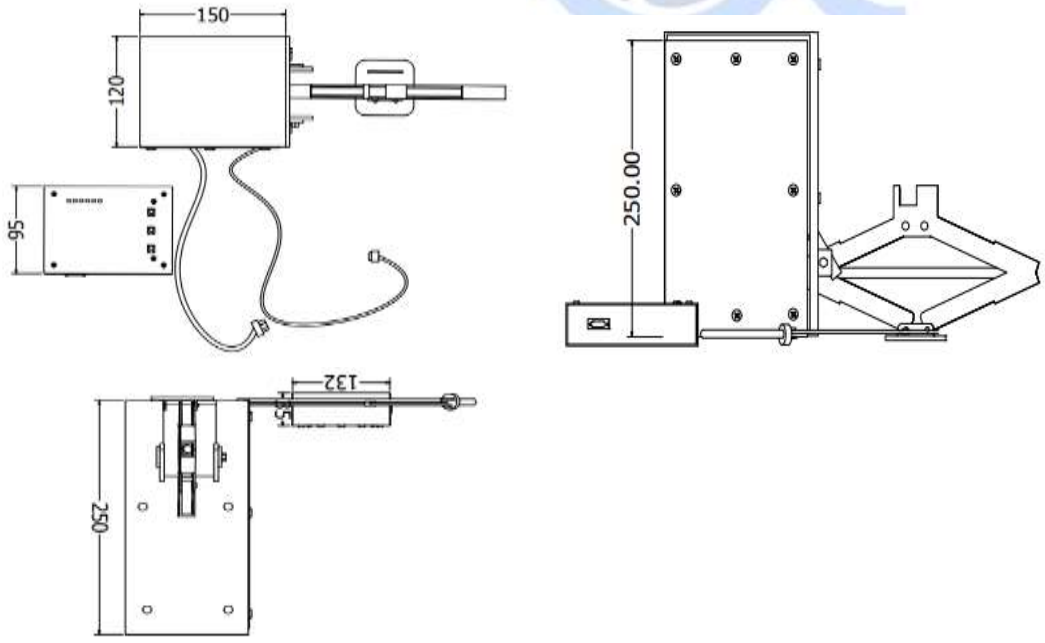

Figure 1. Orthographic view of the automated lift jack

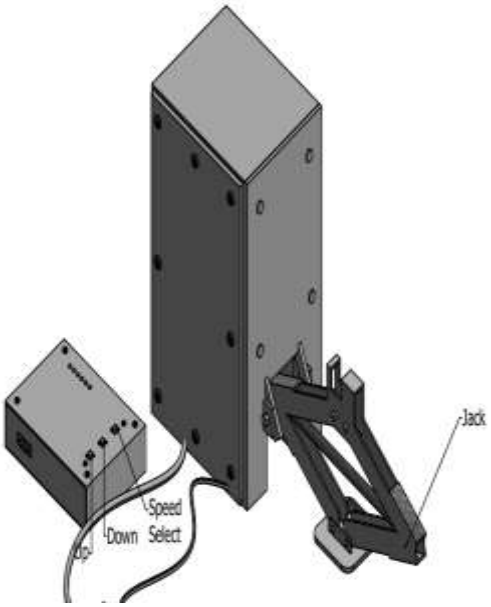

Figure 2: 3d view of the automated lift jack

Figure 3: Prototype of the automated lift jack

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IMPLEMENTATION OF A SOLAR POWERED REFRIGERATOR

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Abstract

Refrigeration has had a large impact on industry, lifestyle, agriculture and settlement patterns. Most conventional refrigeration systems operate with electricity however there are regions where it is difficult or not cost efficient to provide electric service. Throughout developed countries, photovoltaic refrigerators are most widely used to further reduce carbon emissions. Renewable source, particularly solar, has appeared as a potential candidate to supplement conventional fossil sources. A major advantage of solar energy over other renewable sources is that solar energy is abundant. The development of a solar powered refrigerator was achieved by combining several components, which are a solar panel, a refrigerator, an inverter, a charge controller, and a battery bank. The components were connected to each other by a DC wiring systems. The solar panel is placed on an adjustable fixture to ensure the proper alignment of the panel to make sure it will collect the highest amount of sunlight and continuously provide electricity for the system. The refrigerator was meant for a cooling purpose and hence works on vapour compression refrigeration system. The vapour compression system uses compressor, which requires electric power to run it. The selection of Solar photovoltaic (PV) panel which produces energy from the solar source and serve electric power to run the compressor was used to minimize environmental impact and fuel cost. And this has benefited the community and the country at large in the area of pollution. Effective refrigeration was achieved due to the solar photovoltaic cells used since the connection to the power grid in this environment was nothing to write home about.

Keywords*:* Inverter, solar panel, battery, refrigerator and charge controller.

Introduction

Refrigeration is a process in which work is done to move heat from one location to another. The work of heat transport is traditionally driven by mechanical work, but can also be driven by heat, magnetism, electricity, laser, or other means. Refrigeration may be defined as the process of removing heat from a substance under controlled conditions and reducing and maintaining the temperature of a body below the temperature of its surroundings by the aid of external work. Therefore in a refrigerator, power is to be supplied to remove the heat continuously from the refrigerator cabinet to keep it cool at a temperature less than the atmospheric temperature. Refrigeration has many applications, including, but not limited to: household refrigerators, industrial freezers, cryogenics, and air conditioning. Heat pumps may use the heat output of the refrigeration process, and also may be designed to be reversible, but are otherwise similar to refrigeration units (Joaquim, 2009).

Nigeria today is faced with problems such as increase in food spoilage, low level of food preservation and low maintenance of cold temperature for food (fish and meat) and drinks. All these are as a result of lack of constant supply of electrical power coupled with the

problem of getting door to door delivery of cold drinks to places such as offices, homes, schools, and so on.

The quality of energy produced by man depend greatly on individual's ability which had created variance in energy quantities, ultimately, difference in rate at which two or more individuals accomplish same task. Therefore, man had poke into more forms and sources of energy to meet individual needs and to balance the rate at which tasks are accomplished. There are various sources of energy in which solar is also included.

Renewable energy options that use natural sources such as solar energy, oceans, rain, wind and steam from the earth's crust among other natural energy sources are legitimate alternatives to non-renewable energy sources that are likely to cause harmful effects for humans and plants on the planet. Solar power is the most valuable resource that can be used to generate energy amongst these different energies. Throughout developed countries, photovoltaic refrigerators are most widely used to further reduce carbon emissions. Renewable source, particularly solar, has appeared as a potential area to supplement conventional fossil sources. A major advantage of solar energy over other renewable sources is that solar energy is abundant in most of the countries. (Wang *et al.*, 2016). Price of fossil fuel sources also fluctuates over time, whereas solar energy does not incur any fuel cost thus has no point of fluctuation (Abdullah *et al.*, 2016). The usage of solar energy will minimize the amount of fossil fuel related emissions and will aid the persuasion of green technological development. The good climate condition in Nigeria makes the country at a more advantageous as regards solar energy as the best renewable energy source as the weather has longer sunny period throughout the year (Diaz Torres *et al.*, 2016).

Solar powered refrigerators may be most commonly used in the future generations in developing the world to help mitigate poverty and climate change. These refrigerators are capable of storing perishable items such as medications and vegetables in hot weather by using energy from the sun and are used to maintain much needed vaccines to avoid spoilage especially in rural communities where they are not connected to the National grid. The solar cooling system is operated using electricity from the sun by photovoltaic cells.

There are several types of refrigeration systems popularly used for cooling purposes. One of the most common refrigeration systems is vapour-compression refrigeration system. The vapour compression system uses compressor, which requires electric power to run the compressor. Solar photovoltaic (PV) panels can provide electricity for solar source and serve electric power to run the compressor. (Torres *et al.*, 2016).

Solar powered refrigeration system has been a subject of great concern to both the government and various stakeholders in the society. Government has been trying to put mechanisms in place to control harmful emissions from generators mostly used in rural communities to power their refrigerators. The current state of exploitation and utilization of renewable energy is very low. It is therefore a welcome idea when renewable energy can be used to power refrigerators in local communities to aid cooling and preserve vaccines.

Materials and methods

The paper involved assembling of all the components part that made up the solar system and was used to power a refrigerator at the Mechanical Engineering Department of Oyo State College of Agriculture and Technology, Igboora.

The following materials were used for the research work

- 2pcs of 150W Mono Solar Panel
- 1.5KVA 12V Inverter
- 12V/24V 60A PWM Charge Controller
- 220AH/12V Wet Cell Luminous Battery

- 13A ABB Plug
- $4mm^2$ Single Core Cable
- 100A Change-Over Switch (Knife Switch)
- $4mm^2$ Double Core DC Cable

Tools

The following are the tools for the research work

- Nose plier
- Cutting Plier
- Tape (Insulator)
- Battery Tester/Analyser
- Screw Drivers (Flat and Star)
- Tornado Nails
- Hammer
- Multi-tester

Components of solar power

The solar power system is mainly composed of the Solar Panel, the Charge controller, the Battery and the Inverter as shown in figure 2.1 which detailed the inter-connection of these devices together from solar panel to the battery.

The Solar Panel is connected to the battery by the charge controller thereby converting the Solar ray falling on it into electrical charges, and the charges is stored in form of DC signal. The charge controller regulates the charging of the battery. It prevents the over charge of the battery.

The Inverter is connected to the battery, it converts the charge stored in the battery in form of DC voltage into AC voltage for the use in our appliances.

Photovoltaic system

A photovoltaic (PV) system is able to supply electric energy to a given load by directly converting solar energy through photovoltaic effect. A variety of smaller-scale solar and renewable energy technology applications were developed and promoted in the 1970s and 1980s. These include solar photovoltaic systems for lighting, battery charging, refrigeration, communication and water pumping (Herbert, 2002).

Most solar cells are constructed from semiconductor material, such as silicon (the fourteen element in the Mendeleyev table of elements). Silicon is a semiconductor that has the combined properties of a conductor and an insulator.

Solar cell technologies at present fall into three main categories: monocrystalline (single-crystal construction), polycrystalline (semi crystalline) and amorphous silicon thin firm. (Peter, 2011) positive and negative leads. These are connected front series to archive higher voltages.

Plate 1: Solar panel

Solar panel sizing

$$= \frac{I_B V_B N_B}{S_H}$$

where I_B = Current of the battery
V_B = Voltage of the Battery
N_B = Number of Battery
S_H = Sun Hours

$$= \frac{100 \times 12 \times 1}{8}$$

$$= 150w$$

A solar panel of 150w was used for the purpose of this research work.

Charge controller

The primary function of a charge controller is to prevent overcharging batteries. A Charge Controller is needed to prevent overcharging of the batteries. Proper charging will prevent damage and increase the life and performance of the batteries.

Plate 2: Charge Controller

Rating of the Controller = $\frac{pv\ wattage}{Battery\ voltage}$

$$= \frac{150}{12}$$
$$= 12.5A$$

Based on the result above, a charge controller of 60A was selected for the work

Battery bank

Battery store direct current electrical energy for later use. This energy storage comes at a cost, however, since battery reduce the efficiency and output of the PV system, typically by about 10 percent of lead-acid batteries.

Plate 3: Solar Battery

According to Ebunilo and Kwasi-Effah, (2013), Battery Capacity can be determined using

$$\textit{Battery Capacity (Ah)} = \frac{Total\ Watt{-}hours\ per\ day\ used\ by\ Appliances * Days\ of\ Autonomy}{0.85 * 0.6 * nominal\ battery\ Voltage}$$

Where 0.85 is the battery loss, 0.6 is the depth of discharge

$$\text{Battery sizing (Ah)} = \frac{210 \times 1.5}{0.85 \times 0.6 \times 12}$$
$$= \frac{315}{6.12}$$
$$= 51.47$$

Approximately 52Ahr

A battery capacity of 100Ahr was thereby procured to carry the refrigerator conveniently.

Inverter

The power inverter is the heart of the system. It makes 220 volts AC from the 12 volts DC stored in the batteries. It can also charge the batteries if connected to a generator or the AC line. For 12V applications an inverter is not required.

Plate 4: 1KVA Luminous Inverter

The inverter must be large enough and must be 25-30% bigger than the total Watts of Appliances (Ebunilo and Kwasi-Effah, 2013).

$$\text{Apparent Power (VA)} : \frac{\text{Real Power (W)}}{\text{Power Factor (0.8)}}$$

The inverter size will be considered 30% of the required total wattage of the refrigerator. The wattage on the compressor of the refrigerator to be considered is 70W. And it is always recommended that because of the starting current of the compressor, we considered the wattage to be times 3 of the power required. That is giving us 210w as the power required to start the compressor

= 30% of 210w

63w

= 210 + 63 = 273w

The real Power = 273w

$$\text{Apparent Power} = \frac{\text{Real Power}}{\text{Power Factor}}$$

Inverter sizing

$$= \frac{273}{0.8}$$

= 341.25VA

An inverter of 1KVA was adopted to power the proposed refrigerator considering the starting current of the compressor, also to prepare for additional load in the future on the system.

Table 1: BILL OF ENGINEERING MEASUREMENT

S/N	MATERIALS	QUANTITY	PRICE (#)	AMOUNT (#)
1.	150W Mono solar panel	2NOS	55,000.00	110,000.00
2.	1.5KVA 12V inverter	1	128,000.00	128,000.00
3.	12V/24V 60A PWM charge controller	1	45,000.00	45,000.00
4.	220AH/12V wet cell Luminous battery	1	180,000.00	180,000.00
5.	13A ABB plug	1	500.00	500.00
6.	$4mm^2$ single core cable	6metre	800.00	4,800.00

7.	100A change over switch (Knife switch)	1	3,000.00	3,000.00
8.	$4mm^2$ double core DC cable	6	800.00	4,800.00
	Total			**#476,100.00**

Complete installation of the solar powered refrigerator

After mounting, the Solar Panel was connected to get an output voltage of 12V with a $4mm^2$ flexed cable. The output of the Solar Panel was connected to the appropriate section of the Charge Controller and the battery was connected to the Charge Controller with the aid of a $4mm^2$ DC flexed cable. The positive terminal of the inverter was connected firmly to the positive of the battery, likewise the negative terminal of inverter was connected to the negative terminal of the battery. The refrigerator was thereby connected to the out of the inverter to power the refrigerator.

Results and discussion

After the complete installation of the system, test was carried out to ascertain the correctness of the installation procedure and it was ensured that the assembling was correctly done.

After the installation, the inverter was powered on and the Inverter display shows that the connections were done correctly. The output of the inverter was measured with a digital multi-meter and it was found to be 230V, which falls within the expected range of the expected results of the research work. The refrigerator was then powered thereafter.

Effective refrigeration was achieved due to the solar photovoltaic cells used since the connection to the power grid in this environment was nothing to write home about.

The following readings were taken for the cooling temperature and time taken for the cooling of sachet water.

Table 2: Values for temperature and time

Time interval (hrs)	Temperature ^0C
0.0	27
1.0	18
2.0	10
3.0	2
4.0	-5
5.0	-12
6.0	-14
7.0	-15
8.0	-15

The above table shows the result of test carried out on the performance of the refrigerator using sachet water, the system was observed at interval of one hour and temperature was recorded .From the table it was shown that temperature decreased from 27ºC to -15ºC but time increased from 0hour to 8hours .

It was first noted that between 0hour to 6hours temperature increase but between 7hours to 8hours the temperature remain the same.

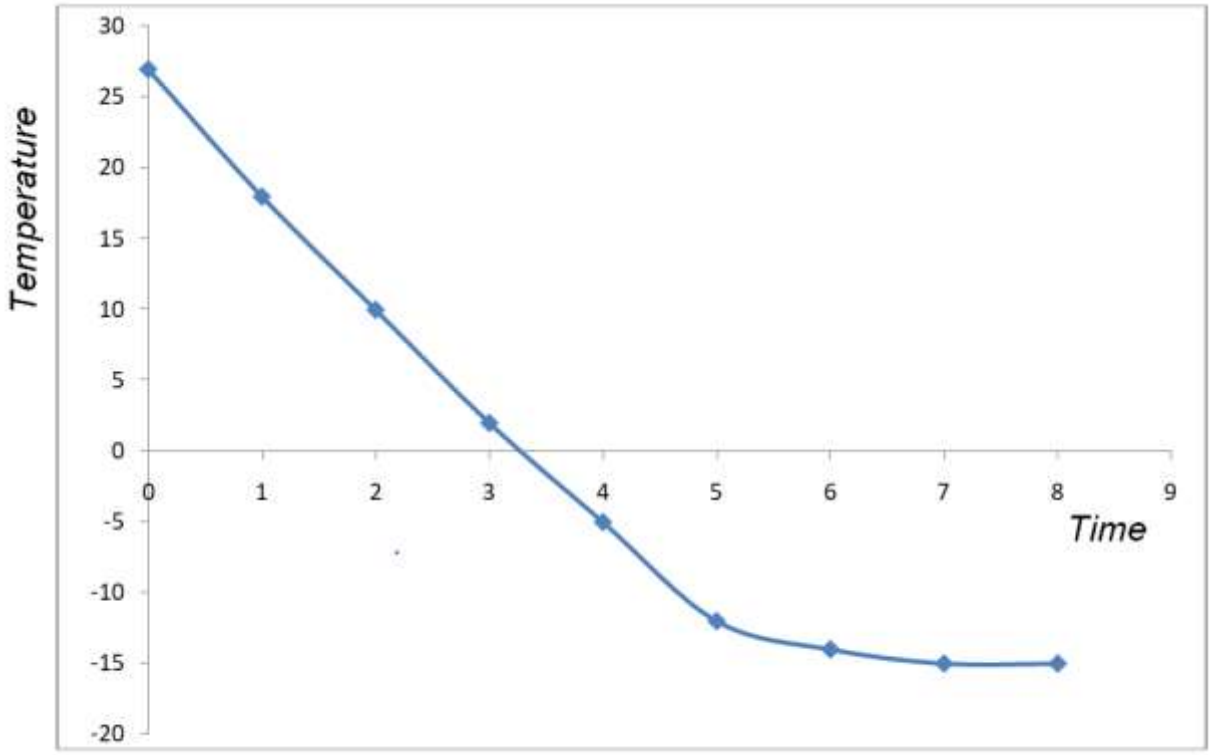

Figure 1: Graph of Temperature (^{o}C) against Time (Hrs)

The result can also mean that the temperature of the water decreased linearly negative with increasing time (Adeyanju *et al.,* 2010).

Conclusion and recommendation

Conclusion

A complete 1KVA, 12V Solar Power System was assembled to power a table top refrigerator. The materials (Inverter, Solar Panel, Battery, Charge Controller) were assembled from the market based on the designed values and tested. The system was used to power an existing refrigerator in the departmental office.

The output of the inverter was recorded to be 230V.

Recommendation

After the complete installation and testing of the Solar Powered Refrigerator, the following recommendations were considered for its performance and improvement;

i. Users should be advised to make use of highly efficient appliances in order to make good use of the power and as well extend its time.
ii. People should be widely enlightened of the benefits of using solar power as a source of energy as it is observed that lots of people still hold an unbeneficial thought of the technology.
iii. Government should encourage the student graduates to be more trained on the technology in order to reduce the unemployment rate in the country.

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CONSTRUCTION OF SOLAR POWERED DC CHARGING BOOTH

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Abstract
In today's environment-conscious world, a lot of interest is being taken in alternate forms of energy. Solar power is a renewable source of energy, which has become increasingly popular in modern days. The construction of a 20 ports USB charger was designed base on two circuits with simple electronic components. Each stage of section in the circuit diagram was constructed and tested before incorporating the next stage of the design.
Keywords: Construction, USB, Solar Powered, Charging Booth

Introduction

In the past couple of years, advancements in technology put devices in our pockets that we could not have even dreamed of years ago. However, these devices often have drawbacks. One of the most pressing drawbacks with phones, tablets, and laptop PCs is power. We have not yet been able to develop efficient energy sources to match the efficiency of our devices. In fact, many laptops can drain a standard battery from a full charge in a matter of a couple hours. (Raghu *et al.*, 2013)

Solar power is one of the widely available energy sources. A Solar battery charger is a device used to avoid using power grid source for charging or as alternative source. It is easy to use and you do not need to pay a lot of attention. This charger has solar panel to collect power from the sun and to convert it to electricity. The main advantage of using a solar battery charger is that it can be used to store energy, which can be used later when sun is not available on a wet or cloudy day. You can charge the battery of your cell phones without taking them out in the sun. (Aliyu *et al.*, 2013).

In rural areas of Nigeria where there is inadequate or even no supply of electricity and they depend majorly on charging stations that utilizes generators to charge their gadgets, it is so important that provisions should be made for an alternative charging source like a solar powered charging booth which will be more environmentally friendly and economically viable, hence, this construction work is necessitated.

Solar energy has two big advantages over fossil fuels. The first is in the fact that it is renewable; it is never going to run out. The second is its effect on the environment. Burning of fossil fuels introduces many harmful pollutants into the atmosphere and contributes to global warming and acid rain.

Cell phones have become an extremely popular device in the entire world and it is easy to say they are part of our daily lives. In the year 2010 there was an estimate of over 4.6 billion cell phones worldwide and the number has been growing by more than a billion ever since; this translates to more than half the world's population (CBS, 2012)

This paper focuses on construction of a 20-ports dc-powered charging booth with a solar system.

Vin	V_{out}	Imax
5-12V	5V	100mA

Table 1: Power requirement for Charging Mobiles Phones (Reddy et al, 2013)

Materials and method

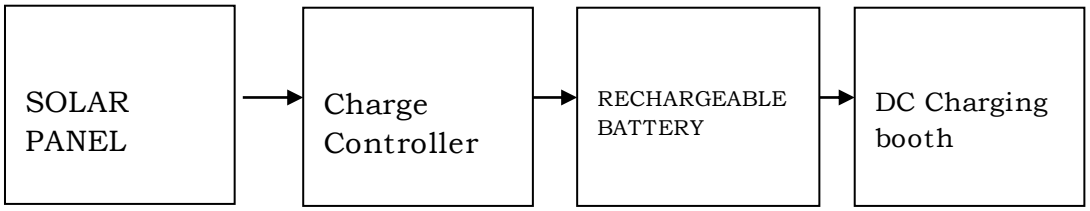

Figure 1: Block diagram of a solar powered dc charging booth

- **TLO 741 Operational Amplifier**

TLO 741 is voltage follower also known as a unity gain amplifier shown in fig. 1, a voltage buffer, or an isolation amplifier. The 741 operational amplifier was used in this construction as unity gain amplifier having a voltage gain of 1, with an input voltage V_{in} = 5V, this is a regulated voltage and fed into the non-inverting input of the amplifier. In a voltage follower circuit, the output voltage is equal to the input voltage; thus, it has a gain of one (unity) and does not amplify the incoming signal. The voltage follower does not need any external components.

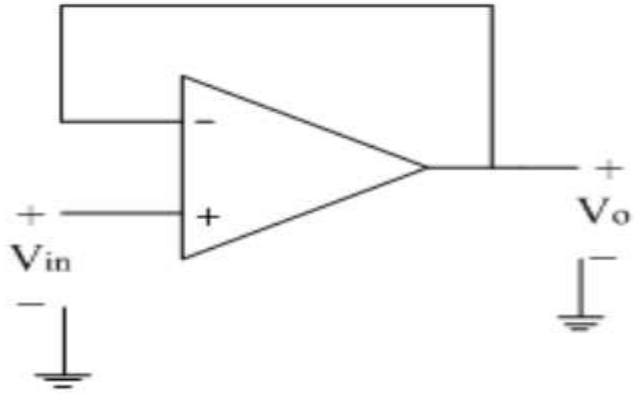

Figure 2: Unity Gain amplifier.

- **Power Supply**

The power supply circuit diagram is shown in figure 2. The power supply consists of voltage regulators of two different voltage values, relay, NOR gate 4001 and other sub-components to enhance overall functionality of this section. A 12V DC relay is used as the battery supply voltage indicator, this relays clicks as soon as the design is connected to the battery voltage during operation, and this ensures a flow of voltage from the battery supply to the entire system. If the battery voltage is low, this relay will not function until the battery is charged. 7805 voltage regulator is a used to regulate the battery voltage from 12V to 5V used for USB, this regulator supplies the voltage to the USB and this voltage is engaged when the device is ON LOAD while another voltage regulator 7806 supplies 6V which is used to engage the device during OVERLOAD stage.

The NOR gate 4001 is a digital logic gate that gives an output of 0 when any of its inputs are 1, otherwise 1. NOR gates can be made to produce a variety of logic gates, including OR and AND gates. The output of the NOR gate is a logic 0 as long as the input voltage is below the threshold. The NOR operation is a logical operation on two logical values, typically the values of two propositions, that produces a value of true if and only if both operands are false. In other words, it produces a value of false if and only if at least one operand is true. The battery low indicator works with 4001 to give output base on the signal received from the

NOR gate and shows output appropriately, the LED indicator comes on to show low battery level when the NOR gate output is 0, and goes off when it is 1.

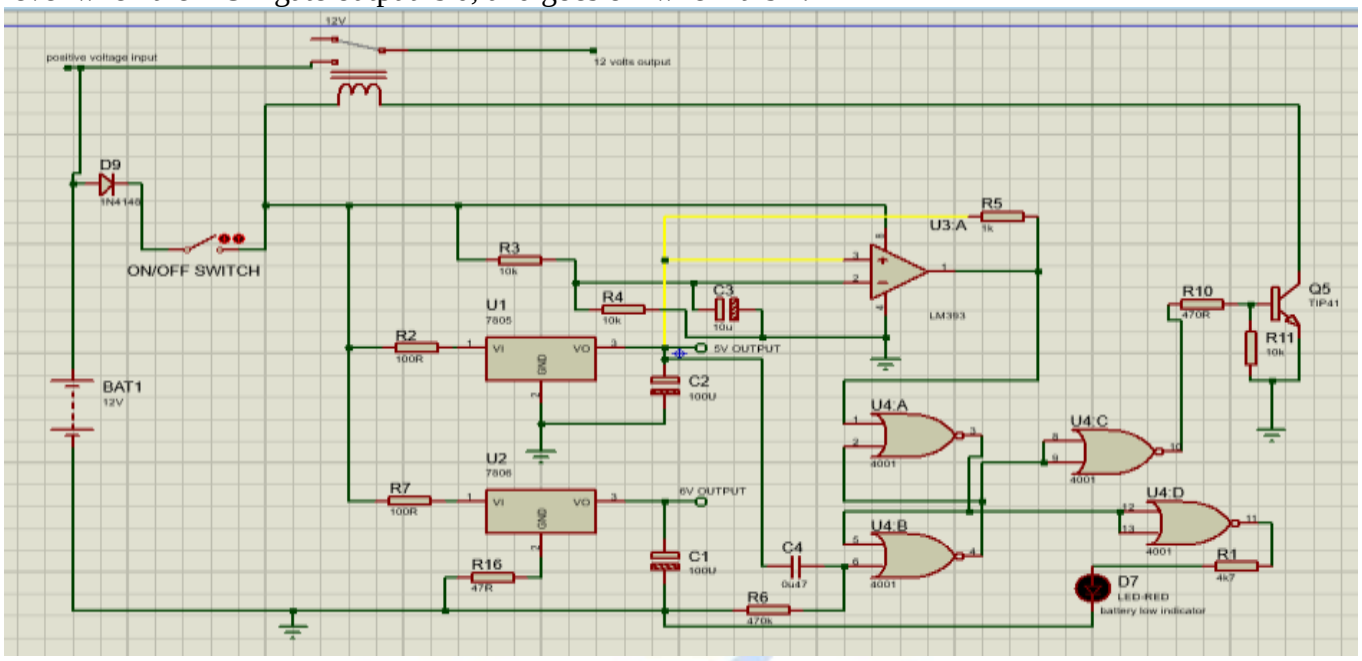

Figure 3: The power supply circuit

- **Printed circuit board design (PCB)**

A printed circuit board (PCB) mechanically supports and electrically connects electronic components using conductive tracks, pads and other features etched from copper sheets laminated onto a non-conductive substrate. Components like capacitors, resistors or active devices, are generally soldered on the PCB. PCBs are designed with dedicated layout software with the "EXPRESS PCB" software application. Figure 3 shows the design environment used by PCB CAD design. This includes the design of the construction circuit diagram using Proteus software for circuit design and simulation, the proteus design version used for is PROTEUS 8.1, and this circuit is then designed using Express PCB (printed circuit board) software. This was made to undergo other processes like ironing, separating, etching, drilling and arranging of components on the panel and soldered before further testing will take place.

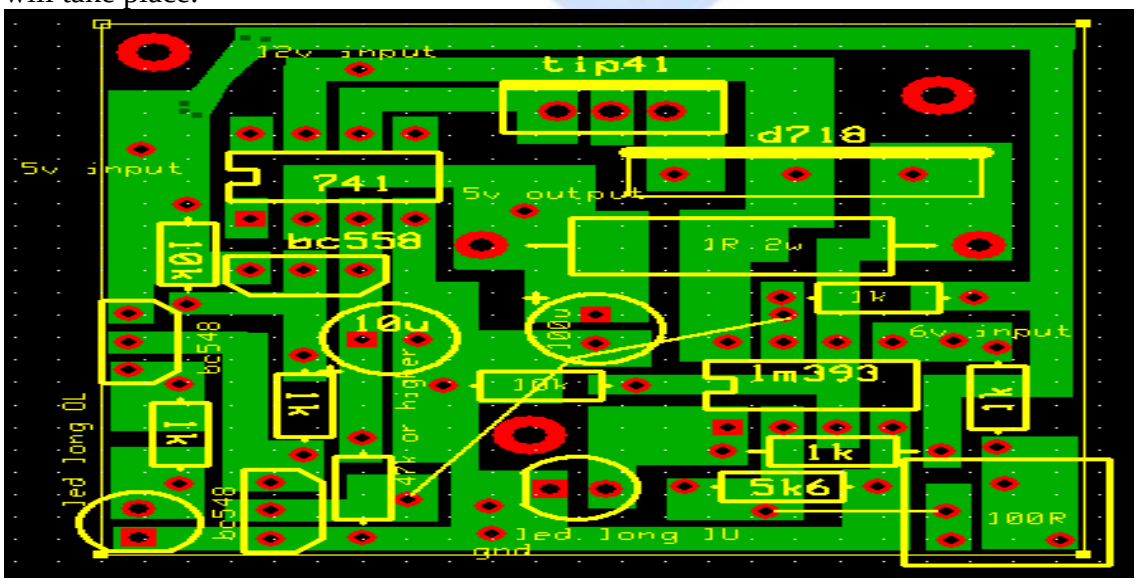

Figure 4: PCB software design for the design

- **Software design, Printing and Etching on PCB**

The software design used is EXPRESS PCB in routing components together, after the completion of this is Printing of the design on a glossy paper, the printed design went through different processes from the application of chemical –ACETONE used to imprint the printed design on the glossy paper as shown in fig. 4 onto the PCB (printed circuit board), this is followed by etching, this involves the use of Iron Carbonate ($FeCO_3$) to etch away the unwanted part of the design leaving the inked of the printed part as shown in fig. 5, these processes are completed by drilling of the PCB for components to be arranged on it before the next stage.

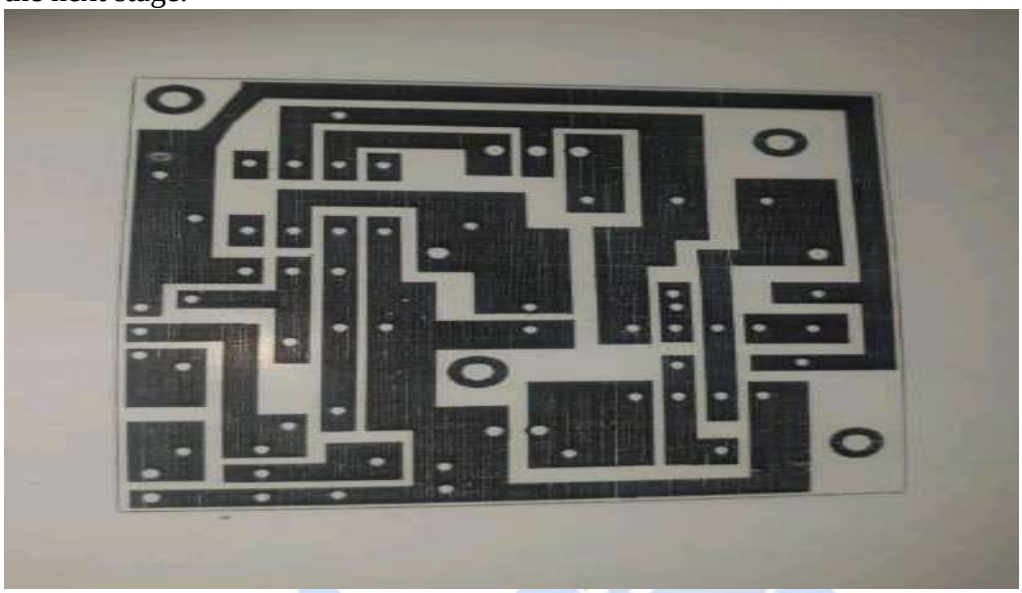

Figure 5: Printing of the design on a glossy paper

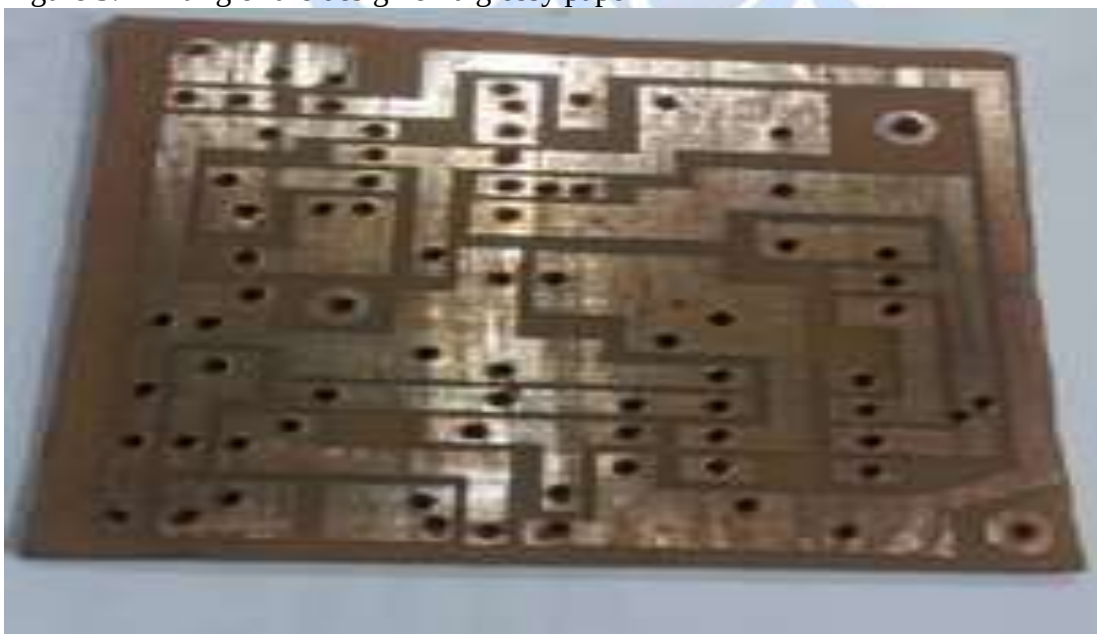

Figure 6: Diagram showing an etched PCB board

- **Soldering on a printed circuit board (PCB)**

It is a board that has lines and pads that connect various points together. A PCB allows signals and power to be routed between physical devices. Solder is the metal that makes the electrical connections between the surface of the PCB and the electronic components. Being metal, solder also serves as a strong mechanical adhesive. In other to ensure good contacts

and to avoid dry joints during soldering, all the components to be soldered were first cleaned by scrapping their legs with sandpaper until the copper became visible. The copper tracks on the board were cleaned in a similar manner; this made soldering much easier as molten solder flows freely over such surfaces. Heat was applied at the right temperature and for sufficient time to ensure that a good joint was made as shown in fig. 6.

Figure 7: Diagram showing the soldered PCB for power supply section for the design

- **Casing, Packaging and Assembling**

A casing was constructed and also a cover board in order to produce a neat and durable production. It was ensured that the casing contains a ground wire to give it a proper earthing. Different sections were assembled together in the casing properly and carefully to avoid destroying the circuit arrangements. We also ensured that the assembling does not create avenue or chance for short circuit. Casing and packaging is shown in fig. 7 and 8.

Figure 8: The power supply panel board arranged with the 20 USB ports.

Figure 9: Casing and packaging showing the USB ports outlet of the chargingTesting

After soldering the circuit components, electrical contact was tested by setting a multi meter to continuity test mode. One terminal of the meter was placed on the soldered joint while the other leg was placed on the copper track to which it was soldered. If the joint was well made, the multi meter emitted a beep sound and if not, it indicated an open connection. Component testing and System testing was carried out to ascertain the proper connection as to avoid short circuit. Each port was tested with a phone and it was efficiently charge the phone

Discursion

The 20 ports charging booth is of low cost, low power operation hence, easily available to everyone. This construction is a basic idea of the research regarding 20 ports charger but still there is a lot more to be explored technologically. The USB port of the mobile is used for the charging, as the USB port is the very helpful voltage source that can charge the mobile. Nowadays, there are two to four USB ports on the laptops that are available in the market. USB actually refers to Universal Serial Bus. It is one of the newest incarnations of method which is used to get information in as well as out from your computer. We are concerned at the fact that ±5 volts of power is being provided by the USB port to the external devices. This paper is therefore concerned about construction of a charging booth of 20 ports; this is multiple charging booths and can serve for as long as the battery voltage is up. The layout of Solar power DC Charging Booth is shown in fig. 9.

Conclusion

The DC Charging Booth constructed can efficiently charge 20 devices at a time. This save noise or air pollution and maintenance cost. The module is tested and working perfectly.

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FARMERS/HERDERS CRISIS, A BANE TO MECHANIZED FARMING AT IGANGAN, IBARAPA NORTH LOCAL GOVERNMENT, OYO STATE

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Abstract
Farmers-herders crises have become a recurrent phenomenon in Nigeria over the years. There have been lingering negative effects of these problems on the warring parties. Several possible solutions have been suggested to ameliorate or put a permanent solution to the crisis. The research examined the causes of the crises between the farmers and the herders and its effects on farming activities at Igangan, Ibarapa North Local Government of Oyo state, Nigeria. It critically examined whether farmers relocated during the crises and how the crises affected the farmlands cultivated during and after the crises. Questionnaires were administered to the population of study and the descriptive Statistics was used, which helped to dertermine the mean and percentage of data collected from the field. It was observed that farmers were relocated, farmlands cultivated were reduced, and food supply was affected negatively. It was recommended that government should take proactive steps in solving the problems.
Keywords: Farmers, Herders, conflicts, crisis, Igangan

Introduction

Conflicts between farmers and nomadic cattle herders have been a common feature of economic livelihood in West Africa (Tonah, 2006). In the period before the beginning of the 20th century, the problem was mainly restricted to the savanna belts of West Africa. Cattle rearing was mainly prevalent in the Guinea, Sudan, and Sahel savanna belts where crop production was carried out only on a small scale during the short rainy season. This gave the cattle herders access to a vast area of grassland. As time went on, and with the introduction of irrigated farming in the Savanna belt of Nigeria, and the increased withering of pasture during the dry season, less pasture was available to cattle herders. The herdsmen had to move southwest to the coastal zone where the rainy season is longer and the soil retains moisture for a long, in search of pasture and water a movement called transhumance (Blench, 2004). This gives rise to increased pressure on natural resources and stiff competition for available resources between farmers and herders (Adebayo, 2001).

Conflict in resource use is not uncommon and perhaps not unnatural in human ecosystems. Moore (2005) noted that conflict is not bad: it is perhaps a necessity in the evolution and development of human organizations. But when conflicts degenerate into violent, destructive crises, they become not only unhealthy but also counter-productive and progress-threatening. Nyong and Fiki (2005) pointed out that resource-related conflicts were responsible for over a 12 percent decline in per capita agricultural mechanization in sub-Africa.

The Fulani cattle herdsmen have identified conflicts arising from land use as the “most critical” problem they face in their occupation (Van’t *et al.,* 2005). The resultant increase in

competition for arable land has oftentimes led to serious manifestations of hostilities and social friction among the two user groups in many parts of Nigeria.
As a result of the movement of farmers in search of grazing pastures most times, they cross the path of farmers, who find fault in the destruction of their crops and machinery by the herders and their animals. The aftermath of such unavoidable contact is usually a crisis or outright bloodletting. The conflicts have not only heightened the level of insecurity, but have also demonstrated a high potential bane to mechanized agriculture in Ibarapaland and other affected parts of the country due to the loss of farmer lives, animals, crops, and valuable properties (Cotula *et al.*, 2004). The emphasis of the study is laid on Ibarapa North local government, Igangan community as a case study.

Study Area
Ibarapa North is in Oyo state, southwest of Nigeria. The state spans longitude 3^0 and 5^0E and latitude 7^0 to 9^0 N. It enjoys an equatorial climate with mean annual rainfall of about 1:350mm, annual temperature is between 24.6^0 C and 31.5^0 C. Relative humidity is from 52 % at the peak of dry season to 83% in the wet season (Adebayo, 2001). The topography is gentle low land with few ranges.

Methodology
The population of the study area, Ibarapa North local government, comprising of Igangan, Ayete, and Tapa are basically farmers. Igangan being the largest community is the case study. For even representation, Igangan was divided into 10 segmented areas of Korede, Babamogba, Adeyin, Alagbede, Abese, Oloola, Eleti, Ayo, Osin-Ago and Bapona. A total of 100 copies of questionnaires were administered. Ten questionnaires were allotted to each segmented area. Simple random sampling was employed in each area for adequate representation of the entire population. Statistical Package for Social Sciences (SPSS) was used for the analysis.
Literature was collected from the local government and oral interviews were of help from the Bales and Obas in the community.

Data presentation, analysis and discussions
Table 1: The causes farmers/herders crisis:

S/N	CAUSES	YES	NO
1	The Fulani are grabbing our lands	85	15
2	they are marrying our wives and daughters	83	17
3	their animals use to eat our crops	89	11
4	They use to rape and abuse our wives and daughters sexually.	87	13
5	Engagement in kidnapping for ransom	90	10
6	Carrying dangerous weapons for threat and killing	80	20
7	They have occupied almost all our land	86	14
8	corrupt traditional rulers collect money and cattle from them in place of land	86	14

Table I shows the responses of the farmers as regards the causes of the crisis. The table shows a valid percentage of farmers in YES and NO formats. The column YES carries the higher percentages of the responses to the questions. These are Affirmations that the grabbing of lands, marrying their wives and daughters, animals eating their crops, raping and abuse of their wives and daughters, kidnapping for ransom, carrying dangerous weapons as threats, and killing and total decimation of their entire land are the causes of the conflict.

Hectare cultivated by farmers before crisis

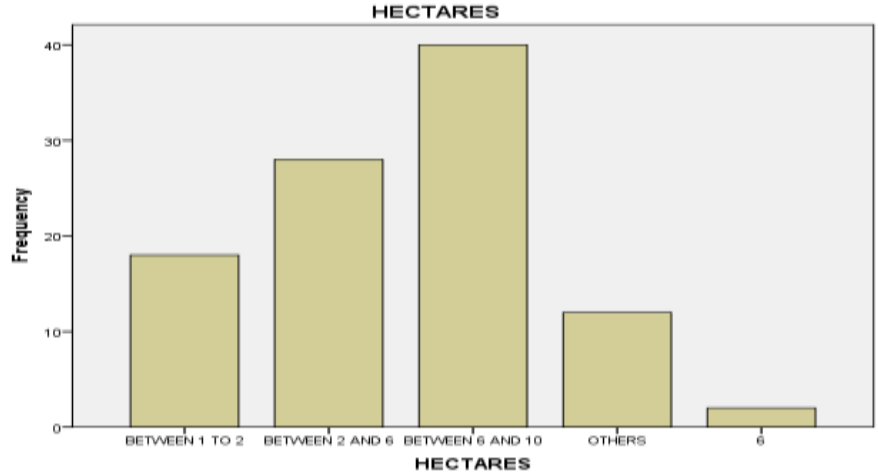

Figure I

Figure I revealed average hectares of land being cultivated by farmers before the crisis.18% of the farmers were cultivating 1-2 hectares, 28% were cultivating between 2-6 hectares and 40% were cultivating above 6 hectares.

This implies that farmers in the study area are large scale farmers and practice mechanized farming and not just subsistence farming.

Effects of crisis on the farmers

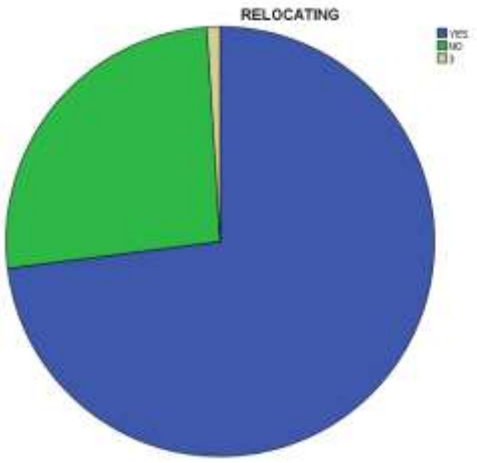

Figure II

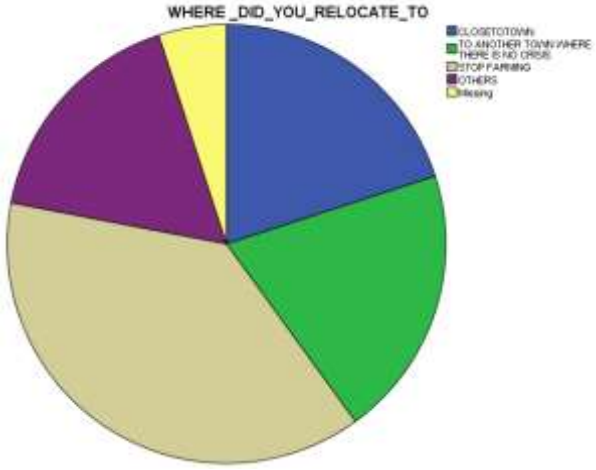

Figure III

Figure II shows that some farmers have relocated from their land for safety. 20% relocated close to the town where they could get land for farming. 20% of them relocated to neighboring towns where they could get enough land for farming while 38% of them stopped farming.

Table 2: **New occupation of those who stopped farming**

WHAT_ARE_YOU_DOING_NOW					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	TRANSPORT	6	6.0	6.1	6.1
	SUPPLY OF FARM PRODUCE	32	32.0	32.7	38.8
	NOTHING	47	47.0	48.0	86.7
	OTHERS	12	12.0	12.2	99.0

	7	1	1.0	1.0	100.0
	Total	98	98.0	100.0	
Missing	System	2	2.0		
Total		100	100.0		

Table 2 explains information in Figure III of respondents who stopped farming Among the respondents that stopped farming, 6% resulted to transport business, 47% are now into the supply of farm produce while 47% are not doing anything. All these have affected cultivation and in turn affected food supply in the affected areas.

Effects on farming

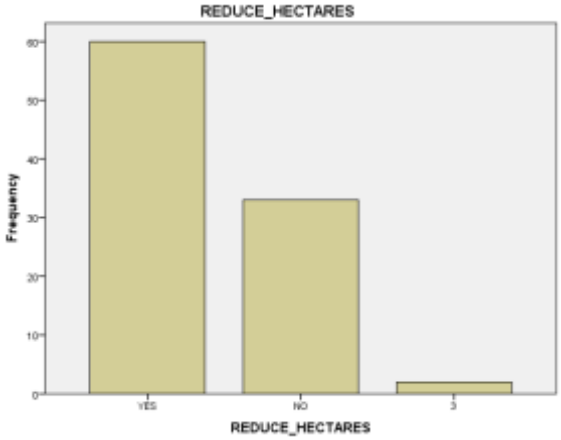

Figure IV

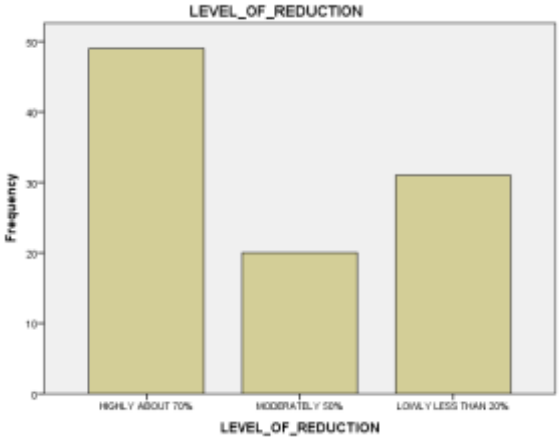

Figure V

Figure IV 60% of respondents reveal that the hectares cultivated during and after the crisis have reduced while Figure V shows the extent of the reduction. 49% attested to the reduction by 70%. This shows clearly that the reduction is high.

Conclusion and Recommendation

The clashes between rampaging herdsmen and farmers trying to defend their territorial lands have become recurrent issues. Hardly will a day pass by in Nigeria without cases of clashes between the two warring parties.

In the events of the clashes North, South West and East of the County, there have been cases of maiming, mass killing, burning of houses, assault, sexual abuse and rapes, and all sorts of inhuman treatments

All these have resulted in the mass relocation of people to neighbouring states that are relatively peaceful. Some internally displaced people are settled down in a place by the government.

These occurrences have led to serious food shortages and have led to a hike in the prices of goods and services, high rates of unemployment, unchecked poverty level, several types of social vices engaged by Nigerian youths, and a serious threat to the unity and coexistence of the country called Nigeria.

According to the research, the case of Igangan in Ibarapa north local government of Oyo state bore a resemblance to what is happening in other parts of the country. The study shows that farmers in Igangan were displaced, the killing of innocent citizens was massive, people took to other businesses, herders were sent away forcefully, cultivation was reduced and all other events that have greatly affected the economy of the area took place

In conclusion, the government should take proactive measures and decisions in solving the age-long lingering problems.

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EFFECTS OF CLIMATE VARIABILITY ON FISH FARMING IN OGUN WATER-SIDE LOCAL GOVERNMENT AREA, OGUN STATE, NIGERIA.

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Abstracts
Climate change implications for fisheries and aquaculture is one of the key comprehensive surveys till date of contemporary scientific research. Certainly, Fishery is weather dependent and this makes it an endangered sector facing common and often intense changes. In spite of the inadequacy of data, using quantitative and qualitative data sources via simple random sampling method, relevant data were collected to assess the fundamental elements that drive aquaculture in Ogun Water-side Local Government Area of Ogun State. In order to attribute adjustment in fish farming to climate variability, the major determinants of fish farming (mostly socio-economic factors) were identified. Although, evidence from the study showed that strong assessment of the determinants of fish farming cannot be ascertained without considering climatological factors. It was revealed that fish farmers acknowledged the effects of climate variability in the aquaculture activities. Hence, fish farming and climatic variables were identified by seasonal irregularity. However weather conditions, such as optimum rainfall and moderate temperature significantly encouraged fish farming. Climate variability is expected to have far reaching effects on the development of rural areas. In view of the outcome of this research work, the following are highly recommended: Nigerian Meteorological Agency (NIMET) and National Bureau of Statistics (NBS) should be encouraged to always make data on climatic variables available on line for research purposes; it is pertinent for fish farmers to take and keep adequate records of their activities especially output and farmers should be encouraged to plant trees with good canopy round their ponds.
Keywords: Climate, Effects, Fish, Farming and Variability,

Introduction

Climate change implications for fisheries and aquaculture is one of the key comprehensive surveys till date of contemporary scientific research. Certainly, Fishery is weather dependent and this makes it an endangered sector facing common and often intense changes, (IPCC, 2007). Coral bleaching, ocean acidification and altered river flows affect Marine and freshwater ecosystems greatly with serious impacts on fisher folk. Fish and fishing communities are vulnerable to sea level rise and livelihoods of fishing communities are threatened by storms and bad weather conditions. Although, the socially and economically fisheries will be negatively affected by impacts of insecurity, emigration, transport and markets (Lakshmi, 2009). Globalization and high level of exploitation has seriously affected fisheries. They suffer from different range of impacts of climate variability, which are unpredictable and sudden. The poorest will be seriously affected being the least able to adapt to or mitigate these impacts. Marine capture fisheries are not left out in the multiple challenges caused by overfishing and poor management with eruption of challenges induced by climate change.

Weather could be seriously differ even on a daily basis – one day might be snowing and the other day is sunny. Climate, on the other hand, doesn't change day-to-day because it is based on longer period of time. Nonetheless, climate varied as well. The way climate parameters

(Precipitation, humidity and temperature) deviate from an average is climate variability and it occurs due to natural and sometimes periodic changes in the movement of ocean, air, volcanic eruptions, and other factors (Defeo and Castilla, 2012).

Globally, the average temperature is not usually the same every year. One year might be hotter than the previous year, nonetheless, in the long run, the trend shows increasing temperature over a period of time as a result of change in climate. Natural fluctuations like the ENSO (El Nino Southern Oscillation) could also be responsible for climate variability (Dugan, *et al.,* 2009). Climate variability is often natural and is causing an increase in the probability of many extreme weather events, and those events contribute to climate change. Climate of Nigeria is not stable, as it is evident in some variables like rise in temperature level; unsteady rainfall; increase in sea level and flooding; desertification and drought; land degradation; more frequent extreme weather events; affected fresh water resources and loss of biodiversity (Elisha *et al.,* 2017; Ebele and Emodi, 2016; Olaniyi *et al.,* 2013). The periods and intensities of precipitation have increased, producing more runoffs and flooding in several areas in Nigeria (Enete , 2014). It was predicted that precipitation variation is on the increase. Rainfall in southern areas is anticipated to increase and increase in sea levels are expected to enhance flooding and submersion of riverine areas (Akande *et al.,* 2017; Ebele and Emodi, 2016). Droughts have also become a persistent phenomenon in Nigeria, and are expected to escalate in Northern Nigeria, as a result of reduction in rainfall and increase in temperature (Amanchukwu *et al.,* 2015; Olapido, 2010). Lake Chad and other lakes in the country are desiccating and at danger of disappearing (Dioha and Emodi, 2018; Elisha *et al.,* 2017). Temperature has risen notably since the 1980s (Enete, 2014; Federal Ministry of Environment, 2014). Climate forecasts for the next decades show a crucial rise in temperature throughout all the ecological zones (Akande *et al.,* 2017).

The total annual fish demand in Nigeria is estimated at 3.4 million metric tons. While about 40 per cent of this demand is met domestically, over ₦125 billion is spent yearly on fish importation (FAO, 2015). As a recent report by the UN Food and Agriculture Organisation (FAO) explains, increasing temperatures, seas and frequency of harsh weather issues will interact to reduce agricultural and horticultural productivity in many regions around the world (FAO, 2018). This has been causing serious challenges to numerous rural fish farmers which is calling for immediate solution to bring down poverty and hungers in Nigeria. Several rural fish farmers are facing problems via variability in climate which is leading to reduction in capital infused in fish farming and leading to food scarcity. This needs to be solved by knowing the thoughts of rural fish farmers and solving it via research. Focusing on the food demand, expansion of agriculture cannot meet these future protein needs without massive impacts on forests, wildlife, nature reserves and parks (Costa-Pierce, 2016). Advancing technologies may increase global agriculture production, but it may not be sufficient without the negative impacts stated earlier. Therefore, the study answered the following questions: what are the socioeconic characteristics of fish farmers in the study area?; what are the climate variation trends in study area?; what are the passived effects of climate variation on fish farming ? The specific objectives of the study are to describe the socioeconomic characteristics of the fish farmers; describe the climate variation trends in the study area; determine the passive effects of climate variation on fish production and to describe the adaptation strategies to climate variation.

Data Analysis

Simple random sampling technique was used to select Fifty five (55) fish farmers in the study area. The data was collected through the use of questionnaire to elicit information from farmers and secondary data on climatic variables and annual fish output were collected from

Nigeria Bureau of Statistics. The data collected was subjected to descriptive analysis such as percentage, mean, frequency distribution and graph to present the data.

Result and Discussion

Data in table 1 indicates that ages of respondents were distributed across all groups of people. This shows that age was not a limit in raising fish though mean age (39) reveals that most of the respondents were youths that were full of strength. Also, 30.91% of the respondents did not have formal education, 21.82%, 23.64% and 9.09% had primary, secondary and tertiary education respectively. It implies that one can raise fish with or without formal education. Mean years of farming experience is 15 while 60% of the respondents were making use of earthen pond and 38.18% were raising the fish using concrete pond. Average family size was 8. It indicates that most of the fish farmers were probably engaging family labour.

Table 1 Distribution of Socio-economic characteristics

Variable	Frequency	Percentage	Mean
Age			
20-29	15	27.27	
30-39	11	20.00	**39**
40-49	17	30.91	
50 – above	12	21.82	
Total	**55**	**100**	
Education			
No formal education	17	30.91	
Adult education	8	14.55	
1^{o}	12	21.82	
2^{o}	13	23.64	
3^{o}	5	9.09	
Total	**55**	**100**	
Year of Farming Experience			
1-10	16	29.09	
11-20	20	36.36	**15**
21-30	15	27.27	
31- Above	4	7.27	
Total	**55**	**100**	
System of Fishery			
Concrete pond	21	38.18	
Earth pond	33	60.00	
Plastic pond	1	1.82	
Total	55	100	
Family Size			
1-5	15	27.27	
6-10	25	45.46	**8**
11-Above	15	27.27	
Total	**55**	**100**	

Source: Research's Survey, 2022

Table 2 indicates that respondents in the study area were earning average of ₦32,727 on monthly basis though about 10.91% were earning above ₦500,000 on monthly basis. The

capacity of the farm on average was 12 acres with 15 as the number of functional mean ponds though they were of different sizes.

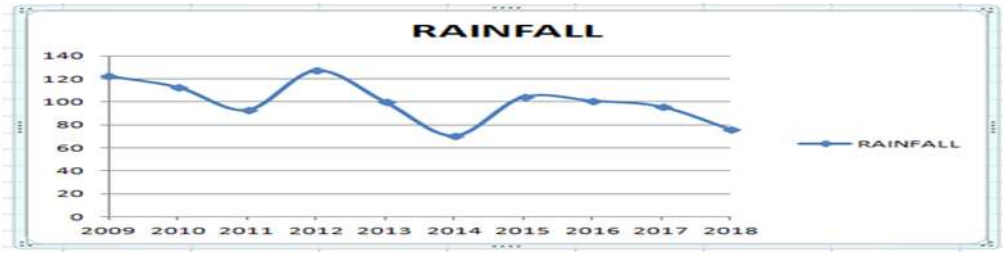
Table 2: Farming Information

Variable	Frequency	Percentage	Mean
Monthly revenue/income from the farming in naira (₦)			
10, 000 – 100,000	14	25.45	
101,000 – 200,000	20	36.4	32,727
201,000 – 300,000	6	10.91	
301,000 – 400, 000	4	7.27	
401,000 – 500,000	5	9.09	
501,000 above	6	10.91	
TOTAL	**55**	**100**	
Size/capacity of your farm (hectares)			
1-2 acres	17	30.9	
3-4 acres	7	12.73	
5-6acre	24	43.64	
Above 6	7	12.73	12
TOTAL	**55**	**100**	
How many ponds do you have			
1-10	12	21.82	
11-20	26	47.27	15
21-Above	17	30.91	
TOTAL	**55**	**100**	

Source: Research's Survey, 2022

The figure above reveals the trend of rainfall distribution between years 2009 and 2018. The pattern has been fluctuating within the years under review. The maximum amount of rainfall was recorded in year 2012 (127.53mm) while the least amount of rainfall was recorded in the year 2014 (70.76mm).

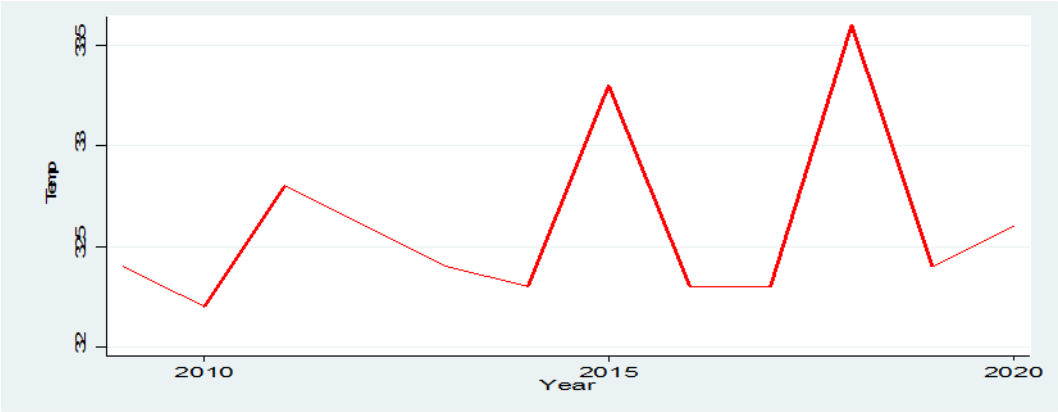
Trend of Rainfall Distribution between Years 2009 and 2018



Source: NIMET

The figure shows that the temperature was increasingly fluctuating between the years 2009 and 2020. The maximum was recorded in the year 2018 (33.60C) while the least maximum temperature was recorded in the year 2010 (32.20C).

Trend of Temperature between Years 2009 and 2018



Source: NIMET

The above table shows the perceived effects of climate variability by the respondents. The farmers agreed that there has been temperature fluctuations in the study area and this was revealed through other perceived effects like high temperature and low rainfall condition which reduce quality of grain; incessant increase in prices of feed grains. Climate variability has effects on feed grain availability and this has resultant effects on fisheries production.

Table 3: Perceived Effect of Climate Variability

Trends of climate variables	SA	A	D	SD	MEAN	SD
Temperature Fluctuation	18(32.73)	15(27.27)	12(21.82)	10(18.18)	2.74	2.45
High temperature and low rainfall conditions reduces quality of grains	16(29.09)	19(34.55)	8(14.55)	12(21.82)	2.7	2.43
Aware of climate variation	20(36.36)	13(26.64)	6(10.91)	16(29.09)	2.67	2.45
Rainfall distribution follows regular pattern	18(32.73)	10(18.18)	14(25.45)	13(26.64)	2.6	2.35
High Temperature And Low Rainfall Have Resulted To High Feed Availability	14(25.45)	15(27.27)	9(16.36)	17(30.91)	2.5	2.24
Price of feed grain are usually high hot and dry season	14(25.45)	13(26.64)	12(21.82)	16(29.09)	2.5	2.21
Price of feed grain are usually high hot and dry season	14(25.45)	13(26.64)	12(21.82)	16(29.09)	2.5	2.21
Climate change has effects on feed grain availability	11(20)	15(27.27)	16(29.09)	13(23.64)	2.4	2.16
Sunshine Intensity	11(20)	14(25.45)	12(21.82)	18(32.73)	2.33	2.09

Increased						
Global warming has effect on fisheries production	11(20)	13(26.64)	17(30.91)	15(27.27)	2.4	2.09

Source: Research's Survey, 2022

Table 4 reveals various methods of adaptation adopted by fish farmers in the study area to weather variability. The most common adaptation was the combination of flushing method and planting of cocoa trees for shade. They normally flush the ponds of old or dirty water to let in clean fresh water in order to increase the oxygen content and reduce the temperature of the water for optimum performance of the fish.

Table 4: Adaptation Method

Variable	Frequency	Percentage
Flushing method	18	32.73
Flushing method and planting of cocoa tree for shade	20	36.36
Planting of palm tree for wind break and shade	8	14.55
Planting of orange tree for shade	5	9.09
Planting of trees for wind break	4	7.27
TOTAL	**55**	**100**

Source: Research's Survey, 2022

Conclusion and recommendations

Despite the limited availability of data, using quantitative as well as qualitative data sources, the study had been able to collect the relevant data to assess the underlying factors that drive fish catch volume. For a robust attribution of changes in fish catch rates to climate variability, the general determinants or drivers of fish catch (non-climatic factors mostly socio-economic factors) were identified. Evidence from the study showed that rigorous assessment of the determinants of fish catch volumes cannot be made without considering climatological factors. The results showed that fishers acknowledged the impacts of climate variability in their scheme of things.

This study found that fish farming was closely associated with variability in climatic variables (factors). Hence both climatic variables and fish catch levels were characterized by seasonal variability. Optimum climatological condition, such as high rainfall (wet periods) significantly boosted fish catch. It is clear that climate variability is expected to have far reaching implications for rural development.

In view of the outcome of this research work, the following are highly recommended: NIMET and NBS should be encouraged to always make their data on climatic variables available online for research purposes; it is pertinent for fish farmers to take and keep adequate records of their activities especially output while farmers should be encouraged to plant trees with good canopy round their ponds.

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EFFECTS OF PRODUCTIVE ASSET ON POVERTY STATUS OF RURAL HOUSEHOLDS IN IBARAPA CENTRAL LOCAL GOVERNMENT AREA OF OYO STATE

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Abstract
Poverty in Nigeria is predominantly a rural phenomenon which constrains dwellers' income, output, and productivity to be low. However, there have been different approaches to reducing rural poverty in Nigeria, but only few have considered asset ownership. Accumulation of assets is an important means by which people can move out of poverty and improve their livelihood. In this study, the effect of asset ownership on poverty reduction was examined among rural households in Ibarapa Central Local Government Area of Oyo State. Multistage random sampling techniques were used to select 120 rural households using structured questionnaires. Data collected were analyzed with the descriptive statistics, 2/3 mean per capital household expenditure (MPCHE) and Probit regression analysis. The results of the descriptive statistics revealed that majority of the respondents were male, married and educated. The mean age and household size was 42 years and 6 members respectively while many do not belong to any cooperative association. The result shows that less than half of the total rural households considered owned or had access to productive household assets as the mean asset was 49.95%. Furthermore, a poverty line of ₦9, 449.27 monthly was estimated and about 62% of the rural household heads were classified as poor households while only 38% were non poor. The study also showed that productive asset ownership, age of household head, education and marital status were the major poverty-reducing variables in the study area while large household size aggravates poverty. The study therefore recommends that the state finance office and other non-governmental organizations (NGOs) should encourage the ownership and expansion of productive assets (by making them available and affordable). Owning assets will not only increase their productivity, but also create opportunities for rural households to alleviate their poverty level.

Key words: Productive asset, Poverty level, rural households

Introduction
The poverty situation in Nigeria is quite alarming as both the quantitative and qualitative measurements attest to the growing incidence, depth and severity of poverty in the country (Dim *et al.*, 2014). It is indeed pervasive and poses a serious threat to the economic development of the country (World Bank, 2010; Lawal, 2011). It is complex, multidimensional, and multifaceted with manifestations in the economic, social, political and every realm of human existence (Iheonu and Urama, 2019). According to a poverty index report published by the National Bureau of Statistics (NBS) in October 2010, 112 million people lived in poverty and this increased to 124.2 million in 2016 (Igbalajobi, *et al.*, 2013; World Bank, 2016). World Bank (2018) report showed that Nigeria emerged as the headquarters of global poverty as more than 195 million people lived in poverty with an estimated 86.9 million people in extreme poverty. Consequently, the report by the World Poverty Clock published in 2019, shows that, the number of extremely poor Nigerians has further risen to 91.6 million. This implies that an additional four million Nigerians have fallen

under the poverty line within a year. The clock also shows that instead of being on track towards attaining the United Nation's first Sustainable Development Goal (zero poverty), poverty is rising in Nigeria (Awotide *et al.,* 2015).

The rising level of poverty in Nigeria is a major threat to rural household production and other livelihood activities as many rural dwellers live in poverty (Awotide *et al.,* 2015). World Bank (2019) reported that poverty in Nigeria is predominantly a rural phenomenon that constrains people's income, output, and productivity to be low. Studies revealed that most people in the rural area engage in agriculture as their major livelihood activities which are mainly characterized by inadequate capital and low productivity because of the scourge of poverty in the area (Awotide *et al.,* 2015). The economic situation of the rural population in Nigeria is characterized by a high degree of vulnerability and poverty (National Bureau of Statistics (NBS), 2012).

However, there have been different approaches to reducing rural poverty in Nigeria, but their focus has been on certain aspects or manifestations of poverty, such as low income, unemployment, economic growth and poor nutrition. Only few have considered asset ownership (Innocent *et al.,* 2014). While Innocent *et al. (*2014) attribute failure of many poverty-alleviation programmes to absence of good governance and inappropriate approaches,. Owning assets empowers the rural dwellers socially, economically and politically (Dim *et al.,* 2014). The empowerment of the poor is very important in poverty alleviation.

Assets are stock of financial, human, natural or social resources that can be acquired, developed, improved and transferred across generations (Ford Foundation, 2004). Asset ownership encourages individuals to save more for future, which ultimately leads to the achievement and accumulation of personal wealth and makes individuals economically independent. Sherraden (2008) avers that assets give people the opportunity to realize their maximum potentials and to escape poverty. In addition, assets constitute one of the main means of generating income, expenditure and consumption; they are an indicator of poverty/ well-being and may serve as collateral for loan, generate status and social advantage (Shambe, 2012). Assets such as land and other physical assets are especially important for the rural dwellers, who frequently rely on a combination of agricultural production and self-employment to obtain their livelihoods (Deere and Unidos, 2010). Deere and Doss (2006) note that assets can be easily converted to cash, generate rent, provide a source of financial income and serve as collateral to secure credit.

A variety of classifications of assets exist in the literature but Barrett and Reardon (2000) divided assets into two categories namely: productive and non-productive assets. Productive assets are those that are used as inputs into production process or as business tools. They include the real property, land, livestock, water and forest, and household productive assets endowments such as sewing machines, computers, fridges, cooking utensils, car, truck, mobile phones etc., which generate income via the activities. These are important to pursue different livelihood strategies (Lawal *et al.,* 2011). Non- productive assets yield income through generating either transfers or capital gains when assets are liquidated (such as membership of groups, financial resources such as savings, supplies of credit or regular remittances or pensions and infrastructures.). Both categories of asset offer a store of wealth and a source of income. Deere and Doss 2010 reported that ownership of assets (such as a sewing machine, stove or refrigerator) may constitute business assets and make possible a series of income-generating activities Owning assets has a more sustainable impact on the well-being and determines the economic activities of a household (Awotide *et al.,* 2011).

The study of the contributions of household asset endowments to poverty status of households has received insufficient attention despite the fact that they are invaluable to poverty outcomes. Thus, reducing poverty requires not only economic growth, but also

investment in asset ownership so as to improve the productive capacity of the households (World Bank, 2014). This study is important owing to the fact that poverty reduction is the prerequisite for any realistic productive activities, children's well-being and household well-being, in general. This study focused on the effects of productive asset on the poverty level in the study area. The findings of this study will aid policy makers and the NGOs in effective formulation of poverty reduction strategies that will focus on increasing the asset ownership of rural households in ways that will translate to the improvement on their standard of living and productivity.

Methodology

The study was conducted in Ibarapa Central Local Government Area of Oyo State of Nigeria. Oyo State which is one of the 36 States in Nigeria and it lies in the Southern part of the country. The LGA came into existence in 1996. According to 2006 census, it has a population of 102,979. The study area shares boundary with Ogun State in the South, bounded in the East by Ibarapa East LGA, to the West by the Benin Republic and to the North by Ibarapa North Local Government. The Local government is heterogeneous and dominated by the Yoruba, others include Ghanaians, Hausa, Fulani and Agatu residing in the area. The location enjoys the wet and dry seasons and the rainfall in the area follows a tropical type with an average annual rainfall ranging from 1850mm to 2250mm and the average annual temperature between 27C and 27 C. Farming, craft works and trading to mention a few assume a major share of occupation of the people. However, agriculture is the dominant sector of the economy. Food crops grown in the area include yam, maize, cassava, cowpea, plantain, sorghum, cassava and vegetables etc.

Multi-stage random sampling technique was used to select 120 rural households from the two main towns in Ibarapa central local government with a well-structured questionnaire. Stage one involves random selection of 4 wards in Igboora and 2 in Idere. Stage two involves random selection of 6 villages in Igboora and 4 in Idere. Stage three involves random selection of 12 rural households in each village giving a total number of 6 wards, 10 villages and 120 rural households. Note that the selection of rural households in the ward and villages was based on proportionate to total population in the area.

Analytical procedures: To achieve the objectives of the study**,** descriptive statistics, 2/3 mean per capital expenditure and probit model regression was used to analyzed the data collected.

Determination of Poverty Level and Construction of Poverty Line

Poverty line is the minimum or the cut-off mark of expenditure on food and non-food items. This Study adopted two-third mean per-capita expenditure as the benchmark (poverty line). Households whose mean consumption expenditure falls below the poverty line were regarded as being poor while those with their expenditure above the benchmark were non-poor (Anyanwu, 2010). In line with the previous poverty studies (such as Adepoju *et al.,* 2012, Krishnan *et al* 2012) per capita household consumption expenditure was used as a proxy for per capita household income

Construction of Poverty Line

PCE = TCE/HHS ----------(lll), MPCHE = THHE/TNR --------(iv) PL = 2/3 * MPCHE ----------v)

PCE = Per Capita Expenditure, TCE = Total Consumption Expenditure, HHS = Household Size

MPCHE = Mean Per Capita Household Expenditure, TNR = Total Number of Respondent

THHE = Total Households Expenditure, PL = Poverty Line

Probit Regression Model:

This model was used to examine the effect of productive asset on the poverty status of rural dwellers in the study area. Poverty status was the dependent dummy variable (1 = non-poor, 0 = poor) for the regression analysis. The probit model is a model used in estimating the probability of events based on dependent dichotomous variable (Gujarati and Porter 2009). The probit model assumes that while we only observe the value of 0 and 1 for the variable Y, there is a latent, unobserved continuous variable Y* that determines the value of Y. The other advantages of the probit model include believable error term distribution as well as realistic probabilities. We assume that Y* can be specified as follows;

$Y^* = X^1\beta + \sum$ (1)Where $\sum$--N (0, 1) then Y can be viewed as indicator,

Y=Vector of dependent variable [1 for non-poor households; 0 for poor households]

X= Vector of explanatory variables, B= Probit co-efficient $\sum$= Random error

The explanatory variables include in the model are;

X_1= Age of the household head (Years), X_2= Marital status (Dummy), X_3= Level of education (Years), X_4= Household size (Number), X_5= Occupation, X_6= productive asset index, X_7= Cooperative, X_8= Years of experience (Years), X_9= Income (N)

Results and discussions

Table 1showed that the mean age of the respondents was 42years which implies that the majority of the households were young and still in their active age group. The result is similar to Kadiri *et al. (*2014) findings that farmers in Niger Delta Region of Nigeria belongs to the middle age class who are physically fit to withstand the stress and risks involved in the production. The majority of the households were male, married and educated where the greater percentage had tertiary education (45.83%). This result is consistent with the findings of Glauben (2006) and Adekoya (2014) that the higher educational level of household heads seems to prevent rural households from chronic poverty because education is vital for boosting the productivity of the human factor and making people more aware of opportunities for earning a living. The mean household size was 6 people per households and the majority of the household engaged in trading (47.50%) followed by farming activities (39.9%). This study suggests that the household experience in trading and farming activities will help them to accumulate more assets as it will be useful in their daily livelihood activities. Many of the rural households (50.42%) do not belong to any cooperative societies.

Table 1: **Distribution of respondents according to Socio-economic Characteristics**

Variable	Frequency	Percentage	Mean
Age Group			
≤20	16	13.33	
21-40	46	38.33	
41-60	50	41.67	
>60	8	6.67	42
Marital Status			
Married	90	75.00	
Single	4	3.33	
Divorce	23	19.17	
Widow	3	2.50	
Level of Education			
No Formal Education	10	8.33	
Primary Education	27	22.50	

Secondary Education	28	23.33	
Tertiary Education	55	45.83	
Household Size			
1-3	36	30.00	
4-6	66	55.00	6
7 Above	18	15.00	
Major Occupation			
Farming	42	35.00	
Artisan	15	12.50	
Trading	57	47.50	
Civil servant	6	5.00	
Co-operative/association			
Yes	44	36.67	
No	76	63.33	
Sex			
Male	74	60.17	
Female	46	38.33	
Total	120	100.00	

Source: Field Survey 2018

Available Productive Asset in the study area

The assets considered in the study were household productive assets that were being used to generate livelihood activities for the households (table 2). Some of the assets were used directly for daily businesses while other serves as inputs in the production process. The result shows that less than half of the household owned or has access to these household assets as the mean asset index was 49.95%. This has a negative implication on their livelihood activities as well as their poverty level. Therefore, access to and control of productive assets is crucial to relieving the rural dwellers of their economic dependency and enhances their engagements in productive activities (UNDP, 1996). Greater access to productive assets can increase people's productivity in their various activities and translate to higher returns in the form of income and other measures of well-being (Shambe, 2012).

Ownership and access to car and motorbike generate incomes to the user and facilitate business transactions among the rural dwellers. Table 2 reveals that only a half of the households owned car and motorbike (51.67%) and more than half did not have access to them. Many did not own any of these means of transportation either because of poor road conditions or high cost of purchase. Easy transportation enhances fast and timely delivery of the rural products, especially the perishable products and thereby improves profitability and income that will lead to poverty reduction. According to Adeoye *et al. (*2014), constructing or rehabilitating the rural road is the major key to rural development.

Rural dwellers receive useful information, such as the latest production technologies, improved seed varieties, pest and disease management and business management techniques that can generate increase in output and income. Access to such information is enhanced through some valuable household assets, such as the radio sets, the television sets, the mobile phones etc. Lack of these valuable information gadgets can further plug the rural dwellers into poverty. Table 2 shows that 54% of the households did not have television and radio set while only 64.17% had access to it, also 61.17% did not have mobile phones. Only 64.17% had access to it. Mobile telephone creates sustainable improvement in the quality of Nigerians living in the rural areas and ensuring socio-economic transformation in the development process. Lack of this vital information equipment implies that important information that can improve their general well-being, for instance, information about health

and security, children and household well-being, food and nutrition, credit accessibilities and improved methods of production will not be received in time. Awotide *et al. (*2011) asserts that lack of these valuable information gadgets has a negative implication for the general economic growth and development of the nation particularly on poverty reduction.

The ownership and access to assets like farm machinery and equipment, house, land, fridge cooking utensils etc., facilitate business stability and enhance better profit. Assets such as land and other physical assets are especially important for rural people, who frequently rely on a combination of agricultural production and self-employment to obtain their livelihoods (Deere and Unidos, 2010). Deere and Doss (2006) note that assets can be easily converted to cash, generate rent, provide a source of financial income and serve as collateral to secure credit.

In summary, households with assets in various forms could have an edge over others in the provision of basic needs and make investments in future generations through health care, education, and training, while those lacking assets are more vulnerable to poverty and less able to recover from periodic disasters.

Table 2: **Distribution of respondents according to available productive asset**

Items	**Assets Owned**		**Assets Accessed**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Car/motorbike	62	51.67	58	48.33
Farm machinery	45	37.50	75	62.50
House	61	50.83	59	49.17
Land	60	50.00	59	49.17
Fridge	69	57.50	50	41.67
Cooking utensils	85	70.83	34	28.33
Business	73	60.83	46	38.33
Radio/television	55	45.83	65	54.16
Equipment	50	41.67	70	58.33
Mobile phone	43	35.83	77	64.17
Mean Asset	49.95		45.25	

Source: Field Survey, 2018

Determination of the poverty level of the rural households

A poverty line of ₦9,449.22 monthly, ₦2,362.32 weekly and ₦337.47 per day were estimated. Rural households whose mean per capital expenditure on food and non food items below this poverty line were classified as poor while those above it were classified as non-poor rural households. Table 3 shows that only 38% of the rural households were non poor and 62% were poor. The result is similar to the findings of Adekoya (2014) who explained that poverty in Nigeria is largely a rural phenomenon. The result indicates a high level of poverty among rural household heads in the study area.

Table 3: Respondents Distribution by Poverty level

Poverty Status	**Frequency**	**Percentage**
Poor	74.00	62.00
Non Poor	46.00	38.00
Total	120	100.00

Source: Field Survey, 2019

Effect of Productive Assets on Poverty Status

The probit model was used to examine the effect of productive asset and certain socioeconomic characteristics on the poverty level of the rural households. The likelihood ratio chi square of 41.59 test for the goodness of fit shows a good fit for the model, with a pro > chi^2 is 0.000, which reveal that the model was a whole statistically significant. Pseudo R^2 was 0.4745 that is 47.45% of the poverty status of the household was explained by the selected explanatory variables. Table 4 revealed that 5 out of 9 explanatory variables were statistically significant in the probit model at various capability levels. These are productive assets, household size, age of household heads, education and marital status. A positive sign on a parameter indicates that the higher the value on the variable the higher the possibility of being poor. Similarly, a negative value of the coefficient implies that the higher the value of the variable the lower probability of farming household poverty.

Productive asset was negatively related to poverty and statistically significant ($p<0.001$). This implies that a unit increase in the asset variable owned by the faming household lowers the poverty level by 1.5%. This result buttresses the work of Glory and Nsikak-Abasi (2014) that asset has a negative correlation with poverty and that households with large assets serve as a collateral that could be pledged to obtain credit for production and consumption smoothening, thereby reducing poverty.

Studies reveal that the household size is a significant determinant of poverty among the farming households. There are two opposing interpretations for the relationship between household size and poverty status. The larger the household size the greater will be the total consumption needs and thus, the higher the poverty status of the household. However, on the other hand, the larger the household size (by adult equivalent) the higher the total labour supply of the farming household, thereby enhancing its income-generating potentials and thereby the effect of a larger household size on poverty status may be neutralized. This study showed that household size is positively related to poverty status and is significant at 10 percent. This implies that the household heads with large household size tend to be poorer (that is, the higher the household size the higher the tendency to become poor). This result is consistent with the findings of (Olawuyi and Adetunji, 2013) who observed that the size of the household is positively related to the poverty status of the household. Awotide *et al. (*2011) noted that the larger the household, the higher the dependency ratio and the tendency to perpetuate poverty in the long run. For instance, an additional person to the household size will increase the probability of being poor.

The coefficient of the explanation variables age was significant at 5% and negatively related to poverty. The age of the household head was negatively related to poverty, indicates that as the farming household heads grow older, the probability of being poor reduce. This implies that older farmers have greater likelihood of being non-poor. More specifically, an increase in age of household head by one year would decrease the probability of being poor by 0.5%. This may be due to accumulation of asset variable and other resources when they were still young. This result is contrary to the study of Omotayo and Oyekale (2013) that poverty increased with an increase in age.

Marital status was significant at 1% and negatively related to poverty. This implies that those who were married tend to have a reduced poverty status. This may be due to the fact that they were able to jointly gather more productive asset as couple or as a result of an addition asset gotten from the women marriage right. This asset could cushion their poverty level when they turn them to productive use.

The educational attainment of rural the households was negatively related to poverty level in the study area. This shows that an additional year/level of education gained by the household head decreases the probability of the household being poor by 0.8%. This is similar to the findings of Akerele and Adewuyi (2011), Bogale, (2013) and Adekoya, (2014). Education

has been described as an effective tool in reducing or cushioning the effect of poverty faced by the rural dwellers. Adekoya (2014) observes that education is vital for boosting the productivity of the human factor and making people more aware of opportunities for earning a living. Awotide *et al. (*2011) aver that there is a link between educational attainment, the income earning potential of the household and poverty. Higher educational level of household members seems to prevent the rural households from chronic poverty (Glauben, 2006).

Table 4: Distribution of respondent according to effects of asset on poverty

Variables	Coefficient	Standard error	Z	p>/Z/
Productive Asset	-1.4460	0.5129	-2.82	0.000***
Sex	0.1164	0.5552	0.21	0.834
Age	-0.5206	0.2241	-2.32	0.020*
Marital status	-0.6533	0.2881	-2.27	0.085*
Household Size	2.1142	0.8226	2.57	0.085*
Coop. Society	-0.2996	0.5360	-0.56	0.576
Occupation	- 0.5728	0.5437	-1.05	0.292
Experience	- 0.0063	0.2804	-0.02	0.821
Educational level	-0.7910	0.2507	- 3.15	0.000***
Constant	3.1232	-.214913	2.570	0.10

No of observation= 120 Pseudo R2= 0.5398 Log likelihood= 36.93 Prob> chi ^{2} = 0.0000, LR chi ^{2} (10) = 41.59.

Source: Field Survey, 2018

Conclusion

The study examined the effect of productive asset on the poverty level of the rural households in Ibarapa Central Local Government Area. Many of the respondents were male, married with post primary school education. The mean age and household size were 42 years and 6 members respectively and many do not belong to any of the cooperative society. Many do not own or have access to these productive assets with the mean productive asset index of 49.95%. 62% of the rural households were classified as poor households with poverty line of ₦9,449.27 per month. The majority of the rural households were poor, lacking productive assets. The study showed that productive asset ownership, age, education and marital status were the major poverty-reducing variables in the study area while large household size aggravates poverty.

Recommendation

The majority of the rural households were poor, lacking productive assets, indicating the need to improve their welfare.. Therefore, the state finance office and other non-governmental organizations (NGOs) should encourage the ownership and expansion of these assets (by making them available and affordable). Ownership of assets encourages individuals to save more for the future, which ultimately leads to the achievement and accumulation of personal wealth and makes individuals economically independent.

The community leaders, the state health centers and other non-governmental organizations should be effectively involved in the formulation of strategies for imparting knowledge on family planning to the farming households. This is necessary to reduce the unappreciated rate of poverty since the large household size contributed to the high poverty rate.

Community leaders and government can also work together to rehabilitate or construct major roads linking from rural areas to urban centers or market places. It eases their transportation and increases their production, thereby reducing poverty.

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EXTENSION AGENTS' ABILITY TO TRANSFER KNOWLEDGE ON SELECTED SUSTAINABLE AGRICULTURAL PRODUCTION PRACTICES IN OGUN STATE, NIGERIA

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Abstract
This study examined the extension agents' ability to transfer knowledge on sustainable agricultural production practices in Ogun State, Nigeria. Purposive sampling technique was used to select the extension agents in the study area. Primary data for this study were collected with the aid of structured questionnaire. These include the socio-economic characteristics of extension agents; Descriptive Statistical tools namely; frequency counts, percentages and mean were used to describe the data, while Borich model was used to analyse the ability. Pearson's Product Moment correlation was used to test relationship between selected socio-economic characteristics of respondents and their ability to transfer knowledge on sustainable agricultural production practices. The mean age of respondents was 48.7years. All (100%) respondents were married and majority (94.4%) were male. Borich model result revealed that ogisiviculture was ranked highest with MWDS of 0.34 and was closely followed by silivepastoral with MWDS of 0.33. The findings indicated that the discrepancy of respondents' ability to transfer current knowledge on the selected sustainable agricultural production practices is above average score. The Pearson's Product Moment correlation results further showed significant relationship between working experience (p=0.291) and ability of the respondents to transfer knowledge on sustainable agricultural production practices. In conclusion, the respondents lacked the requirements to transfer knowledge on sustainable agricultural production practices effectively in the study area. It is recommended that the extension agents should be exposed to formal training on major aspects of sustainable agricultural practices to enhance their competence and improve agricultural production in Nigeria.
Keywords: Extension Agent, Knowledge and Sustainable Agriculture.

Introduction

The success and sustainability of any programme depends largely on the quality, character and skill of those who plan and implement such programme. For agriculture sector to successfully contribute its quota to the development of the country, local institutions staffed by trained manpower are essential. Rapid agricultural development requires large number of extension agents and local officials who understand local problems and how to solve them. If these professionals are to serve effectively, they require a wide range of knowledge, skills and attitudes many of which can be a formal educational system (Adesiji, 2006).

Ali Baygi, Zaralshani and Chizari (2000) identified areas of training for extension workers as technical knowledge in agriculture, agricultural extension philosophy, organization and administration, communications in extension, program planning, the use of research methods, evaluation in extension, human development, the cooperative, extension service, technology, crop production and irrigation, subject matter in agriculture, farmers training, understanding social systems, educational process, time and resource management, motivation of clientele and teaching methods. Although agriculture remains a key component of Nigeria's economy, and currently contributes about 40.0% of the GDP and employing between 60 to 70% of the active population, the sector has however, significantly underperformed its potential" (FGN, 2008).

Dealing with complexity, uncertainty, and conflicting norms, values, and interests associated with sustainability requires a fundamental transformation in the competencies required by agricultural extension agents (Wals and Bawden, 2000).

In view of the above mentioned statements, this study provided answers to the following research questions:

1) What are the socio-economic characteristics of extension agents in Ogun State?
2) How effective is the respondents' ability to transfer current knowledge on sustainable agricultural production practices to the farmers?
3) What are the constraints hindering the effective delivery of sustainable agricultural production practices by the extension agents?

The aim of this study is to examine the extension agents' ability to transfer knowledge on selected sustainable agricultural production practices in Ogun State, while the specific objectives were to;

1) describe the socio-economic characteristics of extension agents in and Ogun state.
2) examine the respondents' ability to transfer current knowledge effectively on sustainable agricultural production practices study area.
3) identify the constraints hindering the effective delivery of sustainable agricultural production practices by the extension agents in the study area.

Hypothesis: There is no significant relationship between selected socio-economic characteristics of extension agents and their ability to transfer current knowledge effectively on sustainable agricultural production practices.

Methodology

The study was conducted in Ogun State, Nigeria. Ogun State is a State in South-Western Nigeria, created in 1976, it borders Lagos State to the south, Oyo State and Osun State to the north, Ondo State to the east and Republic of Benin to the West. Abeokuta is the capital and largest city in the State. It was created in February 1976 from the former Western State. The 2006 census recorded a total population of 3,751,140 residents. Ogun State Agricultural Development Programme (OGADEP) is the only agricultural extension agency of the state government, charged with the responsibility of improving farmers' technical knowledge and skills, promoting the adoption of improved agricultural production practices along the entire value chain, provision of rural infrastructures that support agriculture, thereby facilitating increased agricultural production and industrialization in line with the agenda of the Government.

The population of the study were all the extension agents (EAs) in Ogun State Agricultural Development Programme.

It was found out that, there were seventy one extension agents in the study area. However, for the purpose of this study all the extension agents in the study area were selected purposively, this implies that this study has seventy one respondents.

Primary data for this study were collected using structured questionnaires. The questionnaires contained both open and closed ended questions.

Two types of variables were measured in this study and they are the independent variables and the dependent variables. The independent variables include the selected socio-economic characteristics of the respondents such as sex, marital status, religion, academics qualification, and constraints while the dependent variable is ability of EAs to transfer knowledge on selected sustainable agricultural practices.

Descriptive statistics such as frequency counts, percentages and mean were used to describe the data for objectives one, and three, while Borich model was used to analyse objectives two.

Result and Discussion

Table 1 revealed that the mean age of the respondents was 48.7years: This implies that most of the extension agents in the study area were still in their active and productive years: This attests to a study by Oladosu and Okunade (2006) which states that extension workers were active and energetic. Also, it reveals that 100percent of the respondents in the study area were married.

The table further shows that most (94.4%) of the respondents were male, religion reveals that majority (73.2%) of them were christians, with respect to education attainment, the mean years that the respondents spent in school was 17.2years, this implies that all the respondents were educated up to tertiary level: This is in line with Oladosu and Okunade (2006): that extension workers in agricultural development programme were knowledgeable, polite, cheerful and well skilled in the dissemination of messages.

The mean years of working experience is 19.9years. This implies that the extension personnel in OGADEP were well experienced in terms of numbers of years in service.

Table 1: Distribution of extension agents according to their socio-economic characteristics

Variables	Frequency	Percentage	Mean
Age			
30 – 39	5	7.0	
40 – 49	29	40.9	**48.7**
50 -59	37	52.1	
Marital Status			
Married	71	100.0	
Sex			
Male	67	94.4	
Female	4	5.6	
Religion			
Islam	19	26.8	
Christianity	52	73.2	
Years of Schooling			
11 – 15	23	32.4	
16 – 20	40	56.3	**17.2**
21 – 25	8	11.3	
Working Experience			
6 – 15	18	25.4	
16 – 25	35	49.2	**19.9**
26 – 35	18	25.4	

Source: Field survey, 2022

Table 2 showed the mean weighted discrepancy score (MWDS) of the extension agents' ability to transfer knowledge on sustainable agricultural production practices in the study area. In the rank order, ogisiviculture was ranked highest with MWDS of 0.34 and was closely followed by silivepastoral with MWDS of 0.33. The findings indicated that the discrepancy of respondents' ability to transfer current knowledge on the selected sustainable agricultural production practices is above average score of the assigned measurement of 0.05.

The findings imply that there is need for training on skills of respondents to be able to transfer various sustainable agricultural production practices adequately. The findings was supported by Amirhossein and Kiumars (2008) who asserted that in-service training activities are one way through which EAs can provide the knowledge and skills needed to meet successfully the demands of a changing environment and sustainable future.

Table 2: Ability to transfer knowledge on sustainable agricultural production practices to farmers

Practices		MWDS	Rank
1.	Ogisiviculture	0.34	1st
2.	Silivepastoral	0.33	2nd
3.	Horse gram	0.29	3rd
4.	Graded bundling	0.28	4th
5.	Sun hemp	0.19	5th
6.	Strip cropping	0.13	6th
7.	Alley cropping	0.10	7th
8.	Deep ploughing	0.07	8th
9.	Mulching	0.06	9th
10.	Micro irrigation	0.06	9th
11.	Crop diversity	0.06	9th
12.	Rotational grazing	0.05	10th
13.	Tree farming	0.03	11th
14.	Vegetable barriers	0.01	12th
15.	Nutrient management	0.00	13th
16.	Horticulture	0.00	13th
17.	Integrated pest management	-0.01	14th
18.	Reduce tillage	-0.04	15th
19.	Marketing	-0.04	15th
20.	Cover cropping	-0.07	16th

Source: Field survey, 2022 *Mean weighted discrepancy score (MWDS)

Table 3 showed the severity of various constraints hindering effective delivery of sustainable agricultural production practices of extension agents in the study area. In the rank order, limited budget as a severe constraint was ranked highest with WMS of 2.89 and closely followed by limited number of extension agents compare to the number of farmers with WMS (2.78). The results attest to a study conducted by Cho *et al*; (2004) where they established that the numbers of field staff working in the agricultural extension management are not enough when compared to large number of farmers. Also, Kizilaslan *et al;* had affirmed that agricultural extension sector is characterized by poorly motivated staff, a preponderance of non- extension duties, inadequate finances, the absence of legislative policy for the coordination of work between the management of agricultural extension and other organizations, the dense bureaucratic procedures in the relations between the extension and other organizations, insufficient communication with other organizations and top-down model creates a rigid hierarchy.

Table 3: Constraint hindering effective delivery of sustainable agricultural producton practices

S/N	Constraints	Severe (%) Rank	Mild (%)	Not Constraint (%)	WMS	Rank
1	Limited budget allocated to agricultural extension services	63(88.7)	8(11.3)	0(0.0)	2.89	1st
2	Limited number of extension agents compare to the number of farmers	58(81.7)	10(14.1)	3(4.2)	2.78	2nd
3	Bureaucracy	49(69.0)	21(29.6)	1(1.4)	2.68	3rd

4	Low salaries	47(66.2)	19(26.8)	5(7.0)	2.59	4th
5	Poor infrastructure	43(60.6)	26(49.3)	2(2.8)	2.58	5th
6	Lack of staff motivation	45(63.4)	20(28.2)	6(8.5)	2.55	6th
7	High cost of purchasing and maintaining equipment and software	40(56.3)	29(40.9)	2(2.8)	2.54	7th
8	Poor communication with other organization	36(50.7)	21(29.6)	4(19.7)	2.17	8th
9	Top to bottom approach	13(18.3)	53(74.7)	5(7.0)	2.11	9th
10	Weak linkages between Researchers and extension agents	20(28.2)	34(47.9)	7(23.9)	1.90	10th

Source: Field survey, 2022

Hypothesis: Relationship between socio-economic characteristics of the extension agents and their ability to transfer knowledge on selected sustainable agricultural production practices

Table 4 showed the result of the Product Pierson's Moment Correlation (PPMC) analysis between selected socio-economic characteristics of the extension agent sand their ability to transfer knowledge on selected sustainable agricultural production practices. The table revealed that there is a significant relationship between some socio-economic characteristics such as working experience (p=0.291) of the extension agents and their ability to transfer knowledge on selected sustainable agricultural production practices. This implies that the null hypothesis is hereby rejected for the working experience of the respondents.

Table 4: PPMC analysis between some socio-economic characteristics of the extension agents and their educational needs for sustainable agricultural practices

Variable	p-value	sig. Level	Remark
Age	0.136	0.101	Not significant
Years of schooling	0.058	0.487	Not significant
Working experience	0.291	0.000	Significant

Source: Field survey, 2022

Conclusion and recommendation

It was concluded that extension agents in the study area were still very active. Also, the discrepancy of respondents' ability to transfer current knowledge on the selected sustainable agricultural production practices is above average score, which implies that the respondent's ability to transfer knowledge on sustainable agricultural production practices is not effective.

Recommendation

Sequels to the findings of this study, the following recommendations were suggested;

1. There should be periodic training of extension agents in the study area on sustainable agricultural production practices.
2. Ogun State Agricultural Development Programme should be well funded for the extension agents to be more effective.
3. Necessary facilities should be provided for extension agents to be more effective in the study area.

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OYSCATECH GLOBAL CONSULT

UTILIZATION OF MOBILE PHONES FOR AGRICULTURAL INFORMATION BY WATERMELON FARMERS IN IBARAPA NORTH LOCAL GOVERNMENT AREA OF OYO STATE

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Abstract
The study focused on the utilization of mobile phones for agricultural information by watermelon farmers in Ibarapa North Local Government area of Oyo state. Specifically, the study described the socio economic characteristics of the respondents, accessibility to mobile phones, agricultural uses of mobile phones, level of utilization of mobile phones in accessing agricultural information and challenges that respondent faced in accessing agricultural information through mobile phones. Multistage sampling procedure was employed in selecting 135 watermelon farmers. Data were collected with the aid of structured interview schedule. Descriptive statistics was used to analyze the stated objectives while Pearson Product Moment Correlation was used to test for the relationship between selected socio-economic characteristics and level of utilization of mobile phones for Agricultural information. The results showed that the mean age of the respondents was 38 years, 66.7% were married with the mean household of 6 persons with average farm size of 4 hectares. While annual mean income was ₦340,000.0k. The results further revealed that (98.5%) of the respondents had access to mobile phones for agricultural information. Also, (93.3%) of the respondents used mobile phones to get information on market price of Agricultural product, (80.0%) used mobile phones to get information on credit facilities and (83.0%) used mobile phones to get information about pest and diseases control.
However, (96.3%) of respondents often made use of mobile phones for calling (Voice call) in accessing agricultural information, (84.4%) of respondents often make use of mobile phones for sending and receiving text messages on agricultural information. Also, high cost of mobile phones, poor network coverage, and erratic power supply for charging mobile phones were the challenges that respondents faced in accessing agricultural information through the use of mobile phones. The result of the hypothesis revealed that all the selected socio-economic characteristics Age ($r = -0.562$, $p \leq 0.05$), Household size ($r = -0.607$, $p \leq 0.05$), Farming experience ($r = -0.275$, $p \leq 0.05$), Year spent in school ($r = -0.325$, $p \leq 0.05$), Farm size ($r = 0.446$, $p \leq 0.05$) have a significance relationship with the utilization of mobile phones for agricultural information by watermelon farmers. The study therefore recommended that awareness and enlightenment on the utilization of mobile phones for agricultural information should be encouraged by Government and non-Governmental agencies among farmers.
***Keyword**: Mobile Phones Usage, Agricultural Information, Utilization and Watermelon Farmers.*

Introduction
Information Communication Technologies (ICTs) revolution has permeated every aspect of life and farmers are already specially benefitting from mobile communications. ICTs are the best hope to accelerate development process and mobile telephony is one of the most exciting forms of ICTs particularly in the context of the developing countries (Nyamba and Mlozi, 2012). Mobile phones for agricultural information have great potential to transfer information at the speed of light regardless of distance. Mobile phones for agricultural information, being

a component of ICTs, are now accessible to 60% of the population in sub-Saharan Africa countries (Asa, 2017). The fast penetration of mobile phones for agricultural information could be attributed to its ease of use, low cost in comparison to other ICTs such as computers and its potential to break geographic barriers (De Silva, 2008). It was in the same vein that Aker (2011) described mobile phones for agricultural information as cheap and widely used ICTs that have a great potential to solve the problem of cost and lack of access to information. Nigeria is a country where a sizeable percentage of its population is involved in agriculture and agricultural related activities. Most of these people reside in rural areas noted for inadequate infrastructure like telecommunication, roads, pipe-borne water, electricity, and health facilities among others. The smallholder farmers in rural areas in Nigeria have been disconnected from their urban counterparts until 2001 when Global System for Mobile Communication (GSM) was introduced. From this intervention, there is currently high flow of information to rural dwellers through mobile communication. Mobile telephony is without doubt one of the most explosive developments ever to occur in Nigeria's telecommunications sphere (Fashina and Odefadehan, 2014). In other words, the adoption of mobile phones for agricultural information is growing fast among Nigerians. Since the introduction of mobile phones for agricultural information in Nigeria economy, it has had tremendous impact on so many businesses transactions. Farmers and farming activities in Nigerian as a nation have had their benefits of using mobile phones for agricultural information (Asa, 2017). The basic information and guidance which farmers need to be able to embrace the idea of development is achieved through mobile phones for agricultural information.

Objective of the Study

The general objective of the study is to access the utilization of mobile phones for agricultural information by Watermelon farmers in Ibarapa North Local Government area of Oyo state.

The specific objectives are to:

i. describe the socio economic characteristics of the respondents in Ibarapa North Local Government area of Oyo state.
ii. examine the level of accessibility of mobile phones for agricultural information by the respondents in the study area.
iii. determine the agricultural uses of mobile phones for agricultural information by respondents in the study area.
iv. examine the level of utilization of mobile phones in accessing agricultural information in the study area.
v. determine the challenge that respondents face in accessing agricultural information through mobile phones in the study area.

Hypothesis of the Study

HO: There is no significant relationship between selected socio economic characteristics of the respondents and utilization of mobile phones for agricultural information by the respondents.

Methodology

The study area is Ibarapa North Local Government Area of Oyo State, Nigeria. It was created in 1996 from old Ifeloju Local Government area of Oyo state. It comprises of Ten political wards with headquarters Located at Ayete. It has an area of 1, 218 km^2 and a population of 101,092 National Population Census (2006), consisting of the Ibarapa people, a Yoruba sub-ethnic group. Agriculture is the major occupation in the area, the major agricultural produce in the area are Cash crop and food crop such as Cocoa, Yam, Cassava, Mango and Water melon.

Two stage sampling technique was used. The stages were;
Stage 1: In the three major towns in the study area (Ayete, Tapa and Igangan), there were four major fruit and vegetable association namely; Iwajowa I fruit and vegetable producers association, Iwajowa II fruit and vegetable producers association, Ifelodun fruit and vegetable producers association and Orisun fruit and vegetable producers association. Thus, 100% of the association was selected.
Stage 2: The total registered number of members in Iwajowa I Fruit and vegetable producers association located in Ayete are 52, Iwajowa II Fruit and vegetable producers association located in Tapa are 108, Ifelodun and Orisun fruit and vegetable producers association located in Igangan are 83 and 26 members respectively. Based on the total number of the association, 50% of each of the total number in each group was selected randomly to give a total of 135 watermelon farmers for this study.

Results and Discussion
Socio economic characteristics of watermelon farmers in the study area
Age: Results in Table 2 shows that 8.9% of the respondents were between the ages of less or equal to 30 years, 31.5% were between 30-39 years, 29.5% were between 40-49 years while 10.2% were above 60 years. The mean age was 38 years which implies that most of the respondents were at active and productive age and capable to carry out the task involved in watermelon production.
Sex: The results show that majority 87.4% were male while 12.6% were female. This implies that male dominate watermelon production in the study area. The findings showed that majority of water melon farmers sampled were male in the study area. This is in support of (Jibowo, 2000) who reported that men engaged more in farming activities than women in south-western, Nigeria.
Marital Status: The Results shows that 66.7% of the respondents were married, 18.5% were single, 11.1% were widowed while few 3.7% were divorced. This result indicates that majority of the respondents were married which indicated that there are more responsibilities which need financial commitments hence they need to be fully engaged in water melon production.
Household Size: The result from Table 2 revealed that 96.5% had a household size of less or equal to 9 members in their household, 2.1% had between 10-19 members while 0.7% had between 30-39 members. The mean number of household was found to 7 which imply that most of the respondents had an average of 6 members in their households. Ekong, (2000) expressed the view that the larger the family size, the larger the farmers' farm because of the cheap family labour.
Years spent in school: The results show that 69.6% spent less or equal to 9 years in school while (30.4%) spent above 10 years in school. The mean years of education was found to be seven (8) which imply that most of them can still be categorized as literate.
Annual income: The result from Table 2 below revealed that 30.2% had their annual income less or equal to ₦150,000 from watermelon production, 30.5% had their annual income between ₦151,000-₦300,000, 11.9% had their annual income between ₦451,000-₦600,000 while 18.5% had their annual income above ₦600,000.
Farm size: The result show that (96.3%) of the respondents had cultivates less or equal to 4 hectares, (2.2%) cultivate between 5-9 hectares while only (1.5%) cultivate more than 9 hectares. The mean value of size of land size cultivated was 2 hectares.
Farming Experience : Result from table 2 showed that (10.2%) of the respondents had between 1-10 years of farming experience, (40.4%) had between 11-20 years while very (49.5%) had above 21 years. The mean year of experience was 24 years.

Table 2: Socioeconomic characteristics of the respondents in the study area

Variable	Frequency	Percentage	Mean
Age			
≤30	12	8.9	38
30-39	36	31.5	
40-49	26	29.5	
50-59	25	19.9	
>60	14	10.2	
Sex			
Male	118	87.4	
Female	17	12.6	
Marital status			
Divorced	5	3.7	
Widowed	15	11.1	
Single	25	18.5	
Married	90	66.7	
Household			
≤9	130	96.5	
10-19	3	2.1	
20-29	1	0.7	6
30-39	1	0.7	
Years spent in school			
≤9	94	69.6	
>10	41	30.4	8
Annual income			
≤₦150000	41	30.2	
₦151,000-₦300,000	41	30.5	
₦301,000-₦450,000	12	8.9	#340,000
₦451,000-₦600,000	16	11.9	
>₦600,000	25	18.5	
Farm size			
≤4	130	96.3	
5-9	3	2.2	2
>9	2	1.5	
Farming experience			
1-10	14	10.3	24
11-20	54	40.4	
>21	67	49.5	

Source: Field survey, 2023

Access to Mobile phones for agricultural information by watermelon farmer in the study area.

The result in the Table 3 shows that 98.5% had access to mobile phones for agricultural information in the study area while only 1.5% did not have access to mobile phones for agricultural information. The finding implies that majority of the respondents in the study area had access to mobile phones for agricultural information. The findings agree with Robert (2014) who reported a high level of access to mobile phones by farmers in some parts of Nigeria.

Table 3: Access to mobile phones for agricultural information by watermelon farmer

Did you have Access to Mobile Phones?	Frequency	Percentage
Yes	133	98.5
No	2	1.5

Total	135	100

Source: Field Survey, 2023

Uses of mobile phones for agricultural information by respondents in the Study area

The result in the Table 4 revealed that 93.3% of the respondents used mobile phones to get information on the market price of Agricultural products, 86.7% used it for playing music/video for entertainment during farming activities, 83.0% used it to get information on pest and diseases control, 80.0% used it to get information on credit facilities, 65.9% used it if for information on Agro input supply, 57.0% used mobile phones to get information on New Varieties of watermelon, 54.8%) used mobile phones to get information on Weather report, 49.6% used it to get advisory services, 45.9% used it for information on Postharvest practices, 41.5% used for agronomic practices. The result implies that most mobile phones available in the study area have features for radio and internet services. However, the low usage could be due to the need to the conserve battery life of mobile phones by the farmers since steady electric power supply for charging is a major challenge to use mobile phones in rural areas. (Asa, 2017)

Table 4: Agricultural uses of mobile phones for agricultural information by respondents in the study area

Variables	Yes F (%)	No F (%)
Market Price for Agricultural Produce	126(93.3%)	9(6.70%)
Weather Reports	74(54.8%)	61(45.2%)
New varieties of watermelon	77(57.0%)	58 (43.0%)
Information on Credit facilities	108(80.0%)	27(20.0%)
Pest and disease control	112(83.0%)	23(17.0%)
Agro-input supply	89(65.9%)	46(34.1%)
Advisory services	67(49.6%)	68(50.4%)
Agronomic practices	56(41.5%)	79(58.5%)
Post-harvest practices	62(45.9%)	73(54.1%)
Playing Music/Video for Entertainment during Farming activities	117(86.7%)	18(13.3%)

Source: Field Survey, 2023, F-Frequency, %- Percentage

Level of watermelon farmer utilization of mobile phones for accessing agricultural information.

The result on table 5 showed the result of the level of watermelon farmer's utilization of mobile phones for accessing agricultural information. The result revealed that 96.3% of respondents often make use of mobile phones for calling (Voice call) in accessing agricultural information, 89.6% of respondents often make use of phones radio in getting agricultural information. Also, 89.6% of respondents often make use of mobile phones for receiving message on agricultural information, 84.4% of respondents often make use of mobile phones for sending message on agricultural information, 42.2% of respondents often make use of mobile phones internet in getting agricultural information, while 42.2%, 41.5% and 20.0% uses Facebook, Whatsapp and Mails on mobile phones to get Agricultural information. The result is in line with the findings of Akinwale *et al. (*2019) that low utilization of Facebook, Whatsapp, E-mail and internet can be attributed to inability of the respondents to operate these plartforms, cost of operating these platforms or low awareness and appreciation.

Table 5: Level of watermelon farmers' utilization of mobile phones for agricultural information in accessing agricultural information in the study area

Services	Often F(%)	Occasionally F(%)	Never F(%)
Calling (Voice call)	130(96.3%)	2(1.5%)	3(2.2%)
Use of Phones Radio	117(86.7%)	15(11.1%)	3(2.2%)
Receiving Text Messages	121(89.6%)	10(7.4%)	4(3.0%)
Sending Text Messages	114(84.4%)	15(11.1%)	6(4.4%)
Accessing Internet	57(42.2%)	63(46.7%)	15(11.1%)
Accessing Facebook	57(42.2%)	61(45.2%)	17(12.6%)
Accessing WhatsApp	56(41.5%)	60(44.4%)	19(14.1%)
Receiving Mails	27(20.0%)	40(29.6%)	68(50.4%)
Sending mails	27(20.0%)	39(28.9%)	69(51.1%)
Use of Multimedia Services	19(14.1%)	28(20.7%)	88(65.2%)

Source: Field survey, 2023. F-Frequency, %- Percentage

Challenges of respondents' in accessing agricultural information through mobile phones for agricultural information

Result from Table 6 Revealed the Challenges that Respondents' Faced in Accessing Agricultural Information through Mobile phones in the study area, the table 6 shows that 32.6% of the respondents revealed that the high cost of procurement of mobile phones for accessing agricultural information was very severe and it is affecting them in accessing agricultural information through mobile phones. Also, 50.4% of the respondents revealed that poor network coverage for mobile connectivity was a challenge that was very severe in accessing agricultural information through mobile phones. 41.5% of the respondents attested to the fact that erratic power supply for charging mobile phones for agricultural information was a very severe problem in accessing agricultural information through mobile phones. Finally, 54.8% of the respondents revealed that high cost of maintenance/repair of mobile phones for agricultural information gadgets was a very severe problem in accessing agricultural information through mobile phones. The result implies that poor network coverage for mobile connectivity, erratic power supply and high cost of maintenance/repair of mobile phones were serious challenge that respondents face in accessing agricultural information through mobile phones.

Table 6: Challenges of respondents' in accessing agricultural information through mobile phones for agricultural information

Variables	Very Severe F (%)	Severe F (%)	Not Severe F (%)
High cost of procurement of mobile phones for agricultural information for use.	44 (32.6%)	69 (51.1%)	22 (16.3%)
Poor Network Coverage for mobile connectivity.	47 (34.8%)	68 (50.4%)	20 (14.8%)
Erratic power supply for charging mobile phones for agricultural information.	56 (41.5%)	59 (43.7%)	20 (14.8%)
High cost of maintenance/ repair of mobile phones for agricultural information gadgets.	37 (27.4%)	74 (54.8%)	24 (17.8%)

Source: Field survey, 2023 F-Frequency, %- Percentage

Test of Hypothesis

There is no significance relationship between selected socio-economic characteristics of the respondents and the utilization of mobile phones for agricultural information by watermelon farmers.

The result of the test of hypothesis between selected socio-economic characteristics and utilization of mobile phones for agricultural information by watermelon farmers using Pearson Product Moment Correlation (PPMC) was presented in Table 7. The result revealed that all the selected socio-economic characteristics Age ($r = -0.562$, $p \leq 0.05$), Household size ($r = -0.607$, $p \leq 0.05$), Farming experience ($r = -0.275$, $p \leq 0.05$), Year spent in school ($r = -0.325$, $p \leq 0.05$), and Farm size ($r = 0.446$, $p \leq 0.05$) have a significance relationship with the utilization of mobile phones for agricultural information by watermelon farmers. Therefore, the null hypotheses were rejected and the alternative is accepted. The result implies that as farmers educational level and farm size increase their level of utilization of mobile phones also increase vice versa. This finding corroborates Assif *et al. (*2017) that with increase in education level, farmers will want to have more advance information about cultivation through mobile telephony. On the other hand, as the farmers farm increase, it is expected of them to seek higher returns on their investment by utilizing mobile phones for the purpose of sourcing for agricultural information.

Table 7: PPMC test showing relationship between selected socio-economic characteristics of the respondent and utilization of mobile phones for agricultural information by watermelon farmers

Selected socio economic characteristics	r- value	p-value	Remarks
Age	-0.562	0.081	NS
Household Size	0.607	0.369	NS
Year spent in school	0.325	0.002*	S
Farming Experience	0.275	0.423	NS
Farm Size	0.446	0.001	S

*Significant at ≤ 0.05
NS- Not Significant
S- Significant
Source: Field Survey, 2023.

Conclusion and Recommendations

The results concluded that the mean age of the respondents was 38 years, 66.7% were married with the mean household of 6 persons, the average farm size cultivated was 4 hectares and the mean household size was 7, while annual mean income was ₦340,000.0k. The results further revealed that (98.5%) of the respondents had access to mobile phones for agricultural information. Also, (93.3%) of the respondents used mobile phones to get information on market price of Agricultural product, (80.0%) used mobile phones to get information on credit facilities and (83.0%) used mobile phones to get information about pest and diseases control.

However, (96.3%) of respondents often make use of mobile phones for calling (Voice call) in accessing agricultural information, (84.4%) of respondents often make use of mobile phones for sending and receiving text messages on agricultural information. Also, high cost of mobile phones, poor network coverage, and erratic power supply for charging mobile phones were the challenges that respondents faces in accessing agricultural information through use of mobile phones. The test of the hypothesis revealed that all the selected socio-economic characteristics Age ($r = -0.562$, $p \leq 0.05$), Household size ($r = -0.607$, $p \leq 0.05$), Farming

experience (r = -0.275, p≤0.05), Year spent in school (r = -0.325, p≤0.05), and Farm size (r = 0.446, p≤0.05) have a significance relationship with the utilization of mobile phones for agricultural information by watermelon farmers. Therefore, the null hypothesis was accepted and the alternative is rejected.

Based on these findings, the following recommendations were made:

i. Awareness and enlightenment on the importance and utilization of mobile phones for agricultural information should be encouraged by Extension agent, government and non-governmental agencies so as to give timely and adequate information to farmers.
ii. Government and stakeholder should liaise with Communication Network providers so as to reduce the charges on calls, messages and access to internet by the farmers in order to make Agricultural information available and accessible to them.

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ADAPTATION STRATEGIES TO CLIMATE VARIABILITY ADOPTED BY YAM GROWERS IN OYO STATE, NIGERIA

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Abstract
Climate change has precipitated a number of socioeconomic challenges globally, and agriculture remains the most heated. Yam does not have immunity against the effects of the inconsistency of climate elements. Thus, this study assessed adaptation strategies to climate variability by yam growers in Oyo State. A multistage sampling procedure was used to select 173 respondents for the study. Structured interview schedule was used to elicit responses from respondents. Data were analyzed using mean and percentages. The yam growers were mostly male (68.2%), with mean age and household size of 48 years and10 persons, respectively. The services of hired labour was often (58.4%) employed in carrying out various farming operations. Most (65.9% of respondents did not cultivate less than 6 hectares of farmland for yam production. Most (81.5%) of the respondents had at least secondary education. All (100.0%) of the respondents were aware of climate variability. Yield unpredictability, unpredictable outset of rainfall, and extremely dry spell during the dry season were ranked 1st, 2nd and 3rd, respectively among the effect of climate variability on yam production. Use of shade, topped the adaptation strategies adopted. Cost of procuring materials for adaptation strategies against shortage of water and high temperature was the highest constraint to the adoption of adaptation strategies. It is concluded that yam growers adopt some of adaptation strategies, but were also incapacitated to fully adopt most of the strategies against climate change. It is thus recommended that farmers should be encouraged to organize a cooperative society to provide avenue for education of their members, and to serve as a veritable source of fund to adopt various strategies of adaptation to climate variability that required heavy funding.
Keywords: Climate variability, Yam production, Adaptation strategies,

Introduction

Yam is a common food in Nigerian households. It is produced in every part of Nigeria, but mostly grown in the savannah region of West Africa, which contributes 92% (66.8 million tons) of the world yam production of 72.6 million tons (Food and Agriculture Organization, 2020). Yam is highly nutritious, it contributes over 200 dietary calories per capita per day for over 150 million people in West Africa with over 21% dietary fibre and are rich in carbohydrates, vitamin C, potassium, manganese and other essential minerals (Olabode, 2022 ;Babaleye,2003) Yam helps in ensuring food security in Nigeria as it is available all year round, thereby alleviating hunger and provide job opportunity for a large number of people along its value chain. Yam plays a vital role in enhancing food security and alleviating hunger in many parts of West Africa (Olabode, 2022; Asiedu and Sartie, 2010).

Arable crop production in Nigeria is greatly impaired by the manifestations of climate variability. The abnormal change in any of the climatic parameters often have disastrous effect on their productivity. The opinion was corroborated by Bamire and Amujoyegbe (2005) that yam production in Nigeria is among the most susceptible to the adverse effects of climate change. This is connected to the fact that yam production like any other crops are affected by a number of issues such as physical, economic and cultural factors. The physical

factors are purely climatic which are: rainfall, temperature, relative humidity and wind. All contribute significantly to yam productivity (Olabode, 2022).

Yam has its peculiarity; its growth, vegetative development, tuberization, and the overall productivity of yam, are under the influence of climatic parameters. Edaphic factors, to a greater extent, also determine the wellness or otherwise of yam productivity in short, they are determined by the ability of the soil to release the nutrients required by crop plants in adequate amount and in correct proportion. Yam production has been adversely affected by the manifestations of the effects of alterations of average weather conditions of a place over a long period of time which is known as climate change, while fluctuation of weather elements notably; temperature, rainfall, humidity, wind and others often regarded as climate variability. The development necessitates adaptation strategies by farmers in order to guarantee food security, as they just have to live with it (Bamire and Amujoyegbe, 2005).

In Nigeria, agricultural production especially in the Southern part is still rainfed and depends largely on weather conditions which are obviously unstable and undependable. All the erratic rainfall and temperature fluctuations contribute largely to crop failure and low agricultural productivity (Sulhazan, 2020). Climate change compounded the woes of these set of people at the primary sector of the national economy. It is worthy of note that in Nigeria, agriculture is still traditional, and largely subsistence, and very sensitive to climate change owning to weak capacity to mitigate and adapt to the prevailing climate instability. In the same vein, (PCC.Climate Change 2007) posited that Rainfed agriculture is prevalent in most countries and increasing temperatures, and shifts in rainfall patterns have affected agricultural production, with significant drops in crop and livestock production, thus negatively impacting food distribution.

Adaptation is a response to an unusual, phenomenon like climate variability which tends to alter convention and practice. Adaptation strategies are responses aimed at developing resilience and reduce the degree of vulnerability to a prevailing unfavourable circumstance. Instability of climate adversely impacted on agricultural production and food processing, thereby worsen the standard of living of food producers (Elijah, Osuafor and Anarah (2018). Farmers have the propensity or predisposition to be adversely affected. Adaptation by farmers, in response to current climate change, is reducing climate risks and vulnerability mostly via adjustment of existing systems. Adaptation does not prevent all loses and damages, even with effective adaptation and before reaching soft and hard limits (IPCC, 2022).

Considering the importance of yam in dietary diversity of Nigerians, much is expected to have been done on yam and adaptation to climate variability. Also, there is a dearth of information on adaptation of yam growers to climate change in previous studies. However, the largest variability, in responses comes from the individual coping and adaptation strategies It is therefore expedient to investigate the adaptation strategies adopted by yam growers to climate variability in the study area. The specific objectives are to: describe the socioeconomic characteristics of yam growers in the study area; determine the perceived effect of climate change on yam production; determine the adaptation strategies of yam growers to climate change in the study area, and examining the constraints to climate change adaptation strategies by yam growers in the study area.

Methodology

Multistage sampling procedure was used for the study. Oke-Ogun was purposively chosen because it is regarded as the food basket of the state characterized by large quantity of yam production. Out of the ten Local Government Areas in the Oke-Ogun region of the State, three notable Local Governments for yam production were selected for the study namely: Iwajowa, Irepo, Saki West Local Governments.

Stage I: Purposive selection of three local government that were predominantly yam growers in Oke- Ogun area of Oyo State

Stage II: From the Oyo State Agricultural development Programme (ADP), list of yam farmers from the three Local Government Areas were obtained:

Stage III. Systematic sampling technique was used by selecting every 3rd yam farmers from 203 yam growers to obtain to 67 respondents in Iwajowa Local Government. In the same vein, 49 yam growers were selected out of 147 yam growers in Irepo Local Government area of Oyo State. Similarly, 57 yam growers were selected from 171 members of yam growers in Saki West. In all, 173 yam growers were used as the respondents for the study. Structured interview guide was used to elicit information from the respondents. Descriptive statistics such as frequency counts, percentages and mean were used to analyse data that were collected.

Results and discussion

Socioeconomic characteristics of respondents

Table 1 revealed that the mean age of the respondents was 48 years. This implies that the farmers were relatively in their active ages, vibrant and should be able to adopt series of ethno-engineering practices capable of mitigating and reducing the effects of climate variability. Also, 68.2% and 31. 8% were male and female, respectively. This implies that yam production in the study area was not purely male dominated as an appreciable number of women were also involved, it also depicts gender equity in food production in the study area. Furthermore, most (81.1%) of the respondents had at least secondary education. The implication of this is high level of literacy with the assumption that the yam growers should be familiar with various manifestations of vagaries of uncertainties of most of the climate parameters and their attendant effects on yam production. In the same vein, assists them to employ series of ethno-engineering practices effectively to reduce the impact of climate variability. Further observable from the Table 1, majority (92.0%) of the farmers had at least eleven years of experience in yam production. Thus, they are expected to be well grounded in the best practices of the yam enterprise. Also, the average household size was 10 persons which is believed to provide family labour in yam production. Family labour contributes immensely to household food security and they mostly constitute larger percentage of farm labour among small scale farmers (Yusuf, 2018). Table 1, further shows that slightly above average (65.9%) cultivate more than five hectares of land which affirms their intensive involvement in yam production.

Table 4.1 Socio-economic Characteristics of Respondents

Variables	Responses	Percentages
Age:		
≤ 20	7	4.0
21-30	13	7.5
31-40	23	17.7 Mean = 48 years

41-50	45	26.0
51-60	66	38.1
61-70	14	8.1
≥ 70	5	2.9
Sex:		
Male	118	68.2
Female	55	31.8
Marital Status:		
unmarried	23	13.3
Married	123	71.1
Divorced	3	1.7
Widowed	24	13.9
Educational Status:		
No formal education	16	9.2
Adult/vocational	4	2.3
Primary education	12	7.0
Secondary education	71	41.0
Tertiary education	70	40.5
Years of farming experience:	5	3.0
1-5	9	5.2
6-10	57	33.0
11 -15	52	30.1
16 -20	50	28.9
≥ 21		
Household size:		
1-5	29	16.8
6-10	129	74.6 Mean = 10persons
≥ 11	15	8.7
Source of labour:		
family labour	72	41.6
hired labour	101	58.4
Method of land acquisition:		
Land purchase	47	27.2
Leasehold	53	36.6
Inheritance	52	30.0
Communal holding	11	6.4
Rent	10	5.8
Farm size:		
1-5 hectares	59	34.1
6-10 hectares	78	45.1
11 and above	36	20.8

Source: Field survey, 2022.

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Perceived effects of climate change on yam production

Table 2 presents the perception of yam growers on the effects of climate change on yam production. From the Table, it shows that yield unpredictability was perceived to be the most ranked amongst various effects of climate change. In a situation where drought is getting longer, more intense and more frequent, these unarguably will precipitate unpredictability of yield and the change in the narrative is dependent on the adoption of some ethno-engineering practices such as: the use of shade, mulching, irrigation and varying time of planting and planting of resilient specie of yam. Also revealed from the Table 2, yam growers identified unpredictability of when the rain would begin as another key effects of climate change. Not being able to predict the onset of raining season will definitely affect the planting dates and other cultural operations, hence it was ranked second in the order of degree of severity of effects of climate variability.

Further revealed from the Table 2, the following were ranked above average of 2.0: sharp drop in the amount of annual rainfall, excessively high temperature, rising in sunlight intensity, annual rainfall ending too early, and dryness of yam set. All the statements emphasized the shortage of rainfall and temperature intensity. Adejuwon, (2004) opined that rainfall is by far the most important element of climate change in Nigeria and water resources potential in the country. Consistent reduction in rainfall leads to a reduction in the natural regeneration rate of land resources (Fasona and Omojola, 2005). According to Agboola (1997), soil moisture through rainfall is very important for plants growth. When the negative aspect of rainfall on crop yield is carefully examined, it shows that rainfall can lead to the development of many pest and diseases even on the crop. Inadequate rainfall on the other hand can cause witting of desiccation. Changes in rainfall patterns could cause soil erosion, storms, floods and drought, affecting agricultural productivity.

Table 2. Perceived effects of climate variability on yam production

Perceptual statements	**Responses**					
	SA	**A**	**D**	**SD**	**Mean**	**Rank**
Yield unpredictable	157(90.7)	9(5.2)	2(1.2)	5(2.9)	3.69	1st
Unpredictable outset of rainfall	111(64.2)	60(34.7)	2(1.2)	0(0.0)	3.63	2nd
Extremely dry spell during the dry season	113(65.3)	56(32.4)	0(0.0)	4(2.3)	3.60	3rd
Shift and unpredictable harmattan	121(70.0)	35(20.2)	13(7.5)	4 (2.3)	3.58	4th
Unpredictability of climatic elements such as sun intensity, rainfall, and relative humidity negatively impacted on yam production	101(77.0)	66(38.1)	5(2.9)	1(0.6)	3.54	5th
Excessively high temperature	92(53.2)	70(40.5)	7(4.1)	4(2.3)	3.48	6th
Sharp drop in the amount of annual rainfall	98(56.6)	58(33.5)	15(8.7)	2(1,1)	3.45	7th

Drying of yam seed ducts	73(42.2)	64(34.7)	23(13.3)	13(7.5)	3.14	8th
Rising sunlight intensity has indirect effect on yam productivity as it reduces labour availability and productivity	51(29.5)	67(38.7)	23(13.3)	32(18.5)	2.79	9th
Annual rainfall ends too early	30(17.3	55(31.8)	57(33.0)	31(18.0)	2.48	10th
Annual rainfall starts too early	23(13.3)	56(32.4)	17(9.8)	77(44.5)	2.14	11th
Reduction in soil fertility	41(23.7)	79(45.7)	36(20.8)	17(9.8)	1.96	12th
Incessant occurrence of flooding reduces the yield and quality of yam	23(13.3)	17(9.8)	76(43.9)	57(32.9)	1.91	13th

Source: *Field survey, 2022.*

Adaptation strategies adopted by yam farmers against climate change in the study area

Farmers ability to adapt to impacts of climate variation depends on factors such as wealth, technology, education, information, infrastructure, access to resources and management abilities (Oluwasusi and Tijani, 2013). From the Table, Use of shades, changing of planting periods, multiple planting dates were ranked 1st, 2nd, and 3rd respectively. This implies that high sun intensity and high temperature portends great danger to soil by increasing soil temperature with its effects on soil microorganisms, destruction of soil structure and majorly resulting to the death of yam set. The aforementioned could be checkmated by the adoption of ethno-engineering practices aiming at protecting the soil by maintaining optimum soil temperature.

Also, Table 2 revealed that farmers do engage in livelihoods diversification to serve as insurance against crop failure. In the same vein, yam farmers also prioritized mixed cropping as a measure to guide against the economic effect of crop failure.

Table 3. Adaptation strategies adopted by yam farmers against climate change in the study area

Strategies	**Responses**					
	SA	**A**	**D**	**SD**	**Mean**	**Rank**
Use of shades	132(76.3)	29(16.7)	10(5.7)	02(1.1)	3.68	1st
Change in planting periods	129(74.5)	31(17.9)	03(1.7)	10(5.7)	3.61	2nd
Multiple planting dates	111(64.1)	36(20.8)	17(9.8)	09(5.2)	3.43	3rd
Livelihoods diversification to non-farm enterprise	79(45.7)	46(26.6)	14(8.1)	34(19.6)	3.25	4th
Practising mixed cropping	86(49.7)	62(35.8)	07(4.0)	18(10.4)	3.24	5th
Change in the use of chemicals	89(51.4	41(23.7)	37(21.4)	06(3.5)	3.23	6th
Change in the use of fertilizer	43(24.8)	98(56.6)	24(13.8)	08(4.6)	3.02	7th
Minimum tillage	64(37.0)	69(39.9)	12(6.9)	28(16.2)	2.97	8th
Planting of cover crops	55(31.7)	64(37.0)	31(17.9)	23(13.3)	2.87	9th
Crop rotation	36(20.8)	16(9.2)	64(37.0)	57(32.9	2.18	10th

Planting of early maturing yam	13(7.5)	27(15,6)	92(53.1)	41(23.7)	2.07	11th
Farm land fragmentation	11(6.3)	23(13.2)	82(47.3)	57(32.9)	1.93	12th
Change in harvesting date	12(6.9)	19(10.9)	69(39.8)	73(42.1)	1.82	13th
Use of irrigation system	05(2.9)	22(12.7)	82(47.4)	64(37.0)	1.81	14th

Source: field survey, 2022

Constraints to climate change adaptation

Yam farmers are constrained to adopt most of adaptation measures. Farmers ability to adapt to impacts of climate variation depends on factors such as wealth, technology, education, information, infrastructure, access to resources and management abilities. From the Table 5, cost of procuring materials for adaptation strategies against temperature and water shortages (irrigation) and cost and unavailability of labour, were found to be most pressing as they were ranked first and second, respectively.

Dearth of information on climate change was also prominent as one of the constraints to adopt adaptation strategies. This is in tandem with the opinion of Osei, (2017) that information on climate change are far from the reach of the ultimate users as a result of some institutional failures exemplified by low extension agent to farmer ratio, illiteracy and inaccessibility or poor development of infrastructural facilities to enhance information dissemination to rural community. Also revealed from the Table, unreliable water source and unavailability of land were also found significant in the ranking, this lends credence to the submission of Mishra, 2012,: Ozor *et al.*, 2010; that vulnerability of household is exacerbated by the fact that most farmers depend solely on rainfall as their source of water for farming, and that their activities is inhibited by unavailability of land which would have enhanced the adoption of some ethno-engineering measures.

Table 4. Constraints to climate variability adaptation strategies

Perceptual statements	**Responses**					
	SA	**A**	**D**	**SD**	**Mean**	**Rank**
Cost of procuring materials for adaptation strategies against temperature and water shortages (irrigation)	82(47.3)	56(32.3)	24(13.8)	11(6.3)	3.20	1st
Cost and unavailability of labour	87(50.2)	46(26.5)	29(16.7)	11(6.3)	3.20	2nd
Lack of information on climate change adaptation strategies	50(28.9)	71(41.0)	10(5.7)	42(24.2)	2.74	3rd
Poor access to the use and control of land	49(28.3)	47(27.1)	42(24.2)	35(20.2)	2.63	4th
No access to weather forecast technologies	44(25.4)	39(22.5)	51(29.4)	39(22.5)	2.50	5th
Illiteracy and farmers conservative attitudes	57(32.9)	22(12.7)	46(26.5)	48(27.7)	2.50	6th
Lack of access to supporting institutional facilities	35(20.2)	42(24.2)	59(34.1)	37(21.3)	2.43	7th
High cost of land	21(12.1)	39(22.5)	78(45.0)	35(20.2)	2.26	8th
Poor technical aids from government	27(15.6)	23(13.2)	67(28.7)	56(32.3)	2.12	9th
lack of clear-cut government policy on climate change adaptation and stabilization	19(10.9)	34(19.6)	64(36.9)	56(32.2)	2.09	10th

Credit facility constraint	24(13.8)	17(9.8)	79(45.6)	53(30.6)	2.06	11th
Information on weather and climate forecast not accessible	23(13.3)	21(12.1)	56(32.4)	73(42.1)	1.96	12th
Illiteracy	15(8.6)	10(5.8)	67(38.7)	81(46.8)	1.76	13th
Cultural/ traditional beliefs: planting and harvesting procedural conditions	09(5.2)	06(3.4)	82(47.3)	76(43.9)	1.69	14th

Source:Field Survey, 2022

Conclusion and recommendations

It is hereby concluded that yam growers in the study adopted some of adaptation strategies to climate variability, yet they were constrained to adopt various adaptation strategies of climate variability as a result of inability to procure materials against excessive heat and water shortages. Also, high cost and unavailability of labour, lack of information on climate change adaptation, poor access to the use and control of land, and no access to weather forecast technologies were prominent issues inhibiting the adoption of adaptation strategies among yam growers in the study area

Based on the findings of the study, the following recommendations were made:

1. Information on climate change adaptation strategies should be packaged in such a way that it will be understood by farmers to aid adoption
2. Farmers' cooperative societies should be encouraged to assist members to garner resources to tackle the menace of climate variability
3. Farmers' society where discussion of issues affecting farm enterprise should be channeled towards sharing experience on climate variability.
4. Encumbrances on access to land should be removed to allow farmers have access to land to give room for cultivation of different types of crops to mitigate the effect of climate change..

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IMPACT OF CLIMATE CHANGE ADAPTATION PRACTICES ON FOOD CROP FARMERS' PRODUCTION EFFICIENCY IN SOUTHWEST, NIGERIA

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Abstract
The research sought to determine the impact of climate change adaptation strategies (CCAS) on the production efficiency of Nigerian food crop producers. A multi-stage sampling procedure was utilized to choose 480 rural farming families from three different States in Southwest Nigeria. The descriptive and Tobit regression methods were used to examine the data. The majority (76.0%) of respondents were married, with mean age, household size, and farm size of 47.1 years, 5.31 individuals, and 3.77 hectares, respectively, and 72.0% earning less than ₦100,000 per year from farming. Crop diversification is the most common CSA applied in the region. The Tobit regression result revealed that gender, farm size, interaction with extension agents, and climate change adaption techniques such as crop diversification, mulching, and crop rotation all had a substantial impact on farmers' production efficiency. The research revealed that the production efficiency of Nigeria's farmers was impacted by climate change adaptation techniques used in their agricultural operations. Climate change adaptation measures such as mulching, crop diversification and crop rotation that maintain agricultural sustainability in rural communities by reducing the effects of climate change should be promoted and encouraged by the government and all stakeholders
Keywords: Adaptation strategies**,** Climate change, Crop diversification, Tobit Regression

Introduction

Food provision for households is a necessity, with approximately 820 million people worldwide facing the challenge of hunger, and more than two-thirds of the world population lacks essential nutrients, affecting their diet, well-being, and life expectancy (Food and Agricultural Organization of the United Nations (FAO), 2019). Climate change is one of the most serious environmental issues confronting humanity. Climate change has far-reaching consequences, affecting everything from health to agriculture. Climate change has had a considerable impact on world agriculture in the twenty-first century (Akanbi *et al.*,, 2021). Climate change's impacts on agricultural productivity and food security are predicted to worsen with time and vary among nations and areas (FAO, 2019). Despite its significant contribution to the broader economy, this sector has faced several problems, the most severe of which are climate-related calamities such as drought and flooding. Climate variability and change are having a negative impact on agriculture, and the situation is predicted to deteriorate in the future (Brosch, 2021). There is increasing fear that climate change may adversely impact the capacity to satisfy the food needs of the world's approximately 10 billion people by 2050, which is a major reason why experts are supporting climate-smart agriculture (Akano *et al.*,, 2022). Climate change adaptation solutions include socioeconomic and ecological components to guarantee that present food production operations do not jeopardize future food production capacity. Conventional agricultural techniques, which emphasize producing widely accessible low-yielding cultivars with heavy nitrogen fertilizer application, are no longer sustainable due to increased greenhouse gas (GHG) emissions (FAO, 2019).

Despite several efforts aimed at sensitizing farmers on the relevance of climate change adaptation measures, adoption among farmers in developing countries, particularly Nigeria, remains low (FAO, 2019). According to Akanbi *et al.*, (2021), technical know-how, poor

awareness, cost, culture, and traditional beliefs, as well as poor infrastructures, financing, unsustainable government policy, and other socioeconomic constraints such as education level and years of farming experience, all contribute to Nigeria's low level of adoption of climate change adaptation strategies. According to Amare *et al.,* (2018), there is an urgent need for farmers to prepare for the effects of climate change by adopting adaptation and risk reduction methods such as agroforestry, mulching, and crop diversification in order to attain the highest level of agricultural production both locally and worldwide. This article aims to add to the body of knowledge on how to improve crop farmers' production efficiency in rural farming families via climate change adaptation measures. Using Nigeria as a case study, the research intends to discover distinct CCAS and analyze the influence of CCAS on the production efficiency of food crop producers

Methodology

This research was conducted in the rural Southwest of Nigeria, which includes six states: Ekiti, Osun, Ogun, Oyo, Ondo, and Lagos. The region is limited in the east by Delta State, in the west by the Republic of Benin, in the north by Kwara and Kogi States, and in the south by the Atlantic Ocean. Farming is the most common activity in the geopolitical zone, with maize, cassava, yam, oil palm, cocoa, and lumber all being commercially produced. Most rural households in the zone rely on subsistence farming, with additional income from trade, hunting, food collection, and handcrafting. As a consequence, rural families fell into a more severe poverty category, forcing the majority to rely on savings and aid from relatives.

Sampling techniques and sample size

This research relied on primary data, which was gathered using a standardized questionnaire. The sample population is made up of rural agricultural families that mostly cultivate for subsistence. A multi-stage sampling procedure was employed to choose 480 rural farming families from six states in Nigeria's southwest. The first step entailed the random selection of 50% of the states in the Southwestern geopolitical zone (Oyo, Ekiti, and Ogun). The second step included choosing two Agricultural Development Programme (ADP) Zones from each state, for a total of six zones randomly. The third step entailed picking two blocks at random from each of the six ADP zones, totaling 12 blocks. The fourth step involved picking four cells at random from each of the 12 blocks, totaling 48 cells. The last step involved picking 10 homes at random from each of the 48 cells, for a total of 480 rural farming households. Descriptive statistics (means and frequencies) were used to examine the acquired data. The Tobit regression model was used to estimate the influence of CCAS on agricultural producers' production efficiency in the research region.

Results and discussion

Descriptive statistics

Table 1 shows the socioeconomic characteristics of the respondents, with more than two-thirds of the households (81.0%) led by men and a mean age of 47 years, indicating that they are likely to be productive with the available resources. This was consistent with Akano *et al.,* (2022), who found that the average age of respondents in rural farming families in Nigeria was between 45 and 50 years. About 76.00% of the respondents were married, and 78.00% had farming as their main source of livelihood activities with mean household size and farm size of 5 persons and 3.77 hectares, respectively. The majority (72.00 percent) of the rural farming households earned less than $250.00 while about two-thirds (81.0 percent) of them had contact with extension agents. Extension agent is very important in information dissemination and the adoption of new technology (Akter and Ahmed, 2021). The result of the CCAS used by the respondents revealed that crop diversification is the form of CCAS

mostly used in the study area. About 3.13% of the respondents are low users while 61.25% and 15.63% of the respondents are medium and high users, respectively (see Fig. 2). The result was in line with Amare *et al.,* (2018), who asserted that CCAS in rural areas are being silent and the importance is not well pronounced which could be the reason for its moderate usage in the study area

Table 1: Summary of the socioeconomic characteristics of the respondents (n = 480)

Variable	Mean	SD
Gender of respondent (1 = male, female = 0)	0.81	0.193
Age group (1 = adult; 0 = youth)	47.1	0.201
Education level of respondent (1 = formal; 0 = Non formal)	0.62	0.117
Household size (number)	5.31	0.410
Marital Status (1 = Married; 0 = Otherwise)	0.76	0.291
Farm size (hectares)	3.77	1.321
Farming experience (years)	8.23	1.092
Contact with extension agent (1 = yes)	0.81	0.018
Main source of income: (1 = Farming, 0 = Others)	0.78	0.512
Income from farming: <100,000 USD	0.72	0.221
100,000 – 200,000 USD	0.20	0.012
> 200,000	0.08	0.162

Table 2: CCAS and Degree of Usage

CSAP	WMS	SD
Crop diversification	4.723	1.004
Crop rotation	4.281	0.961
Mulching	2.104	0.452
Agroforestry	1.982	0.142
Use of Organic manure	3.441	0.811
Use of Fadama land	2.981	0.051
Planting crops with early maturity	3.831	1.031
Planting drought-tolerant crop varieties	4.016	1.441
Planting cover crop	1.052	1.113
Intercropping	4.101	0.742
Irrigation	1.961	0.022

Note; WMS = Weighted Mean Score SD = Standard Deviation

Maximum likelihood estimates of Tobit regression of the effect of CCAS on production efficiency of food crop farmers

The result of the Tobit regression analysis shows the effects of selected socio-economic characteristics of the respondents and CCAS on the production efficiency of the respondents (as shown in Table 3). The statistically significant variables affecting the production efficiency of the respondents were the gender of household head ($p<0.1$), farm size ($p<0.01$), contact with extension agent ($p<0.05$), main occupation ($p<0.05$) and CCAS practices ($p<0.01$). The gender of the household's head was positive (0.1045) and significant ($p<0.1$), implying that a male-headed household had a higher probability of production efficiency than their female counterparts, and this might be due to more males having higher income-generating activities. The result was buttressed by Akanbi *et al.,* (2021), who reported that there are more efficient male-headed households than female-headed ones in Nigeria. In

addition, the coefficient of farm size was positive (1.3011) and significant ($p<0.01$). This shows that the larger the farm size of a household the more the likelihood of being efficient with the available resources. The coefficient of the education status of the household's head was positive (0.1167) and significant ($p<0.05$), which implies that educational level had a higher probability of leading to efficient farming production. Education is expected to increase the capacity of farmers to obtain, process and utilize information relevant to the adoption and management of agricultural resources (Omotayo, 2016). The coefficient of access to extension service and training was positive (1.0413) and significant ($p<0.05$), implying that an increase in access to extension service increased the likelihood of being efficient in the utilization of resources.

Furthermore, the coefficient of CCAS practices was positive (2.0017) and significant ($p<0.05$), indicating that the more CCAS practice, the higher probability of achieving production efficiency in farming output in the study area. The results imply that CCAS adaptation would brighten the chances for farming households in the study area to be production efficient. The Adjusted R2 of 0.6275 implies that the explanatory variables explain about 62.75 % of the variations in the Tobit regression model.

Table 3: Tobi regression result of the effect of CCAS on production efficiency of crop farmers

Variables	Coefficient	Robust Standard Error	Z	Marginal effect
Constant	-0.1218***	0.1173	-2.4145	-0.0152
Gender	0.1045*	0.0891	1.8871	0.0229
Formal Education	0.1167**	0.0316	1.9409	0.0231
Household size	-0.0021	0.2184	-0.9618	-0.1209
Farm size	1.3011***	0.7101	2.3314	0.0321
Farming experience	-1.0019	0.5331	-0.9928	-0.0318
Farm income	0.0031	0.0346	1.0201	0.0313
Contact with an Extension agent	1.0413**	0.1942	1.9903	0.0122
Main occupation	0.1043	0.2813	1.1193	0.0218
CCAS Practice	2.0017***	0.5012	2.6711	0.1033
Likelihood =	-157.021			
Pseudo R^2	0.6275			
Chi Square	35.42***			
Number of observations	480			

Note: ***, **, and * represent 1%, 5%, and 10% significance level, respectively

Conclusions and Recommendations

This article focused on various CCAS practices in the study area, level of usage and then examined the effects of the level of usage of CCAS on production efficiency of food crop farmers in the study area. The study revealed that use of CCAS agricultural practices improved the production efficiency of crop farmers. Furthermore, crop diversification, crop rotation, planting of drought/heat tolerant crops, intercropping and using organic manure were among the highly accepted CCAS practices by the sampled farming households in the study area. The result revealed that mainstreaming CCAS into food crop production would impact the livelihood and production efficiency of small-scale farming households in the study area. Based on the findings, the study recommends that government and all stakeholders should promote and encourage the adoption of CCAS which will ensure agricultural sustainability in agrarian communities through mitigating the effect of climate change. Also, farmers should be encouraged to diversify their source of livelihood, this will

help to adopt the various forms of CCAS without lacking income for the sustenance of their households.

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ASSESSMENT OF CONSTRAINTS TO ADOPTION OF IMPROVED CASSAVA PRODUCTION PRACTICES BY CASSAVA FARMERS IN OGBOMOSO AGRICULTURAL ZONE

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Abstract
The study assessed the constraints to adoption of improved cassava production technologies in Ogbomosho Agricultural zone of Oyo state. Multistage sampling procedure was employed and interview schedule was used to collect information from the selected 120 cassava farmers in the study area. Descriptive statistics and inferential statistics were used for the analysis. The results showed that the mean age was 53years, 60.0% were male, majority (78.3%) were married while most of them were literates. It was revealed that majority (77.5%) of the respondents practiced monogamy while the mean household size was 7 persons. Majority (78.3%) were into farming as their major occupation and majority (76.7%) were Christians while the mean year of experience and mean farm size was 23 years and 6 hectares respectively. Furthermore, 32.0% of them spent above 300,000 on production with mean cost of production of ₦231, 816.67 while their mean income was ₦366, 358.33. It was discovered that 80.0% of the respondents were aware of the use of improved variety, 50.06% of them were aware of improved spacing, 56.7% of them were aware of the use of fertilizer while majority (75.0%) identified and control pest and disease. The results further showed that 60.8% were not aware of improved weed management, 78.3% were not aware of cassava stem multiplication while 72.5% were aware of mechanization. It was revealed that 44.0% of the respondents got their information from mass media. It was also revealed that the respondents adopted improved weed management than other improved varieties followed by the use of improved cassava varieties. The major constraint to the adoption of improved cassava practices was revealed to be inadequate training followed by inadequate credit facilities. The results of the correlation analysis showed that there was a significant relationship between adoption level of improved cassava farming practices and selected socio economic characteristic of the farmers. It was recommended that extension service delivery should be provided for the farmers through method and result demonstrations of these improved practices as well as improved planting materials and inputs.

Introduction
Agriculture is most widely spread form of human activity and it is more basic than any other industry (World Bank, 2008). Over 70% of Nigeria population engage in one form of agriculture or another (Oladapo, 2005). The level of produced food over the last two decades has reduced dramatically in Sub-Saharan Africa resulting in decline in the standard of living of the populace, the problem of food shortage in developing countries could be overcome through the use of modern agricultural technologies such as improved seed, use of fertilizers, pesticides, proper spacing and agricultural mechanization (Liberio, 2012). Factors that have been observed to enable adoption of technologies were research efforts the shift in the focus of advice, the trend towards better education and training of farmers, quicker and cheaper means of disseminating and sharing information, availability of financial resources, pressure from consumers, non-governmental organization, the media and the public in general, many

reasons have been adduced for the less impact of improved agricultural technologies, abandonment of previously adopted agricultural technologies, gender differences and technological characters (Nweke, *et al.*, 2002).

Cassava (*manihot esculenta*) is an important subsistence food crop in the semi-arid areas and sometimes considered as famine reserve when cereals fail due to its drought tolerance and the root can readily be stored under the ground (Kapinga *et al.*, 2005). Contributing to low productivity include prevalence of devastating pest and diseases, shortage of planting materials, drought, poor soil fertility, use of varieties with low genetic potentials, lack of improved seed system and low adoption rates of research recommendations by farmers (Mtunda *et al*, 2002). This is the case in Oyo state in which improved technologies are partially adopted by farmers. The technologies promoted include proper spacing, land preparation, timely weeding, use of fertilizers or manure, use of improved planting materials, use of manual and powered grater and chipping machines for cassava processing and use of insecticides/herbicides (Mtunda, *et al*, 2002). The majority of farmers are still confined with traditional technologies such as use of local planting materials, improper spacing, improper fertilizer application, traditional cassava processing, improper land preparation and improper weeding (Mkamilo and Jeremiah, 2005).

Problem Statement

Despite the government efforts and supply of improved planting materials, proposing the use of herbicides/pesticides, planting time, use of proper spacing, use of fertilizers, weed control, harvesting time, improved storage, planting methods and proper processing, there is still low adoption of recommended technologies. The diocesan annual reports on cassava production in the year 2012/2013 indicated that the distribution of improved cassava planting materials and promotion of improved cassava technologies was taught and demonstrated through diocesan agricultural development programmes (DADPs), however, farmers are reluctant to change and still practicing with their traditional ways of growing cassava such as use of local planting materials which are susceptible to pest and diseases. Considering constraints to adoption of improved cassava production technologies this study aims to proffer solutions to the following research questions;

Objectives of the study

The main objectives of this study is to assess the constraints to adoption of improved cassava production technologies in Ogbomosho Agricultural zone of Oyo state while the specific objectives are to;

i. describe the socio-economic characteristics of cassava farmers in the study areas
ii. identify different improved cassava production technologies available in the study area,
iii. identify sources of information on improved cassava production technologies in the area
iv. identify the constraints to adoption of improved cassava productions technologies in the study.

Hypothesis of the study

Ho1:-There is no significant relationship between the cassava farmers' socio-economic characteristics and adoption of improved cassava production technologies.

Materials and Methods

This study was carried out in Ogbomoso Zone of Oyo state. The zone comprises of five local government areas namely: Ogbomoso North, Ogbomoso South, Surulere, Ogo Oluwa, and Orire. Primary data were obtained through the administration of interview schedule which

were used to obtain information from 120 cassava farmers with the use of a multistage sampling technique.

Results and Discussion

Table 1 showed that 24.0% of the respondents were within the age range of 41-50yrs with mean age of 53years, while more than half of the respondents (60.8%) were males and majority (78.3%) of the respondents were married. This implies that the cassava farmers in the study area were active adults and responsible. It was revealed from the table that 40.0% of the respondents had access to secondary school while only 25.0% of them did not have any formal education. This implies that most of the respondents were literates. Majority of the respondents (77.5%) were monogamist, average number (51.7%) of the respondents had household number of between 6-10 persons and majority of the respondents (78.3%) were into farming as their major occupation. The result revealed that 76.7% of the respondents were Christians with 29.1% of the respondents having cassava farming experience of between 1-10 years having 23years as mean years of farming experience. It showed that 50.0% of the respondents were members of farmers group, 47.5% of them did not belong to any social group, 1.7% was members of co-operative societies while 0.8% of the respondents belong to Nigeria Cassava Growers Association. 62.5% of the respondents cultivate cassava on a land area between 1-5 hectares with 6 hectares as mean farm size. The mean cost of production was ₦231,816.67 while the mean total return was ₦366,358.80. Table 2 revealed that majority of the respondents (80.0%) were aware of the use of improved cassava varieties while average number of the respondents (50.0%) were aware of improved plant spacing. However, 56.7% of the respondents were aware of the use of fertilizer while 75.0% of the respondents were aware of pest and diseases indication and control. It was shown that 60.8% of the respondents were not aware of the improved weed management practices, 78.3% of the respondents were not aware of cassava stem multiplication practice and majority of the respondents (72.5%) were aware of mechanization. Table 3 showed that less than half of the respondents 44.0% had their information through mass media, 20.0% had their information through farmers social group 14.2%, 11.7% and 7.5% had their information through Friends/Family, Extension agent and University/College of Agriculture respectively while 2.5% of the respondents had their information on improved cassava production practices through Research Institute. Table 4 showed the level of adoption of improved weed management. It showed that adoption level of improved weed management ranked 1st with the weighted mean score of 2.83, 2nd ranked 1st with the weighted means score of 2.83, 2nd rank was the use of improved cassava varieties with the weighted mean score of 2.55,3rd rank was pest and disease control with weighted mean score of 2.39.

Table 1 Distribution of Respondents According to Socio-economic Characteristics.

Variable	Frequency	Percentage	Mean
Age (Years)			
≤ 20	2	2.0	
21-30	10	8.2	
31-40	20	16.6	
41-50	29	24.0	
51-60	27	22.5	
61-70	11	9.2	
Above 70	21	17.5	53
Sex			
Male	73	60.8	
Female	47	39.2	
Marital status			

Married	94	78.3	
Separated	3	2.4	
Divorced	6	5.0	
Widow/Widower	13	11.0	
Single	4	3.3	
Level of education			
Primary Education	26	22.0	
Secondary Education	48	40.0	
Tertiary Education	16	13.0	
No Formal Education	30	25.0	
Nature of Household			
Monogamy	93	77.5	
Polygamy	27	22.5	
Number of Household/(Persons)			
1-5	51	42.5	
6-10	62	51.7	
11-15	6	5.0	
Above 15	1	0.8	
Major occupation			
Farming	94	78.3	
Civil service	6	55.1	
Trading	10	42.3	
Artisan	10	99.2	
Minor occupation			
Farming	55	45.8	
Civil servant	4	3.0	
Trading	50	42.0	
Artisan	11	9.2	
Religion			
Islam	28	23.3	
Christianity	92	76.7	
Farming experience (Years)			
1-10	35	29.1	
11-20	31	25.8	
21-30	27	22.5	23
31-40	14	11.7	
41-50	9	7.0	
Above 50	4	3.3	
Membership of social group			
No of social group	57	47.5	
Farmer's group	60	50.0	
Nigeria cassava growers	1	0.8	
Cooperative association group	2	1.7	
Land area cultivated (Hectares)			
1-5	75	62.5	
5-10	36	30.0	6.13
Above 10	9	7.5	
Average Cost (₦)			
10,0000-50,000	30	25.0	
51,000-100,000	23	19.0	

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101,000-150,000	10	8.0	
151,000-200,000	13	10.8	231,816.67
201,000-250,000	4	3.2	
251,000-300,000	2	2.0	
Above 300,000	38	32.0	
Average Returns (₦)			
10,000-50,000	13	10.8	
51,000-100,000	17	14.2	366,358.80
101,000-150,000	23	19.2	
151,000-200,000	6	5.0	
201,000-250,000	5	4.2	
251,000-300,000	6	5.0	
Above 300,000	50	41.6	

Source: Field Survey, 2017

Table 2: Distribution of Respondent According to Their Awareness on Improved Practices

Variable (s)	**Yes**		**No**	
	Frequency	Percentage	Frequency	Percentage
Use of improved variety	96	80.0	24	20.0
Improved spacing	60	50	60	50
Use of fertilizer	68	56.7	52	43.3
Pest/ diseases identification And control	75	30	25	
Improved weed management	47	39.2	73	60.8
Cassava stem multiplication	26	21.7	94	78.3
Mechanization	87	72.5	33	27.5

Source: Field Survey, 2017.

Table 3: Distribution of Respondents According to Their sources of Information on Improved Practices

Source of Information	**Frequency**	**Percentage**
On improved practices		
Mass media	53	44.0
Research Institute	3	2.5
University/ College of Agriculture	9	7.5
Farmers' social group	24	20.0
Extension Agent	14	11.7
Friends/ Family	17	14.3

Source: Field Survey, 2017

Table 4: Distribution of Respondents According to Constraints Preventing Adoption of Improved Practices.

	Very Severe Frequency	Severe Frequency	Mild Frequency	Weighted Mean score	Rank
Inadequate Training	73(60.8)	20(16.7)	27(22.5)	2.38	1st
Inadequate credit facility	63(52.5)	31(25.8)	26(21.7)	2.30	2nd
High cost of implementation	44(36.7)	54(45.0)	22(18.3)	2.18	3rd
High cost of improved production	43(35.8)	56(46.7)	21(17.5)	2.18	3rd
Complexity	52(43.3)	26(21.7)	42(35.0)	2.08	5th
Inadequate contact with Extension Agent	39(32.5)	36(30.0)	45(37.5)	1.95	6th
Unavailability of improved planting material	35(29.2)	37(30.8)	48(40.0)	1.89	7th

Source: Field Survey, 2017
(Figures in parenthesis are percentages)

Table 5: Pearson Correlation between Selected Socio-Economic Characteristics and Adoption of Improved Cassava Farming Practices.

		General Adoption Level	Cassava Farming Experience	Total Land Area for Cassava Production	Cost of Production	Return from Production
General Adoption Level	Pearson Correlation	1	-253(**)	.355(**)	-168	-25(**)
	Sig (2 tailed)		.005	.000	.067	.003
	N	120	120	120	120	120
Cassava Farming Experience	Pearson Correlation	-253(**)	1	-.089	.269(**)	.019
	Sig (2 tailed)	.005		.334	.003	.836
	N	120	120	120	120	120
Total Land Area for cassava production	Pearson Correlation	-.089	1	.351(**)	1	.618(**)
	Sig (2 tailed)	-334		.000		.000
	N	120	120	120	120	120
Cost of production	Pearson Correlation	.168	.269(**)	.269(**)	1	.618(**)
	Sig (2 tailed)	.067	.003	.003		.000
	N	120	120	120	120	120
Return from production	Pearson Correlation	.265(**)	.019	.624(**)	.618(**)	1
	Sig (2 tailed)	.003	.836	.000	.000	
	N	120	120	120	120	120

**** Correlation is significant at 0.01 level**

Conclusion and Recommendations

It was concluded that majority of the respondents in the study area were aware of the improved cassava production practices but adopted the practices that were not cost consuming. Also, they continued with the use of some traditional practices. There were many constraints that contributed to their partial level of adoption of some improved cassava production practices which include inadequate training, inadequate of credit facility and high cost of implementation. Also, source from which they got information on improved practices was mass media which means they might not even get the accurate or exact information needed on these improved practices. Therefore, the following recommendations were suggested;

- Extension service delivery should be provided for the farmers through method and result demonstrations of these improved practices to convince them to adopt them.
- Farmers should endeavor to join farmers' cooperatives where they can get loans with minimum interest so that they can practice most or all of the improved technologies.
- Ministry of Agriculture through research centres should make effort to ensure availability of subsidized improved planting materials and other inputs to cassava farmers.

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ASSESSMENT OF FACTORS AFFECTING PROCESSING OF GARI IN YEWA NORTH LOCAL GOVERNMENT AREA OF OGUN STATE

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Abstract
The study assessed factors affecting processing of Gari in Yewa North Local Government in Ogun State. The population of the study comprised Gari Processors. Multi-stage sampling techniques was used to select one hundred and twenty Gari Processors in the study area. Data were obtained using structure interview and described statistically using Pearson Product Moment Correlation Coefficient for the hypothesis. The results revealed that majority (85.8%) of the respondents are female with mean age of 31 years. Christianity and Islam dominated the study area with 50.8%and 48.3% respectively. Furthermore, the household size of the respondents was on average of 3 persons per household; with average of 6 years of Garri processing experiences. Majority(98%) used obsolete equipment in processing Gari. Cooperative societies, personal savings and friends were the major sources of credit to Gari Processors. Inadequate capital(wms=29.18), high cost of transportation (wms=29.17) and unavailability of labour(wms=28.67) were identified as major constraints that faced Gari Processors. There exist a significant relationship between quantity produced per day(r-value=-0189;p-value=0.038 and Processors years of experience(r-value=-0.2501;p-value=0.006). It is therefore recommended that non-governmental organization should assist Gari processors in securing loan to enable them purchase modern processing equipment which will boost production of Gari production.
Key words: Gari, Assessment, Processors, Factor.

Introduction

The Nigeria agricultural sector is characterized by small scale traditional farming methods with very low levels of mechanization and modern technologies leading to low levels of productivity. Abang *et al. (*2000) stated that Nigerians are poor and hungry despite efforts made by various governments improving agricultural productivity and efficiency of the rural farmers who are the major stakeholders of agricultural production. This effort is geared towards programs that will result to effective production. One of such programs is the Root and Tuber Expansion Program aimed at increasing root and tuber crops production. Nigeria produces about 34 million metric tons annually (FAO 2014) most of the cassava produced in Nigeria is consumed locally. And in spite of the fact that Nigeria is the world largest producer, its output falls below total demand for the crop as food, for industry and export. Productivity and Technical Efficiency of Cassava Production in Ogun State, Nigeria Specifically, in the area of Cassava, a Presidential Initiative on Cassava Production and Export was unfolded by Nigerian government in 2002.).

A major and most popular form in which cassava is processed and marketed in Nigeria is Gari (Ebukima et al 2010). Gari can be described as a fermented and roasted granular product from cassava. Gari is obtained from cassava roots after several successive steps: peeling, washing, grating, pressing/fermenting, sieving, and cooking/drying (Eze *et al.,* 2014). Marked variability is observed among traditional Gari, depending on processes used which give the gari different sensory properties (color, particle size, dryness, and sourness.

Garri is mostly taken more than once by most households in the producing areas. Production and processing of cassava into gari is vital as it serve as a source of nutrients and livelihood for many people in Yewa North Local Government Area of Ogun State. Gari is the most commercialized

cassava product as it constitutes about seventy percent of all cassava products. Its wide consumption is attributed to its relatively long shelf life and ease of preparation for consumption. Cassava processed into gari makes the root tuber overcome its main challenge of high perishability; fresh cassava tuber` may not last for more than four days after harvesting.

Statement of Research Problem

Cassava is an annual crop of diverse or numerous uses in tropical region of the world. It is a versatile crop that is very rugged and strives in most environmental or climatic conditions. It is processed into different final products which help to ensure food security of households in the developing country. Gari is a roasted cassava which must have undergone series of processing stages principally to get rid of the poisonous hydrocyanic acid before it can be edible and safe for human consumption. However, the processing of cassava to gari is laborious and energy shaping especially with the use of traditional method of processing. In the same vein, proper processing of gari guarantees a long period of storage. Gari producers are exposed to a number of health hazards such as burns, inhalation of poisonous gaseous materials, contact with cyanic acids, and general body pain. The continuous supply of gari to the public should be guaranteed to ensure food security of the masses, which can be ascertained by increase output through the maximization of the cassava value chain, and breaking the vicious cycle associated with low level of investment, and the use of crude and primitive methods of processing. Credit facility, training and retraining of cassava processor, ensuring enabling environment glamourized with necessary processing and storage facilities are the pivots upon which the efficiency of Gari production hinges. It is in the consideration of the foregoing that this study is poised to provide answers to the following research questions:

Research Questions

1. What are the socio-economic characteristics of the respondents in the study area?
2. What are the equipment used by Gari Processors in the study area?
3 What are the sources of credit available to the Gari Processors in the study area?
4 What are the constraints to cassava processing in the study area?

The general objective of the study is to assess factors affecting processing of Gari in Yewa North Local Government area of Ogun State.

The specific objectives of the study are to;

1. describe the Socio-economic Characteristics of the Respondents in the study area
2. identify the equipment used by Gari Processors in the study area
3. identify the sources of credit available to the processors in the study area
4. identify the constraints to cassava processing in the study area

Methodology

Study Area

The study was carried out in Yewa North Local Government Area of Ogun State. Yewa North is one of the Local Government areas that made up Ogun-State. Its Headquarter is situated at Ayetoro. The Local Government has the bearing of 7.1702° N, 2.8577^0 E.The vegetation distribution is much of rainforest and derived savannah dictated by rainfall pattern that distinctly made the south part mainly forest vegetation and the north derived savannah vegetation. Cassava production has a comparative advantage over other occupation in the study area which makes the local government a reputable area for Gari production.

Population of the study

The population of the study comprised Gari Processors in Yewa Local Government area of Ogun State

Sampling procedure and Sample size

Multi -stage sampling procedure was used to select one hundred and twenty Gari Processors for the study. Stage one involves purposively selection of five political (5) wards out of eleven (11) wards which include: Sunwa ward, Ayetoro ward, Ijoun ward, Igbogila/Ibese ward, Joga-Orile/Ibooro ward. In the second stage, the list of the villages was collected from all the wards making a total of Fifty five wards and thirty percent (30%) of the villages were randomly chosen from the wards. The third stage involves the collection of the list of Gari processors from the village head and from Three hundred and sixty processors, twenty percent (20%) of the Processors was randomly selected in all the villages.

Data Analysis

Both Descriptive and Inferential statistics was used to analyze the data collected. Descriptive statistical tools that was used are frequency count, percentage and mean while inferential statistical tool used was Chi-square, t-test.

Results and Discussion

Socio-economic characteristics of the respondents

Table 1 presented Socio- economic Characteristics of Gari Processors' in the study area. The table revealed that majority (85.8%) of the respondents are female with mean age of 31 years. This implies that Gari processors in the study area are active and energetic to carryout processing activities. Furthermore, majority (67.5%) of the respondents were married while 11.7% of the respondents acclaimed to have been separated from their spouse.

The table also revealed that Christianity and Islam dominated the study area with 50.8%and 48.3% respectively. Furthermore, the household size of the respondents was on average of 3 persons per household; with average of 6 years of garri processing and storage experiences. Meanwhile, the variable on production activities on Gari processing and storage activities shows capital size of production in various size of capacity among the respondents. From the table; 34% of the respondents produce on capital size of #15,000- #50,000 while 1.7% of the respondents produce of capital size of #251,000- #300,000; with average production of 4 bags per day.

Table 1: Socio-economic characteristics of Gari Processors

Characteristics	Frequency	Percentage	Mean
Sex			
Male	12	10.0	
Female	108	90.0	
Age			
18-25	23	19.2	
26-30	51	42.5	
31-35	17	14.2	
36-40	13	10.8	
41-45	16	13.3	31 Years
Marital status			
Married	81	67.5	
Single	25	20.8	
Seperated	14	11.7	

Religion			
Christianity	61	50.8	
Islam	58	48.4	
Traditional	1	0.8	
Educational status			
Primary	7	5.9	
Secondary	73	60.8	
Tertiary	40	33.3	
Household size/ person			
1-3	79	65.8	
4-6	32	26.7	
7-9	9	7.5	3 Person
Capital size of investment			
15,000- 50,000	41	34.2	
51,000-100,000	35	29.2	
101,000-150,000	17	14.1	
151,000-200,000	24	20.0	
201,000-250,000	1	0.8	
251,000-300,000	2	1.7	
Years of experience			
2-5	59	49.2	
6-10	58	48.3	
Above 10	3	2.5	6 years
No of bags produced per day/ 50kg			
> 5	3	2.5	
5-10	58	48.3	
11-20	35	29.2	
21 above	24	20.0	

Field Survey, 2022

Equipment used in Gari Processing by the Gari Processors in the Study Area

As shown in table 2, majority of Gari Processors used obsolete equipment in processing Gari. The result revealed that 96.7%, 100%,100%,98.3%,100%,100% and 86% used obsolete Cassava Grater, Cassava Peeler, Vibration sieve, Gari Fryer, Gari Parker, Hydraulic Press and Sealing machines respectively. This implies that processing of Gari in the study area is cumbersome, energy consuming and time wastage as a result of obsolete equipment in place.

Table 2 Distribution of Respondents According to Equipment used in Gari Processing.

S/N	Equipment	Local/obsolete	Modern
1.	Cassava Grater	116(96.7)	4(3.3)
2.	Cassava Peeler	120(100.0)	0(0.0)
3.	Vibration sieve	120(100.0)	0(0.0)
4.	Gari Fryer	118(98.3)	2(1.7)
5.	Gari Packer	120(100.0)	0(0.0)
6.	Hydraulic Press	120(100)	0(0.0)
7.	Sealing machine	104(86.7)	16(13.3)

Source: Field Survey, 2022
Figures in Parenthesis are in Percentages

Sources of credit available To Gari Processors in the Study Area

Table 3 presented sources of credit available to Gari Processors in the Study area. From the table, majority (91.7%) of the Gari Processors adjudged that they got their credit from cooperative societies. This is followed by Personal Savings (90.8%), Friends(75%) Agricultural banks(66.7%). This implies that Gari Processors got their capital mainly through cooperative societies and their friends.

Table 3: Distribution of Gari Processors according to sources of credit available to them.

S/N	Sources of Credit	Yes
1.	Agricultural Banks	80(66.72
2.	Commercial Bank	35(29.2)
3.	Cooperative Societies	110(91.7)
4.	Friends	90(75.0)
5.	Family/ Relations	45(37.5)
6.	Personal savings	109(90.8)

Source: Field Survey, 2022

N.B: Multiple Responses

Figures in Parenthesis are in percentages

Constraints faced by Gari Processors in the Study Area

As presented in Table 4, the following were identified as major constraints facing Gari Processors In their Processing activities: Inadequate capital was ranked first (wms=29.08),High cost of transportation was ranked 2nd(wms=29.17), unavailability of labour was ranked 3rd (wms=28.67), High cost of Machine was ranked 4th(wms=28.17)

Table 4: Distribution of Constraints faced by Gari Processors in the Study Area

S/N	Variable	Serious constraints	Constraints	Not Constraints	wms	Rank
1.	Inadequate Capital	113(94.2)	6(5.0)	1(0.8)	29.18	1st
2.	High cost of Transportation	111(92.5)	8(6.7)	1(0.8)	9.17	2nd
3.	Unavailability of Labour	104(86.7)	16(13.3)	0(0.0)	28.67	3rd
4.	High Cost of Machine	101(84.2)	16(13.3)	3(2.5)	28.17	4TH
5.	High Cost of Cassava Tubers	84(70.0)	34(28.3)	2(1.7)	26.83	5th
6.	High Cost of Fuel	60(50.0)	56(46.7)	4(3.3)	24.67	6th
7.	Obsolete Equipment	58(48.3)	42(25.0)	20(16.7)	23.17	7th
8.	Inadequate Space for Processing	51(42.5)	54(45.0)	15(12.5)	23.0	8th
9.	Theft/ Pilfering	49(40.8)	4(28.3)	37(30.8)	21.0	9th
10.	Rodents Infestation	27(22.5)	55(45.8)	38(31.7)	19.08	10th
11.	Roof Leakages	15(12.5)	20(16.7)	85(70.08)	14.17	11th

Source: Field Survey, 2022

N.B: Multiple Responses

Test of Significant Relationship Between Selected Socio- economic Characteristics And Constraints Faced by Gari Processors

Table 5 presented PPMC test showing Relationship Between Selected Socio- economic Characteristics And Constraints Faced by Gari Processors. The result revealed a significant relationship between quantity produced per day(r-value=-0189;p-value=0.038 and Processors

years of experience(r-value=-0.2501;p-value=0.006). This implies that Processors' age, households size, Size of investment has nothing to do with constraints facing Gari Processors in the Study area. Therefore we reject the null hypothesis for age households size and size of investment.

Table 5: PPMC Test Showing Relationship Between Selected Socio- economic Characteristics And Constraints Faced by Gari Processors

Variables	r-value	P-Value	Decision
1. Age	-0.097	0.290	NS
2. Household Size	0.170	0.64	NS
3. Size of investment	-0.078	0.395	NS
4. Years of experience	-0.2501(**)	0.006	S
5. Quantity Produce per day	-0189(**)	0.038	S

Source: Field Survey, 2022

** Correlation is Significant at 0.01 level (2- tailed)

NS= Not Significant

S = Significant

Conclusion and recommendation

The Study concluded that Gari Processors in the study area are financially incapacitated and as such they are still using obsolete equipment for Gari processing which is time and energy consuming. It also leads to decrease in production. Also, the cost of transportation is high as a result in hike in fuel price and deplorable condition of road. It is therefore recommended that non-governmental organization should assist Gari processors in securing loan to enable them purchase modern processing equipment which will boost production of Gari production. The Gari processors through communal effort should help to grade the existing road to make it motorable. Also both the government and non-governmental organization should further assist Gari processors to enable them secure loan from both Agricultural and commercial banks at a reduced interest rates.

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PRODUCTION AND PACKAGING OF AFRICAN MEDICATED BLACK SOAP AS AN ENTREPRENEURIAL SKILL FOR ALLEVIATING POVERTY

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Abstract
This study showed the production of African Medicated Black Soap. The main objective is to produce and package African Medicated Black Soap using plantain peel ash and Cocoa pod ash blend with honey and lime juice. The specific objective are to produce chemical from plantain and Cocoa pod ash, to produce African Medicated Black Soap with the chemical produced, blend honey and lime with the product , packaged and subjected to assessment of the respondents acceptability. The plantain peels and Cocoa pod were sundried. The chemical obtained and palm kernel oil were burnt on open fire until thicker. The product was kept for two weeks. Then, honey and lime were blended with the product to incorporate it into Medicated Black Soap. Percentage scores was employed using five (5) hedonic scales to assess the product. It was deduced that (85.0%) agreed that the products were excellently accepted. About (15.0%) agreed that the products were excellently accepted. It can be concluded that African Medicated Black Soap can be used for provision of self employment and entrepreneurial skill for poverty alleviation.
Keyword: Production, Plantain peel, African Medicated Soap

Introduction

African black soap originated in Africa or West African. The soap is made from the of African plants. Those plants are locally harvested because of the ash. It has characteristics black colour. According to Jeanne, (2012), the colour vary from jet black to light brown depending on the ingredients used in making soap. Black soap contains leaves and bark from plantain, Shea tree barks, Cocoa pod and palm kernel oil. Then slowly roasted in a kettle pot according to the size want and then various oil (palm oil, coconut oil,shea butter oil and palm kernel oil) are stirred in to the mixture, steep and allowed to cool at least two (2) weeks before use.

Klaus and Kurt,(2005), discovered that black soap are brown or jet brown with high glycerin contents. It can absorbed water quickly, and it should be stored in plastic bag or other dry containers and some other dry area in the shower or tub.

(Amfani 2017), deduced that in homemade soap, the glycerin is left, as an emollient (skin softener) and adds nice feel to the soap. The black soap made with plantain peels contain a high concentration of iron along with Vitamin A and E. Plantain peel comes with many internal and external benefits, and that's why it can be used to treat skin disorders and defects, such as wrinkles, skin allergies, acne and reduction scaring.

In some areas, they use cocoa pod rather than plantain. But when plantain peel ash and cocoa pod ash are mixed together, the soap produced is usually excellent for treating acne, pimples and other skin diseases with it's properties. (Hofecker, 2017).

In Ghana, this kind of soap is usually made by women, and it is fairly -traded. Recipe that is used for making this kind of soap handed down for generations of people in Africa. There are different types of recipe for a black soap depending on the tribe that making it, and they keep it a secret. and resulted in different colour variations in the soap produced. (Bella on line 2010).

Honey has high level of monosaccharides, fructose and glucose and it contains about 70 to 80 percent sugar, which provides it's sweetness. Honey also has an antiseptic and antibacterial properties. Modern medical science has managed to find the uses of honey in chronic wound

management and combating infections. This management knowledge center article includes a brief history of honey. Honey is linked to wound healing properties and antibacterial actions. It has been used for medicine over five thousand years (5000yrs). Honey makes black soap to smooth and soothes skin thereby serve as medicated agents and also, lime extract is useful in removing blemishes and dark (Klaus and Kurt, 2005).

Statement of Problem

It has been discovered that plantain peels are thrown away after the consumption of plantain. Also, people don't health benefits of plantain peels and lime extract in fighting skin diseases. Therefore, the study uses plantain peels and Cocoa pod to process African black soap and blend with honey and lime juice in the production of African Medicated Black Soap instead of using refined Medicated Soap.

Materials and method

Local palm kernel oil, chemical (Aro produced from plantain peels ash and cocoa pod ash),honey and lime juice.

Production of chemical

Plantain peels and cocoa were sun dried and burnt into ash. The ash obtained was mixed with water and the liquid extracted through filtration was soaked thoroughly to obtained chemical.

Method of African black soap

Dilute the chemicals obtained from cocoa pod ash and plantain peel ash with palm kernel oil, burn on open fire till it's become thicker. Allowed to cool for at least two (2) weeks

Method of African Medicated Black Soap

Add pure honey into the product produced in a mortal. Mash it with pestle until the honey was well blended with the black soap. Add lime extract/juice to it and mash. Package the product produced.

Parameter	Score	Colour	Appearance	Texture	Usefulness	Overall acceptability
Excellent	5	11 (55.0%)	15 (75.0%)	16 (80.0%)	16 (80.0%)	17 (85.0%)
Very good	4	9	5	4	4	3
Good	3	-	-	-	-	-
Better	2	-	-	-	-	-
Bad.	1	-	-	-	-	-

The table shows that (55.0%) respondents rated harmoniously in Colour excellency, (45.0%) rated it to be very good. It also assessed that (75.0%) respondents agreed that the appearance were pleasing, (25.0%) believed that it's very good.The result indicated that (80.0%) respondents agreed that the texture were firm, (20.0%) believed it to be good. It further indicated that (80.0%) respondents agreed that the products to be useful, (20.0%) agreed to be good. Hence, it can be deduced that (85.0%) agreed that the products were excellently accepted, (15.0%) agreed that the products to be good.

Conclusion

From the result, it can be concluded that African Medicated Black Soap had good characteristics measure in terms of vibrant colour, appealing appearance and overall acceptability from the respondents. Therefore, African Medicated Black Soap can be used as an entrepreneurial skill in alleviating poverty.

Recommendation

From the findings, it can be recommended that people should be encouraged and trained on the production of African Medicated Black Soap. Also, further research should be carried out on the production of African Medicated Black Soap.

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UTILIZATION OF BIOCHAR TECHNOLOGY AS SOIL AMENDMENT BY ARABLE CROP FARMERS IN IBARAPA CENTRAL LOCAL GOVERNMENT AREA OF OYO STATE

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Abstract
Agriculture is an important aspect of the lifestyle in rural areas and the role of agricultural resources in sustainable development in Nigeria has been positively established. The application of biochar to the soil by converting organic waste is now one of the new eco-friendly management tools worldwide. This study therefore examined the utilization of biochar technology as soil amendment by arable crop farmers in Ibarapa Central Local Government area of Oyo State, Nigeria. Multistage sampling technique was used to select 120 arable crop farmers for this study. A well-structured interview schedule was used to collect the data, which was then subjected to descriptive and inferential analysis. The results revealed that majority of the respondents were male, married with secondary education. Also, farming was the primary occupation of the respondents with mean household size, farm size and income from arable crop farming estimated at 8 persons, 7.5 hectares and ₦86,450.90 respectively, Majority 93.3% of the respondents were aware of biochar technology, have access to it and utilized biochar technology for soil amendment. Also, few of the respondents utilized biochar technology occasionally while majority of the respondents made used of biochar for soil amendment frequently. The result of Pearson Product Moment Correlation analysis revealed that age ($r = 0.410$, $p<0.05$), household size ($r = 0.230$, $p<0.05$), farm size ($r = 0.297$, $p<0.05$), farming experience ($r = 0.561$, $p<0.05$) exerted a significant relationship with the utilization of biochar technology as soil amendment. The study recommends that extension services should create awareness on utilization of biochar technology by offering services especially in area of adoption of biochar technology as source of soil amendment.
Keywords: Utilization, Biomass, Biochar Technology and Arable Crop farmers.

Introduction

Agriculture is an important aspect of the lifestyle in rural areas and the role of agricultural resources in sustainable development in Nigeria has been positively established. Due to the availability of a rich tropical rainforest in Nigeria, biomass resources are abundant (Adeniyi, 2016). Furthermore, the differences in the weather and climate in the northern and southern parts of the country ensure that a wide variety of crops can be cultivated. Biomass is the oldest source of energy to humans and was once the global energy source before the advent of oil and electricity (Oladele *et al.*, 2016). Biochar is the solid residue obtained from the thermo chemical processing of biomass (Oladele *et al.*, 2016). Biochar is a carbon-rich (65–90%) material that possesses a porous structure of char particles (Ighalo and Adeniyi, 2018). This enhances its water-retaining capacity, nutrient retention of soil, as well in microbial accumulation. Biochar can be used for agricultural and environmental applications. The use of fertilizer is deemed not too advantageous for tropical soils because it induces acidity and nutrient imbalance (Adeniyi, 2017). Biochar is favoured because besides stimulating soil

fertility, it can assist in the stabilization of nutrients in the soil to prevent leaching. It also favours soil microbial activities. Besides its use for soil amendment and conditioning, biochar has other environmental applications. It can be used as a sequestrate of carbon in the soil for the mitigation of climate change (Adeniyi, 2017). It can also be used for water treatment applications as an adsorbent of pollutants (Adeniyi, 2017). Attention must be paid to biochar as it has the potential of ameliorating food insecurity environmental pollution and promoting sustainable development. The application of biochar to the soil by converting organic waste is now one of the new eco-friendly management tools worldwide (Adekiya *et al.*, 2020). Biochar is a C-rich organic material that has undergone the pyrolysis process of biomass thermal decomposition when heated to temperatures usually between 300 °C and 1000 °C under low oxygen concentrations (Nwone *et al.*, 2019). Used as a soil amendment, biochar can recover soil fertility and plant growth, improve C sequestration, assist waste management, and immobilize pollutants (Lonappan *et al.*, 2018). Biochar has a high surface area and high organic matter. It is therefore an appropriate habitat for soil micro- and macro-organisms. It can therefore increase soil biota by improving soil quality (Ogunyemi *et al.*, 2018) and improving the output of the farmers at long run. In view of these, the following research questions were answered;

1. What are the socioeconomic characteristics of the respondents?
2. Are the arable crop farmers aware of biochar technology as soil amendment material or not?
3. Are the arable crop farmers have access to biochar technology in the study area?
4. Are the respondents able to utilized biochar technology as soil amendment or not in the study area?
5. What are the factors influencing utilization of biochar technology by arable crop farmers?

Objectives of the study

The broad objective is to analyze the utilization of biochar technology as soil amendment by arable crop farmers in Ibarapa Central Local Government area of Oyo State.

The specific objectives are to:

1. describe the socioeconomic characteristics of the respondents?
2. ascertain whether arable crop farmers are aware of biochar technology as soil amendment material or not
3. investigate arable crop farmers have access to biochar technology in the study area
4. examine whether the respondents utilized biochar technology as soil amendment or not in the study area
5. identify factors influencing utilization of biochar technology by arable crop farmers in the study area

Hypothesis

The hypothesis of the study were stated in null form as follows

HO: There is no significant relationship between the selected socioeconomic characteristics of the respondents and the utilization of biochar technology by arable crop farmers.

Research methodology

The study was carried out in Ibarapa Central Local Government area of Oyo state, Nigeria. Ibarapa Central Local Government area which has it headquarter in the town of Igboora covers about 440km^2 derived from the savannah to west of Ibadan, the Ogun and Oyan rivers from its eastern and western boundaries respectively, between approximately 7.33^o latitude, 3.0^o longitude with a population of 102,979 at the 2006 census (Awoyemi-Kolade, 2011). Multistage sampling procedure was used to select 120 arable crop farmers.

1st Stage: Ten wards (10) in the study area were purposively selected (7 wards in Igboora and 3 wards Idere).
2nd Stage: Simple random sampling technique was used to select one (1) out of three (3) wards in Idere and three (3) out of seven (7) wards in Igboora, making four wards.
3rd Stage: Random selection of thirty (30) respondents from each wards making one hundred and twenty (120) respondents for this study.

Results and discussion

Socioeconomic characteristics of arable crop farmers

The socioeconomic characteristics of the respondents were presented in Table 1. The results shows that 11.7 percent of the respondents were less than 30 years, 16.7 percent of the respondents fall within the age range of 30 - 40 years, 60.0 percent was in the age range of 41 - 50, 4.2 percent fall within the age range of years 51 - 60 with mean age estimated at 47 years. This implies that majority of the respondents are in their active age (productive age) and are expected to perform more effectively within the available resources.
In terms of their marital status, majority (70.8 percent) of the respondents are married while 10.0 percent and 12.5 percent of them are single and widowed, respectively. In terms of household size as shown in Table 1, 20.8 percent of the respondents have household size of less than 5 while 62.5 percent have household size between 5-10 and 16.7 percent of the respondents have household of more than 10 members with mean household size of 8.
The result also revealed that farming (62.5 percent) is the major primary occupation of the respondents, 1.7 percent, 25.0 percent and 10.8 percent of respondents engage in trading, artisan and civil servant as their primary occupations respectively. Also, majority 66.7 percent of the respondents cultivate between 5-10 hectares of land with mean farm size of 7.5ha. The finding also revealed that majority 60.8 percent realize above ₦800,000 from arable crop production while slightly above average of the respondents 52.5 percent had secondary education in the study area.

Table 1: Socioeconomic characteristics of the respondents (n = 120)

Variable	Frequency	Percentage	Mean
Age			
Less than 30	14	11.7	
30 - 40	20	16.7	
41 – 50	72	60.0	47
51 – 60	5	4.2	
Above 60	9	7.5	
Marital status			
Single	12	10.0	
Married	85	70.8	
Widowed	15	12.5	
Divorced/Separated	8	6.7	
Sex			
Male	85	70.8	
Female	35	29.2	
Primary Occupation			
Farming	75	62.5	
Civil servant	2	1.7	
Artisan	30	25.0	
Trading	13	10.8	
Farm Size (Ha)			

>5	12	10.0	
5 – 10	80	66.7	7.5
<10	28	23.3	
Income from farming (₦)			
>400,000	10	8.3	
400,000 – 800,000	37	30.8	
>800,000	73	60.8	
Household size			
Less than 5	25	20.8	
5 – 10	75	62.5	8
Above 10	20	16.7	
Educational Level			
No formal	30	25.0	
Primary	22	18.3	
Secondary	63	52.5	
Tertiary	5	4.2	

Source: Field Survey, 2022

Awareness of Biochar technology as soil amendment and Access to Biochar technology by arable crop farmers.

The distribution of respondents according to awareness of biochar technology as source of soil amendment and accessibility of biochar technology were presented in Table 2. Majority (99.3 percent) of arable crop farmers in the study area were aware of biochar technology as soil amendment while 6.7 percent of them were not aware of soil amendment properties of biochar technology in the study area. Also, distribution of arable crop farmers in the study area based on their accessibility of biochar technology revealed that majority (87.5 percent) of them reported they had access to biochar technology while only 12.5 percent of them reported to have no access to biochar technology in the study area. The result implies that respondents were aware and have access to biochar technology as soil amendment in the study area.

Table 2: Distribution of respondents based on their awareness and access to Biochar technology as soil amendment.

Awareness of Biochar technology	**Frequency**	**Percentage**
Yes	112	99.3
No	8	6.7
Access to Biochar technology		
Yes	105	87.5
No	15	12.5
Total	**120**	**100.0**

Source: Field Survey, 2022

Utilization of Biochar technology by arable crop farmers in the study area.

Table 3 revealed that distribution of respondents based on utilization of biochar technology and the level of utilization of biochar technology for soil amendment in the study area. Majority (87.5 percent) of the respondents utilized biochar technology for soil amendment in the study area while 12.5 percent of them claimed not to utilized biochar technology Furthermore, distribution of the respondents based on level of utilization of biochar

technology as soil amendment revealed that majority (66.7 percent) frequent used biochar technology as sources of soil amendment, 20.8 percent just used biochar technology occasionally as soil amendment while 12.5 percent of the respondents never made used of biochar technology. The result implies that respondents utilized biochar technology for soil amendment in the study area.

Table 3: Distribution of respondents based on utilization of Biochar as soil amendment.

Utilization of Biochar technology	**Frequency**	**Percentage**
Yes	105	87.5
No	15	12.5
Level of utilization of Biochar technology		
Frequently	80	66.7
Occasionally	25	20.8
Never	15	12.5
Total	**120**	**100.0**

Source: Field Survey, 2022

Crops which soils are treated with Biochar technology in the study area.

Table 4 revealed the distribution of respondents based on the crops with which their soils are treated with biochar technology in the study area. Majority (87.5 percent) of the respondents treated soil of maize with biochar technology, 70.8 percent, 12.5 percent, 66.7 percent, 6.7 percent, 4.2 percent and 39.2 percent of arable crop farmers in the study area claimed to used biochar technology to amend the soil of cassava, yam, sweet potato, vegetable, cowpea and watermelon planted respectively. The result implies that respondents treated their farm with biochar technology during production.

Table 4: Distribution of respondents based on crops which soils are treated with Biochar technology.

Crop*	**Frequency**	**Percentage**
Maize	105	87.5
Cassava	85	70.8
Yam	15	12.5
Sweet Potato	80	66.7
Vegetable	8	6.7
Cowpea	5	4.2
Watermelon	47	39.2

Source: Field Survey, 2022
***Multiple responses**

Factors influencing utilization of Biochar technology by arable crop farmers in the study area.

Table 5 revealed the distribution of respondents based on perceived factors influencing biochar technology utilization for soil amendment in the study area. The result showed that 66.7 percent, 65.0 percent and 59.2 percent claimed that inadequate knowledge about biochar technology, lack of extension services on biochar technology and poor access to biochar technology constituted to factors affecting biochar technology utilization as soil amendment in the study area respectively. Also, 75.0 percent of them reported that inadequate agricultural research is a factor affecting biochar technology utilization while 70.8 percent and 86.7 percent of arable crop farmers in the study area perceived that comparative advantage of

biochar technology to other soil amendment methods and lack of general awareness about biochar technology as soil amendment in the study area, respectively. The result implies that all the aforementioned factors influence utilization of biochar technology as soil amendment in the study area.

Table 5: Distribution of arable crop farmers based on factors influencing Biochar technology utilization by arable crop farmers.

S/N	Factors influencing Biochar technology utilization	Yes		No	
		Frequency	**Percentage**	**Frequency**	**Percentage**
1	No adequate knowledge about biochar technology	80	66.7	40	33.3
2	Lack of extension services on biochar technology	78	65.0	42	35.0
3	Poor access to biochar technology	71	59.2	49	40.8
4	Lack of adequate agricultural research	90	75.0	30	25.0
5	Comparative advantage of biochar technology to other soil amendment methods	35	29.2	85	70.8
6	Lack of general awareness about biochar technology as soil amendment	16	13.3	104	86.7

Source: Field Survey, 2022

Test of hypothesis

The hypothesis of the study was stated in null form.

HO: There is no significant relationship between selected socioeconomic characteristics of the respondents and the utilization of biochar technology by arable crop farmers.

The test of significant relationship of between selected socioeconomic characteristics (age, household size, income, farm size and farming experience) of the respondents and the utilization of biochar technology by the respondents was presented in Table 6. Pearson Product Moment Correlation analysis revealed that age ($r = 0.410$, $p<0.05$), household size ($r = 0.230$, $p<0.05$), farm size ($r = 0.297$, $p<0.05$), farming experience ($r = 0.561$, $p<0.05$) exerted a significant relationship with the utilization of biochar technology as soil amendment in the study area. Therefore, the null hypothesis was rejected. The result implies that Age, household size, farm size and farming experience influence the utilization of biochar technology in the study area.

Table 6: Summary of Pearson Product Moment Correlation analysis showing relationship between selected socioeconomic characteristics of the respondents and the utilization of Biochar technology (n=120)

Socio-economic characteristics	r-value	p-value	Remark
Age	0.306	0.011	S
Household Size	0.311	0.021	S
Income	0.067	0.117	NS
Farm Size	0.297	0.016	S
Farming Experience	0.561	0.022	S

S = significant; NS = not significant
Source: Field Survey, 2022

Conclusion and recommendations

The study concluded that majority of the respondents were male, married with secondary education. Also, farming was the major primary occupation of the respondents in the study area with mean household size, farm size and income from farming estimated at 8 persons, 7.5 hectares and ₦86,450.90 respectively. Majority of the respondents were aware of biochar technology, have access to it and utilized biochar technology for soil amendment in the study area with few of the respondents utilizing biochar technology occasionally while majority of the made used of biochar technology for soil amendment frequently. Based on these findings, it was recommended that extension services should create awareness on utilization of biochar technology by offering services especially in area of adoption of biochar technology as source of soil amendment.

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IS CONCEPTION OF TWINS ABSOLUTELY DEPENDS ON OKRA LEAF CONSUMPTION ALONE IN IBARAPA CENTRAL LOCAL GOVERNMENT AREA OF OYO STATE?

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Abstract
The study examined if conception of twins in Ibarapa Central Local Government of Oyo State solely depends on okra leaf consumption. The data for this study was obtained with aid of interview guide. Descriptive statistics and multiple regressions were used to analyze the included variables. The results show no gender discrimination against okra leaves consumption, the respondents were elites, young adults, 50% of consumers were married with moderate household size, 54.7% of the respondents were farmers. About 77% preferred fresh Okra leaf while 13.3% didn't consume Okra leaf (health reasons inclusive) and average price of okra leaves bought weekly per family was ₦92.60k. The close substitute for okra was *Corcorus olitorus*, 55.8% of the respondents consume it as substitute and 62.18% of the respondents believed that consumption of okra induces conception of twins in the study area. Multiple regression result revealed that okra leaves price, health factor consideration, income, family preference and okra leaves consumption were statistically significant variables that influenced okra leaves consumption. Therefore, it is recommended that health workers should embark on sensitization program to enlighten the citizens of ibarapa central local government on the detail health benefits of okra consumption beyond the tradition and cultural reasons.

Keywords: Consumption, Abelmoschus esculentum, Twins, Ibarapa and Oyo state

Introduction

Okra (*Abelmoschus esculentum*) is an attractive vegetable plant that belongs to the genus *Abelmoschus*, family *Malvaceae*. Okra is one of the important annual crops in the tropical and sub-tropical regions, (Habtamu, *et al.*, 2015). It is a multipurpose crop valued for its tender leaves and pods. The leaves, fruits or pod and flowers of okra are use to prepare wide range of delicacies consumable worldwide. The utilities of okra across globe has place a premium that cannot be overemphasized economically, nutritionally and culturally, (Onuwa, *et al.*, 2022).

Economically, global production of okra has been estimated as 6 million tons annually and 500,000 to 600,000 tons as annual output has been reported to be from West Africa (Onuwa, *et al.*, 2022 and Bamire and Oke, 2003). Okra attracts higher premium market value during dry season when most of vegetables are not available (Philip, *et al.*, 2019). These are the evidences that okra serves as an important economics crop both to the farmers and for households' food consumption worldwide. Also, okra is considered good for production of animal feeds; okra leaf mucilage is suitable for medicinal and industrial application. Okra is useful in confectionary among other uses (Bakhru, 2003).

Nutritionally, Okra's content is very rich in fibre, remarkable vitamins and mineral with a unique protein profile (McGuire and Beerman, 2012). It has been reported that Okra contains vitamin K that aids blood clotting and prevents excessive bleeding and also play a positive role in bone health. (Alexandra *et al*, 2015 and *Wyatt et al.*, 2014) submitted that okra

contains almost 40% of the daily value of vitamin C that is essential for normal growth and development in the body, maintaining and repairing tissues, including: skin, teeth, and bones

Culturally, in Western part of Nigeria okra leaf is widely consumed with high premium by Ibarapa people because they believe that eating okra leaf increasing high tendency of giving birth to twins and this seems to be evident among Ibarapa ethnics because hardly could one get to a household in Igboora without seeing a set of twins. The indigenous believes is that consumption of okra leaves locally known as (Ilasa) is capable of making woman give birth to twin and for this motive they give preference to okra leaf consumption more than any other soups. But after a careful study of existing litereature, it is clearly revealed that okra leaf is not only meant for giving birth to twin but there are some nutritive value that can be derived from okra leaves.

The necessity for this study emanated from dearth of empirical based information observed aftermath of thorough search for okra consumption related studies in the study area. Therefore the general objective of this study is to identify other factors that influence consumption of okra leaf asides traditional belief of conception of twins in Ibarapa central local government area of Oyo State. The specific Objective include; description of the socio-economic characteristics of people in the study area and to determine the factors influencing consumption of Okra leaves in the study area.

Research methodology

Study Area

This study was carried out in Ibarapa Central Local Government area of Oyo State. This made up of two major towns which are (Igboora and Idere) and rural settlements. The area has an area of 440km^2 and population of the area according to 2006 census population is 102,979, latitude 3.30^{o}S and longitude 9.40^{o}N. The area shares boundaries in the North and East by Ayete and Ibarapa north local Government Areas, respectively. Also, share boundaries with Abeokuta, Ogun State in the South and Benin Republic in the west.

The rainfall pattern in the area follows a tropical type with an average annual rainfall ranging from 1000mm to 1430mm and temperature of 27^{o}C to 32^{o}C. This gives the area the opportunity to have two main seasons which are dry seasons which start from December to February and the raining season which start from March/April to October/November their major occupation is farming.

Data Collections

Data used for this research study was of primary origin. A structure questionnaire was administered to the respondents through Interview schedule and observation. This is to ensure adequate, accurate and quality of all variables required. A random sampling technique was used to select fifteen (15) respondents from each of the 10 wards. The data collected was subjected to rigorous data cleaning exercise and this end up with a total sampled population of one hundred and twenty (120) respondents in the final analysis of this study.

Analysis of data

The data collected was subjected to both descriptive statistics and inferential analysis. Descriptive statistics performed include; frequency count, percentage, mean and standard deviation. Multiple regression model is the inferential analysis tools employed.

Multiple regression models:

$Y = \beta o + X_1\beta_1 + X_2\beta_2 + X_3\beta_3 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots + \mu$

Where

Y	=	Amount spent on consumption of okra leaf per month
βo	=	Constant
X_1	=	Sex (male=1, female = 0)
X_2	=	Age (years)
X_3	=	Education (formal=1, none-formal =0)
X_4	=	Marital Status (married =1, otherwise = 0
X_5	=	Family size (number is family)
X_6	=	Primary Occupation
X_7	=	Consume okra leaf
X_8	=	Okra leaf Price
X_9	=	Traditional belief
X_{10}	=	Health Factor
X_{11}	=	Family preference
X_{12}	=	Easy to prepare
μ	=	error term

Results and discussions

The results of descriptive statistics of socioeconomics characteristics of the respondents sampled are on Table 1. The results revealed that 52.5% of respondents were male and 47.5% were female. This implies there is no gender discrimination against okra consumption among the inhabitants in the study area. The frequency distribution of age of the respondents revealed that 55% of the respondents were below 33 years, 29% were between 33 to 53 years of age while the remaining 16% of the sampled population were above 53 years of age. The mean age for respondent was about 38 years with standard deviation of 5 years. The summary of the analysis of respondents ages implies that respondent in the study area were young adults. The implication of the result is that the inhabitants were in their active and reproductive stage of their life cycle. The empirical analysis of the educational qualification of the sampled populations show that 39% of the household had higher educational qualification while 45% have at most secondary educational qualification and 14.17% were with none-formal education in the study area. It could be inferred that the majority of the respondents in the study area were elites and this could contribute to their improved living standard.

Generally, marital status could induce some influence on consumption; therefore, the distribution of marital status of the respondents on okra consumption was examined. The analysis of this study show that more than 50% of okra leaves consumers were married and close to 39% were singles, while 13.33% were either divorced or widow. The results affirmed that being married has influence on okra consumption in the study area.

Household size is also a key factor that could influence consumption of a given commodity, specifically; the distribution of household size was analyzed among sampled population in relation to okra consumption in the study area. The result revealed that household with maximum of 5 people was 52.13%, 39% were having between 6-9 household population while 8.55% of the respondent had more than 9 persons per household in the study area, the average household size was about 6 with standard deviation of 2, it could be deduced that majority of the respondents in the study area kept moderate household size.

According to outcome of the primary occupation analysis, 54.7% of the respondents were primarily farmers while 45.34% were none-farming households. The results of primary occupation revealed diversification in the sources of livelihood among the population sampled of the study area.

Okra Leaf consumption parameters

Generally it is assumed that all inhabitants of the study area do consume okra leaves. Empirically, to validate this assumption, this study examined the population sampled size of the households as related to consumption of okra leaves in the study area. The result showed that 86.7% of the respondents consumed Okra leaves, while 13.3% didn't consume Okra leaf at all. The reasons for none consumption of okra leaves was further probed and the result show that 62.50% did not like okra at all and 37.5% do not consume okra for health reasons. There are two principal dimensions by which okra leaves could be prepare for consumption: either fresh or dried. Therefore, this study examined the form that takes most preference among the respondents in the area. Majority, (about 77%) of the people in Ibarapa preferred fresh Okro leaf when compare to dried (3.85%) or consumed both (19.23%). The distribution of amount spent on okra leaves shows that larger proportion (65.38%) of the respondents spent ₦ 20 – ₦100, 26.92% spent ₦ 120 – ₦250 and about 8% spent more than > ₦250. Also, amount spent by a typical household in the study area was ₦92.60 with standard deviation of ₦15.50. It worth noting that amount spent on okra leaves varies with households' size and seasons of the years. Usually, larger household size and dried season tend to increase amount spent on vegetable generally and okra specially.

Table 1: Socioeconomic Profile of Respondents in the Study Area

Variable	Frequency	Percentage	Mean
Sex			
Female	57	47.50	
Male	63	52.50	
Total	**120**	**100**	
Age			
<26	38	31.67	
26-35	28	23.33	
36-45	15	12.50	37.7±5
46-55	20	16.67	
>55	19	15.82	
Total	**120**	**100**	
Educational Level			
Primary School	22	18.33	
SSCE	32	26.67	
Higher education	47	39.00	
Professional Qualification	2	1.67	
None-formal education	17	14.17	
Total	**120**	**100**	
Marital status			
Single	43	38.83	
Married	61	50.83	
Divorced/Separated	6	5.00	
Widow/Widower	10	8.33	
Total	**120**	**100**	
Religion			
Christianity	80	66.67	
Muslim	30	25.00	
Traditional	10	8.33	
Total	**120**	**100**	
Family Size			

2 – 5	63	52.13	
6 – 9	47	39.32	5.85
>9	10	8.55	
Total	**120**	**100**	
Primary Occupation			
Farming	66	54.66	
Non Farming	54	45.34	
Total	**120**	**100**	

There are substitutes for okra consumption and this study stated some of other vegetables that people in the study area do substitute for okra. The results show that 55.8% of the respondents consumed *Corcorus olitorus*, 34.17% Amaratus, 8.33% Celosia, while 1.6% other vegetables as substitute. The traditional and cultural belief that consumption of okra induces conception of twins in the study area was also investigated. The results indicate 37.82% of the respondents disagreed to belief of giving birth to twins through consumption of Okra leaf while 62.18% agreed. This findings affirmed the traditional and cultural belief of Ibarapa citizens that consumption of okra leaves has been the origin for usual twins' birth in their domain.

Table 2: Distribution of okra consumption parameters

Variable	Frequency	Percentage	Mean
Okra Leaf consumption			
No	16	13.33	
Yes	104	86.67	
Total	**120**	**100**	
Reasons for none consumption			
It cause stomach ache	6	37.50	
I don't like it	10	62.50	
Total	**16**	**100**	
Forms of okra leaves consumed			
Dried only	4	3.85	
Fresh only	80	76.92	
Both	20	19.23	
Total	**104**	**100**	
Amount spent on okra leaves			
₦ 20 – ₦100	68	65.38	
₦120 – ₦250	28	26.92	₦92.60±15.50
₦300 –above	8	7.70	
Total	**104**	**100**	
Time prepared okra leaf per weeks			
1 – 3	94	90.38	
4 Above	10	9.62	
Total	**104**	**100**	
Substitute for okra leaf			
Corcorus olitorus	67	55.83	
Amaratus	41	34.17	
Celosia	10	8.33	
Other	2	1.67	
Total	**120**	**100**	
Time Prepared other veg. per week			

1 – 3	116	88.33
5 -6	4	11.66
Total	**120**	**100**
Belief of giving birth to twins		
No	46	37.82
Yes	74	62.18
Total	120	100

Regression analysis on okra leaves consumption

The second objective of this study is to determine the factors influencing consumption of Okra leaves in the study area. In other to achieve this, some relevant variables were selected and subjected to multiple regression model analysis. The result of the multiple regression model are show on table 3. The coefficient of determination for the model was found to be 0.60. This implies that included variables in the regression model accounted for 60% variation in the level of okra consumption in the study area, while the remaining accounted for exogenous variables, that is, variables that were not captured in the model.

Also, multiple regression result revealed that okra leaves price was statistically significant at 1%, health factor consideration was statistically significant at 5% level while income, family preference and okra leaves consumption were statistically significant at 10% level. It worth noting that all variables were positively and statistically significant related to okra leaves consumption except okra price that was negatively related to okra leaves consumption. The implication of okra price being negatively related to consumption is that okra leaves is normal goods.

Moreover, most families in the study area take preference for okra leaves consumption and health benefits consideration has been identified as a key factor influencing okra consumption. It has been reported that okra consumption has many nutritive values. Okra's content aids blood clotting and prevent excessive bleeding and also play a positive role in bone health. Also, okra is very rich in fibre, vitamins, mineral and protein (Alexandra *et al.*, 2015, Wyatt *et al.,* 2014 and McGuire and Beerman, 2012).

Table 3: Result of multiple regression on okra leaves consumption

VARIABLE	COEFFICIENT	T-VALUE	P>/T/
Sex	-26.14429	-0.77	0.444
Age	.7283501	0-52	0.601
Education	2.867875	0-29	0.770
Marital Status	-7.498011	-0.23	0.817
Family Size	-6.831884	-1.08	0.283
Primary Occupation	7.673767	0.41	0.683
Consume okro leaf	94.92859	1.73	0.087*
Okro leaf price	-129.3886	-3.31	0.001***
Traditional belief(birth twins)	24.25668	0.66	0.508
Health Factors	97.90202	2.44	0.016**
Family Preference	62.066726	1.69	0.094*
Income	.2614612	1.79	0.076*
Constant	8.555739	0.08	0.935
R^2 = 0.63			
AdjR^2 = 0.60			

*, **, *** represent 10%, 5% and 1%

Summary, Conclusion and Recommendation

The summary of findings of okra leaf consumption in Ibarapa Central Local Government of Oyo State is thus; no gender discrimination against okra leaves consumption, the respondents were elites, young adults, married with moderate household size and the respondents were mostly farmers. Majority (77%) preferred fresh Okra leaves while some didn't consume Okra leaves for health reasons and average price of okra leaves was ₦92.60k. *Corcorus olitorus* was found to be major substitute for okra and 62.18% of the respondents believed that consumption of okra induces conception of twins in the study area. Inferential analysis revealed that okra leaves price, health factor consideration, income, family preference and okra leaves consumption influenced okra leaves consumption. Therefore, it is recommended that health policy stakeholders should embark on sensitization program to enlighten the citizens of Ibarapa central Local Government on the detailed health benefits of okra consumption further than the tradition and cultural reasons.

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ASSESSMENT OF PRESERVATIVE ACTIVITIES AMONGST FOOD GRAIN SELLERS IN OYO STATE, NIGERIA

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Abstract
Food security of any nation hinges on food availability, food affordability and food accessibility/utilization. Therefore, different people perform different roles in an attempt to make food available to the citizenry. Therefore, this study assessed preservative activities amongst food grain sellers in Oyo State, Nigeria. Multistage sampling procedure was used to select 120 food grain sellers. The results revealed that 65.5% of the respondents were female which made the food grain selling to look like a female dominated occupation. All (100%) food grain sellers asserted that pest control prevented re-infestation of insects in the storehouse. Majority (99.2%) engaged in preservative activities by using chemical such as DD force, Snipers, Actellic dust, phostoxin and DDVP on their food grains to prevent insect attack. There was a significant relationship between sex (χ^2 = 5.592,pv = 0.002); marital status (χ^2 = 2.161, pv = 0.001); marketing/selling experience (r = 0.416, pv = 0.000) and preservative activities among food sellers in the study area. It was recommended that there should be persistent and vigorous campaigns in various markets to discourage the use of chemical preservation of food materials.
Key words: Food, grain sellers, preservation

Introduction
A country that would have sustained food security must duly satisfy the three major components that are strictly attached to food security. These are food availability, food affordability and food utilization/accessibility on sustainable basis. In the pragmatic efforts of making food available to the consumers, there are different actors playing different roles. While farmers produce, sellers oversee that the produce is available and presented to the consumers in a form that is not inimical to their health. However, there are series of problems hampering the smooth activities of the sellers after procuring the produce from the farmers. In particular is the insect attacks which reduce both the quality and quantity of produce available in the market for sale. This was corroborated when Mobolade, Bunindro, Sahoo and Rajashekar (2019) asserted that great amount of cereal is being destroyed. Hence, the sellers therefore, always make conscious efforts so that their commodities are not spoilt by preventing the insects, through whatever means at their disposal to reduce the menace of insect attacks on their wares. In their desperation to secure the quality and quantity of commodities from the havoc of insects, sellers applied various preservative endeavours to protect their produce. Therefore, this study assessed preservative activities amongst food grain sellers in Oyo State, Nigeria and the specific objectives were to describe socioeconomic characteristic of food grain sellers, examine preservative activities among food grain sellers and identify perceived effects of preservative activities among the food grain sellers. However, the only hypothesis was stated in null form that there is no significant relationship between selected socio-economic characteristics and preservative activities of the food grain sellers in the study area.

Methodology
Multistage sampling procedure was used to select respondents for this study. First stage was the random selection of 10% of Local Government Areas (LGAs) of Oyo State giving three LGAs which are Ibarapa Central, Ogbomoso North and Ibadan North Local Government

Areas being selected. Second stage was the purposive selection of prominent food grain markets of the selected LGAs. These were Oja Towobowo in Ibarapa Central LGA, Oja Waso in Ogbomoso North LGA and Bodija market in Ibadan North LGA. Stage three was the proportionate random selection of food grain sellers from their association register. Hence, 26 respondents from 261 in Oja Waso; 82 respondents from 820 in Ibadan North; and 12 respondents from 122 in Ibarapa Central. Therefore, 120 respondents from 1203 food grain sellers were used for this study.

Results and discussion

Socio-economic characteristics of the respondents

Data in Table 1 revealed the socio-economic characteristics of food grain sellers in the study area where 65.0% were female and 35.0% were male. This implies that food grain sellers were female dominatedoccupation. Educational attainment of the respondents revealed that 34.2% had senior secondary school education, 27.5% had junior secondary school education and only 5.0% did not have any form of formal education. This implies that food grain sellers possessed various degree of educational attainment. Also, 68.4% of the respondents sourced their investment capital from cooperative societies while 15.8% were from personal savings and 8.3% sourced their money from Bank of Agriculture. This implies that there were various sources of fund available to food grain sellers in Oyo State. The mean age of respondents was 43 years. This implies that food grain sellers were agile, vibrant and have vigour required to engage in the venture. Majority (70.8%) had 11 – 20 years of selling food grain. The mean for years of selling experience possessed by the respondents was 16 years. This implies that they possessed enough experience in the marketing of their produce.

Table 1: Distribution of respondents by socio-economic characteristics

Socio-economic characteristics	Frequency	Percentage	Mean
Sex:			
Male	42	35.0	
Female	78	65.0	
Educational attainment:			
Primary school	25	20.8	
Junior secondary school	33	27.5	
Senior secondary school	41	34.2	
Tertiary education	15	12.5	
No formal education	6	5.0	
Sources of capital:			
Personal savings	16	15.8	
Friends /family	4	3.3	
Cooperative society	82	68.4	
Commercial banks	6	5.0	
Bank of Agriculture	10	8.3	
Age (in years):			
20 -30	5	4.2	
31 – 40	19	15.8	
41 – 50	80	66.7	**43**
51 – 60	12	10.0	
61 and above	4	3.3	
Market (selling) experience (in years):			
1 -10	9	7.5	
11 – 20	85	70.8	**16**

21 – 30	21	17.5
Over 30	5	4.2

Source: Field Survey, 2023

Preservative activities amongst food grain sellers

Data in Table 2 described the various preservative activities of the food grain sellers in Oyo State. It was revealed that majority (99.2%) of the sellers engaged in the activities of applying synthetic chemicals such as DD force, phostoxin, DDVP, cypermethrin, actellic dust, etc. to preserve their produce. This is similar to a study conducted by Lougraimzi *et. al*, (2022) where the result showed that majority (91%) of the respondents used synthetic insecticides. Using synthetic insecticides for preservation is against the outcry and rules that forbid the use of chemicals to preserve food for human consumption. This nefarious activity by the food grain sellers persists because of weak regulatory and enforcement mechanism (Nwosu and John, 2022). Also, 35.8% of the respondents usually preserve their produce with whole dried pepper while nobody used biological insect to preserve their produce.

Table 2: Preservative activities by food grain sellers

Preservative activities	Frequency	Percentage
Store sanitization	20	15.7
Hermitically sealed bags	10	8.33
Chemical control (DD force, phostoxin, actellic dust, etc)	119	99.2
Use of biological insects	0	0.0
Use of whole dried pepper	43	35.8

Source: Field Survey, 2023

Perceived effects of preservative activities among food grain sellers

Data in Table 3 revealed that all (100%) of the respondents affirmed that preservative measures applied kills pests that accompanied farm produce from the field. This is very dangerous as the chemical residue attach itself to the treated grains in the store and this makes the commodities to be dangerous for human consumption (Hamel, Rozman and Liska, 2020). This is because any chemical that can kill pests will certainly be harmful to human beings. Furthermore, all (100%) the respondents agreed that pest control they employed prevent re-infestation of pests in the store. Also, all (100%) the respondents affirmed that pest control smeared on their produce was easy to apply and 99.2% of the respondents believed that pest control made stored produce looked attractive to customers. On the other hand, 84.2% of the respondents asserted that pesticides caused irritation to the eyes, nose and skins and 25.0% endorsed that they are poisonous to human health. This implies that majority of the food gain sellers might not be aware of the potential danger inherent in the use of chemical pesticides for food grain preservation or those that might be aware were indifferent about the consequences on human health just because of their personal gains. However, merely 5% believed that pest control can cause diseases in human beings. This further affirms that majority of the food sellers were ignorant of their actions regarding food grain preservation.

Table 3: Distribution of perceived effects of preservative activities among food grain sellers

Effects of preservative activities*	Frequency	Percentage
Kills pest that accompanied farm produce from the field	120	100
Prevents re-infestation of pest in the stores	120	100
Makes stored produce lasts long in the stores	115	95.8
Makes store produce looks attractive to customers	119	99.2

Easy to apply	120	100
Poisonous to human beings	30	25.0
Can cause diseases in human beings	6	5.0
Irritations to the eyes, nose and skins	101	84.2

*Multiple responses

Source: Field Survey, 2023

Test of hypothesis

HO: There is no significant relationship between selected socio-economic characteristics and preservative activities among food grain sellers. Table 4 has depicted the relationship that existed in which Chi-square and correlation analyses established that there was a significant relationship between sex (χ^2 = 5.592, pv = 0.002); marital status (χ^2 = 2.161, pv = 0.004); age (r = 0.424, pv = 0.001); marketing/selling experience (r = 0.416, pv = 0.000) and preservative activities among food grain sellers, all at 0.5 level of significant. Sex that was significant could be traced to the fact that marketing/selling of grain food stuff was female dominated occupation and that selling aspect of farming was actually designated to women in African settings. That is, when men were engulfed in cultivation, women were assigned with responsibility of marketing the farm produce

Table 4: Chi-square and correlation analyses showing relationship between socio-economic characteristics and post-harvest pest control among food grain sellers

Socio-economic characteristics	χ^2	df	r-value	p-value	Decision
Sex	5.592	1		0.002	S
Marital status	2.161	3		0.004	S
Educational attainment	5.246	4		0.143	NS
Age			0.424	0.001	S
Selling experience			0.411	0.000	S

S = significant; NS = Non-significant

Source: Field Survey, 2023

Conclusions and recommendation

It could be concluded that most food grain sellers were using synthetic chemical pesticides to preserve their food wares. The sellers were mostly ignorant of the health hazards associated with the use of pesticides to preserve food grain. Grain sellers had versed experience in selling food grains. Therefore, it was recommended that vigorous efforts should be deployed by all stakeholders such as government at various levels, non-governmental organizations (NGOs) and philanthropic organizations to embark on serious campaigns to discourage the use of chemical preservation on food materials. Also, market leaders must adequately enlighten their followers and as well enforce best practices in markets within their domains.

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PERCEIVED EFFECTS OF FARMERS-HERDSMEN CONFLICTS ON ARABLE CROPS FARMERS' SOCIO-ECONOMIC STATUS IN OKE OGUN AREA OF OYO STATE.

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Abstract
This study assessed the perceived effects of farmers- herders conflicts on arable crops farmers' socio- economic status in Oke-ogun area of Oyo state, Nigeria. Multi stage sampling technique was used to select 160 respondents from the two purposively chosen local government in the study area. Data were collected using interview guide to elicit information on; socio economic characteristics, intervention mechanism to control the conflicts and the perceived effects of the conflicts on the arable crop farmers, socio economic status. The results showed that religion intolerance (89.38%) Poisoning of animals (88.13%) and Tribalism (84.38%) were the major causes of the conflicts in the area while 63.75% of the respondents indicated the effects were unfavorable to their socio economics status. The result of Pearson Product Moment Correlation (PPMC) revealed that there were significant relationships between age (r=0.205, p=0.020); household size (r=0.371, p=0.011) of arable crops farmers and the perceived effects of socio economic status. The study concluded that the effects of famers-herders conflicts was unfavorable on their socio-economic status in the study area. It was therefore recommended that government should provide drinkable water for the populace, so as to reduce competition for water between the farmers and the Fulani cattle, since scarcity of water was indicated as a cause of the conflicts in the study area.
Keywords: Herdsmen, Arable crops, Conflicts, Socio-economic Status.

Introduction

Up to date, Nigeria have witnessed series of violent conflict of interest resulting from the activities of herders who moved about on a daily basis with their cattle in search of water and greener pastures (Sulaiman, 2015).

According to Adelakun, Adurogbangba and Akinbile, (2015), farmers were at the extreme detriment of the conflicts in Oyo State as it affects their families, farm and has led to the reduction in farm output, loss of properties and scarcity of food. According to Akinbile (2007), Socio-economic status was the position an individual occupies in a society with respect to the amount of cultural possession, effective income, material possession, prestige and social participation. The objectives of the study were to; identify the socio-economic characteristics of the respondents, determine the perceive effect of farmer-herdsmen's conflict on arable crops farmers' socio-economic status, determine the causes of conflict in the study area and identify the methods used in mitigating the effects of farmer-herders conflict,

Methodology

The study was carried in Oke Ogun area of Oyo state. It comprises of ten local government areas; Atisbo, Irepo, Kajola, Itesiwaju, Iwajowa, Olorunsogo, Orelope, Iseyin, Saki west and Saki east. It lies within latitude $7^0$70'N and longitude $2^0$60' E, it has the total land area of 15,193,320 square kilometers. The area is endowed with wide expanse of fertile land suitable for cultivation of yam, millet, guinea corn, cassava, cowpea, maize and soybean.

Due to the prominent activities of Fulani Herdsmen in the study area, Saki east and Saki west were Purposively chosen for the study. According to the Oyo State Agricultural Development Zoning system, the two local governments consist of 16 cells. 10% of the cells were randomly chosen to give 8 cells. The registered arable crop farmers in the cells were 1,605. 10% of the registered farmers were also randomly chosen to give 160 respondents for the study.

Interview schedule was used to elicit information from the arable crop farmers in the study area.

Results and discussion

The results in Table 1 revealed the mean age of the respondents was 47 years. This revealed that majority of the respondents were in their economic productive age. The educational distribution of the respondents revealed that 21.88% of the respondents had no formal education while 60.00%, 15.63% and 2.50% of the them had primary education, secondary education and tertiary education respectively. The result also revealed that 85.00%, 54.00% and 21.00% of the respondents were Muslims, Christians and Traditionalists respectively. This implies that the respondents were of different religion and the Muslims were the highest. This is in line with Genyi,(2017) in his research work that middle region is kind of a transition between religion and nomadic sedentary life.

Table 1: Socioeconomic characteristic of arable crop farmers in the study area.

Variables	Frequency	Percentage	Mean
Age			
Less than 30	16	10.00	
30 – 40	44	27.50	
40 - 50	54	33.75	47
Above 50	46	28.75	
Religion			
Christianity	54	33.75	
Islam	85	53.13	
Traditional	21	13.12	
Marital Status			
Single	7	4.38	
Married	105	65.63	
Divorced/Separated/Widowed	48	30.00	
Sex			
Male	120	75.00	
Female	40	25.00	
Educational Qualification			
No Formal	35	21.88	
Primary	96	60.00	
Secondary	25	15.63	
Tertiary	4	2.50	
Farming Experience (Years)			
Less than 5	35	21.88	

5 - 10	106	66.25	8.2
11 – 15	10	6.25	
Above 15	9	5.63	
Farm Size			
Less than 5	49	30.63	
5 – 10	68	42.50	5.7
Above 10	43	26.88	
Household Size			
Less than 4	45	28.13	
4 – 8	91	56.88	7
Above 8	24	15.00	
Total	160	100.00	

Source: Field Survey, 2023

Perceived causes of conflicts in the Study Area

The percentage distribution of the respondents base on their perceived causes of conflicts in the study area was presented in Table 2. In term of causes of conflicts in the study area as perceived by the respondents, 89.38%, 84.38%, 77.50% and 63.75% of the respondents reported that religion intolerance, tribalism, selfish interest from both parties involved and communal values/norms were the factors that always causes conflicts between arable crop farmers and herders in the study area respectively.

Table 2: Distribution of the respondents based on causes of conflicts in the study area (n=160)

S/N	Causes of conflicts	Always Freq. (%)	Occasionally Freq. (%)	Never Freq. (%)
1	Religion intolerance	143 (89.38)	4 (2.50)	13 (8.130
2	Tribalism	135 (84.38)	14 (8.75)	11 (6.88)
3	Illiteracy	12 (7.50)	137 (85.63)	11 (6.88)
4	Selfish interest	124 (77.50)	30 (18.75)	6 (3.75)
5	No interest in funding animals by herders	20 (12.50)	128 (80.00)	12 (7.50)
6	Ammunitions in the custody of herders	94 (58.75)	42 (26.25)	24 (15.00)
7	Government bias ethnical policies	25 (15.63)	49 (30.63)	86 (53.75)
8	Land ownership dispute	18 (11.25)	116 (72.50)	26 (16.25)
9	Climate variabilities	94 (58.75)	12 (7.50)	54 (33.75)
10	Values and norms	102 (63.75)	16 (10.00)	42 (26.25)
11	Poisonings of animals	141 (88.13)	8 (5.00)	11 (6.88)
12	Scarcity of water	86 (53.75)	65 (40.63)	9 (5.63)

Source: Field Survey, 2023

Percentages are in Parentheses

Intervention mechanisms used in resolution of conflicts

Table 3 showed the distribution of the respondents, based on mechanisms employed in conflicts resolution in the study area. Majority (78.13%) of the respondents chose mediation method as means of conflicts resolution between arable crop farmers and herders in the study area. Furthermore, 66.87%, 63.75%, 63.13% and 59.37%, of the respondents chose creating

fence around their farm areas, arbitration process, compensation and negotiation mechanisms in conflicts resolution among arable crop farmers and herders in the study area. This implies that the communities in the area had their different ways of resolving conflicts. This is also supported by Abass (2012) in his study that there was no retreat nor surrender in the Conflict for Survival between Fulani Pastoralists and Farmers in Northern Nigeria.

Table 3: Distribution of Respondents according to mechanisms of conflict resolutions in the study area (n=160)

S/N	Mechanism	Freq.	%
1	Mediation	125	78.13
2	Adjudication	95	59.37
3	Reconciliation	62	38.75
4	Arbitration	102	63.75
5	Negotiation	91	56.87
6	Extermination	59	36.88
7	Compensation	101	63.13
8	Police arrest	59	36.87
9	Creating grazing paths	54	33.75
10	Creating fence	107	66.87

Source: Field Survey, 2023

Effects of farmers-herder's conflicts on socio-economic status

The distribution of respondents on perceived effects of farmers-herders' conflicts on their socio-economic status is presented in Table 4a and4b. Forty-two (42) perceptional statements were constructed to determine arable crop farmers' perception on effects of farmers-herders' conflicts on their socioeconomic status where the lowest score was 42 while the highest was 126. The mean score was 88. Therefore, 41 – 87 formed the unfavorably disposed mark group and 88 – 126 formed the favorably disposed mark group. The Table showed that 63.75% of the respondents were favorably disposed toss the perceptional statements on the negative effects of farmers-herders conflict on their socio-economic status while 36.25% were unfavorably disposed to the perceptional statements. The finding affirms that the effects of farmers-herders conflict in the study area were well perceived and as such the effect was unfavourable on their socioeconomic status. This implies that farmers in Oke Ogun area had been finding it difficult to improve their living standard, due to these conflicts.

Table 4a: Perceived effects of farmers-herders' conflicts on their socio-economic status in the study area (n = 160)

S/N	Statements	Agreed Freq. (%)	Undecided Freq. (%)	Disagreed Freq. (%)	WMS
1	I have withdrawn children from school	82 (51.25)	16 (10.00)	62 (38.75)	2.39
2	My children have to go to school in turns	62 (38.75)	72 (45.00)	26 (16.25)	2.23

3	My children cannot go beyond primary education	41 (25.63)	93 (58.13)	26 (16.25)	2.09
4	My children are doing well in their studies	62 (38.75)	56 (35.00)	42 (26.25)	2.13
5	All my children that secure admission was allowed to go school	61 (38.13)	44 (27.50)	55 (34.38)	2.07
6	My children have the opportunity of education to any desired level	60 (37.50)	59 (36.88)	41 (25.63)	2.12
7	My annual income has reduced drastically	65 (40.63)	62 (38.75)	33 (20.63)	2.20
8	Swapping property for money	66 (41.25)	58 (36.25)	36 (22.50)	2.14
9	I used to borrow money from people	68 (42.50)	52 (32.50)	40 (25.00)	2.18
10	I cannot go to town frequently again	80 (50.00)	20 (12.50)	60 (37.50)	2.38
11	I am planning to live the village and find daily paid jobs in the cities.	40 (25.00)	95 (59.38)	25 (15.63)	2.09
12	My annual income has increase so much	77 (48.13)	62 (38.75)	21 (13.13)	2.35
13	I continually acquire property	63 (39.38)	69 (43.13)	28 (17.50)	2.22
14	I lend money to people	41 (25.63)	91 (56.88)	28 (17.50)	2.08
15	I visit town frequently	64 (40.00)	59 (36.88)	37 (23.13)	2.17
16	I want to increase my farm enterprise	58 (36.25)	60 (37.50)	42 (26.25)	2.10
17	I cannot feed my family conveniently any more	63 (39.38)	60 (37.50)	37 (23.13)	2.16
18	I engage in food rationing for my family	74 (46.25)	31 (19.38)	55 (34.38)	2.27
19	We eat what is available	67 (41.88)	34 (21.25)	59 (36.87)	2.21
20	Sending children to my relation to live with them because I cannot feed them	75 (46.88)	51 (31.87)	34 (21.25)	2.26

21	My family members are conveniently fed	87 (54.37)	53 (33.13)	20 (12.50)	2.42
22	There is enough food =, for my family	40 (25.00)	97 (60.63)	23 (14.38)	2.11
23	We eat varieties of food always	74 (46.25)	70 (43.75)	16 (10.00)	2.36
24	My children live with me so as to take good care of them	65 (40.63)	67 (41.87)	28 (17.50)	2.13
25	My support toward community service has decline	48 (30.00)	84 (52.50)	28 (17.50)	2.16
26	I cannot service my membership in the social organization I belong to.	65 (40.63)	55 (34.38)	40 (25.00)	1.97
27	I have been evading tax	55 (34.38)	63 (39.37)	42 (26.25)	1.72
28	I have been shying away from my extended family obligations	63 (39.37)	56 (35.00)	41 (25.63)	2.13
29	I cannot buy clothes for my children	61 (38.13)	63 (39.38)	36 (22.50)	1.82
30	My prestige and honour have reduced in the society.	58 (36.25)	65 (40.63)	37 (23.13)	1.98
31	I have increased my support to community service	63 (39.37)	57 (35.63)	40 (25.00)	2.13
32	I pay my membership due to promptly	78 (48.75)	64 (40.00)	18 (11.25)	2.01
33	I conveniently pay my tax regularly	39 (24.38)	98 (61.25)	23 (14.38)	1.75
34	I take care of my extended family members	70 (43.75)	68 (42.50)	22 (13.75)	2.38
35s	I clothe my children adequately	72 (45.00)	26 (16.25)	62 (38.75)	2.30
36	There is more prestige and honour for me in the society	57 (35.63)	40 (25.00)	63 (39.37)	1.99
37	There had not been addition valuable	55 (34.38)	74 (46.25)	31 (19.38)	2.10

38	My farm enterprise has reduced to subsistence	41 (25.63	63 (39.37)	56 (35.00)	1.70
39	I buy fairly used clothes	55 (34.38	65 (40.63)	40 (25.00)	1.91
40	I cannot afford household utilities {e.g., radio and TV set, generator, furniture, etc.}	31 (19.38)	55 (34.38)	74 (46.25)	1.65
41	I cannot build my own house	48 (30.00)	80 (50.00)	32 (20.00)	2.03
42	Appreciable possession of valuable material	78 (48.75)	60 (37.50)	22 (13.75)	2.07

Source: Field Survey, 2023
Percentages are in Parentheses

Table 4b: Categorization of respondents on perceived effects of farmers-herders' conflicts on their socio-economic status in the study area (n = 160)

Perceived effect categories	Scores	Frequency	Percentage
Favorable	88 – 126	102	63.75
Unfavorable	42 – 87	58	36.25
Total		160	100

Source: Field Survey, 2023 Minimum scores = 42 Maximum scores = 126

Test of hypothesis

The hypothesis of the study was tested and results presented below.

$H0_1$: There is no significant relationship between selected socioeconomic characteristics of the respondents and effects of farmers-herdsmen conflicts on their SES

The test of significant relationship of selected socioeconomic characteristics of the respondents and effect of farmers-herdsmen conflicts on SES is presented in Table 8. Pearson Correlation analysis revealed that age ($r = 0.205$, $p<0.05$), household size ($r = 0.371$, $p<0.05$), farming experience ($r = 0.281$, $p<0.05$) and farm size ($r = 0.301$, $p<0.05$) had a significant relationship with the effect of farmers-herders' conflicts on SES. This implies that the age of the respondents, household size, farming experience and farm size inert a positive significant influence on effects of farmers-herders conflicts on arable crop farmers' SES.

Table 5: Summary of Pearson Correlation analysis showing relationship between selected socioeconomic characteristics of the respondents and effect of farmers-herdsmen conflicts on their SES (N=160)

Socio-economic characteristics	r-value	p-value	Remark
Age	0.205	0.020	S
Household Size	0.371	0.011	S
Farming experience	0.281	0.010	S
Farm size	0.301	0.010	S

S = significant; NS = not significant

Source: Field Survey, 2023

Conclusion and recommendations

It can be concluded from the study that the effects of farmers-herders conflict in the study area were well perceived and as such the effect was unfavourable on their socioeconomic status. The major mitigating methods against farmers- herders' conflicts in the study area were; planting of crop that cattle don't eat, seeking help from local leaders, reducing herd stocks and engaging many income generating sources. Based on the findings of this study, religion tolerance should be more emphasized in the different worship centers, since this has been mentioned as one of the causes of the conflicts in the study area and carrying of weapons and ammunition by the herdsmen should be prevented.

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THE DESIGN AND CONSTRUCTION OF OFFICE SUIT USING AFRICAN DESIGN FABRIC (ADIRE ELEKO).

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Abstract
This work aimed at design and construction of an office suit using African fabric (Adire eleko) among senior female staff in Oyo State College of Agriculture and Technology, Igboora. It was carried out in the clothing unit of the department of Home and Rural Economics. The constructed suit was displayed to panelist for assessment; the panelist includes 50 percent of the teaching staff as 35 that are 25 of non-teaching senior female staff and 15 respondents. A total of 50 respondents were selected randomly. The data on the acceptability of the office suit constructed were collected using an hedonic scale questionnaire. The data collected was analyzed using descriptive statistics, and all the samples were accepted by large number of the respondents. It was recommended that the finding be used as training manual in entrepreneurial training for youths and government should support people that participate in such training as to make a successful business and self-reliant. It will help in reducing the rate of unemployment and eradicate poverty in Nigeria.
Keywords: Adire Eleko, African Design, Office Suit, Design, Construction.

Introduction

Background of the study

West Africa has been one of the world's great textile-producing region. The locally available yarn for spinning was cotton, which grew in two colours, white and pale brown. In some places a wild silk was also spun, while raffia and bast fibers were available in addition, as imported textiles and fibers from trans-Saharan and coastal trade networks, from the late fifteenth century onward. Only in the inland Niger Delta region of Mali were the wool fibers of local sheep of sufficient length to permit spinning, whereas Sahara wool was the major source of spun yarn. Elsewhere in the sub-Saharan region, in the forests of Central Africa, raffia was the only available fiber and the savannas of east and southern Africa cotton was spun, as for as Great Zimbabawe (Aronson, 2003).

The most widely used dye was locally produced Indigo, also exported for use in North of the Sahara, though in both regions other colours were available from vegetable and mineral sources. These dyestuffs' might be used on the yarns prior to weaving, sometimes tie-dyed to form simple ikat-like patterns and they were used in the colouring and patterning of woven cloth. In some areas woven textile and tailored garments were embroidered, especially in the region from Lake Chad westward to the inland Niger Delta of Mali. There was also some occurrence of patchwork, applique and quilting: and one tradition of hand printed cloth. Hand-printed cloth was also found in Zanzibar, brought from India. In raffia-weaving region of central Africa, cut-pile embroidery was well developed together with applique and patchwork. In eastern and southern Africa, local textile traditions seem to have depended on the weaving process for patterning. From the late nineteenth century onward, local textile industries in sub-Saharan Africa have had to compete with factory-printed cotton cloth, sometimes successfully. Though in eastern and southern Africa, the local production of woven cloth was supplanted in the early twentieth century. The felting of vegetable fibers to

produce bark cloth (strictly speaking not a textile) has survived in Ghana and Uganda, though it was at one time more widespread (Elcher, 2003).

Adire is a resist-dyed cloth produced and worn by the Yorubas of Southwestern Nigeria in West Africa. The Yoruba label adire, as "tied and dyed" and applied to indigo-dyed cloth decorated with resist patterns around the turn of the twentieth century. With the introduction of a broader colour pallete of imported synthetic dyes in the second half of the twentieth century, the label "adire" was expanded to include a variety of hand-styled textiles using wax resist batik methods to produce patterned cloth in a dazzling array of dye tints and hues.

The traditional production of indigo-dyed adire involves two female specialists-dyers (alaro) who control production, marketing and decorators (aladire), who create the resist patterns. In the oldest forms of adire, two basic resist techniques are used to create soft blue or white designs to contrast with deeply saturated indigo blue background.

Adire eleko has starchy maize or cassava paste hand-painted onto the surface of the cloth as a resist starch (Byfield, 2002).

Statement of the problem

Adire eleko has been most common and prestigious among Yoruba speaking tribe in the western states of Nigeria. Adire which most are familiar with and its uniqueness. Also, there has been several usage of this African design on traditional African wears, clothes worn for several events (wedding ceremony) e.t.c. but has not been use for office wear. This research intend to produce adire eleko to make suit jacket among the senior female staff of Oyo State College of Agriculture and Technology, Igboora.

Objectives of the study

The main objective of this study is to design and construct suit jacket using Africas design fabric (Adire eleko) among senior female staff in Oyo State College of Agriculture and Technology, Igboora.

The specific objectives are:

- produce African design fabric (adire eleko)
- draft pattern pieces for suit jacket among the senior female staff of Oyo state college of Agriculture and Technology, Igboora.
- construct the suit jacket using adire eleko
- determine the acceptability of suit jacket produced among senior female staff in Oyo State College of Agriculture and Technology, Igboora.

Significance of the study

It will enhance the designing and construction of office suit using fabric (adire eleko) and the acceptability among the office workers

- It will improve job opportunity if well accepted and adopted.

Materials and methods

Research design

The design employed was drafting of the design of the pattern made on the fabric, also a pattern was made for the design of the office suit.

Study Area

This research work was carried out in the department of Home and Rural Economics (H.R.E.), clothing unit in Oyo state college of Agriculture and Technology, Igboora, Oyo State.

Population of the study
The total population of the study comprised of the entire female senior staff. Both teaching and non-teaching staff were used and 70 members of teaching staff and 59 of non-teaching given a total of 129

Sampling Size and Sampling Techniques
50 percent of the teaching staff made up of 35 respondents and 25 percent of non-teaching senior staff members amount to 15 respondents were taken randomly.

Procedures for data collection
The data was collected through the use of sample product that was designed and well-structured questionnaire to the respondent to receive their views on the product produced.

Materials used to make Adire Eleko

Materials	Quantity
● Fabric	20yards
● Dye	126gram
● Caustic soda	90 grams
● Hydrosulphite	72 grams
● Corn starch	135 grams
● Stirring rod	1 roll
● Hand glove	1 pair
● Bowl	2
● Water	2 liters
● Cassava flour	126 grams
● Tape measure	1
● Pressing iron	1

Method of producing Adire Eleko

- Gather all the materials
- Put water on the fire and allow to boil
- Pour cassava flour and caustic soda to the pot and stir thoroughly, it melts it with hand
- Put the fabric under the sun for 25 minutes to dry the stamp
- Boil water in a kettle and allow to boil.
- Measure the dye and other chemical to prepare the dye bath and mix with warm water, (make sure it is warm)
- Put the fabric stamp into the dye bath
- Starch the fabric and sundry
- Iron the fabric after sun drying.

Equipment for construction

Equipment	*Quantity*
● Tape measure	1
● Sewing machine	1
● Scissors	1
● Chalk	1
● Needle and thread	1 and 4
● Whipping machine	1
● Iron and iron board	1 and 1

● Brown paper	1
● Eraser	1
● Transparent meter ruler (ruler)	1
● Pencil	1

SAMPLE A
SKIRT AND BLOUSE
BODY MEASUREMENT

● Burst	42 inches
● Waist	40 inches
● Half length	17 inches
● Sleeve	17 inches
● Band	36 inches
● Hips	46 inches
● Length skirt	29 inches
● Back	16 inches

SAMPLE B
SKIRT AND BLOUSE
BODY MEASUREMENT OF FEMALE SENIOR STAFF

● Burst	40 inches
● Waist	38 inches
● Half length	17 inches
● Sleeve	17 inches
● Band	36 inches
● Back	16 inches
● Hips	44 inches
● Skirts length	27 inches

Procedure Sample B

- Get the fabric and materials available
- Place the pattern on the fabric and use tracing wheel and sewing allowance, trace out using pencils
- Cut the fabrics out according to the tracing
- Cut the linen out according to fabrics
- Sew and iron

Procedure 1

- After joining the fabric, measure the neck round
- Cut out the collar according to the pattern
- Join the collar on the round neck

Procedure 2

- Measure the neck round and cut the fabric straight
- Shape the edges, iron and sewing
- Then join the collar to the neck round then join peplum

Procedure 3

- Measure the gown length and cut the fabrics straight
- Sew down and join the sleeve to the arm
- Hole and sewn.

Procedure

Skirt

- Get the materials available
- Place materials on the pattern and trace out adding sowing allowance
- Cut the materials out
- Cut linen according to fabric
- Sew and iron

Method of Data Analysis

Data was analyzed using descriptive tool such as frequency, percentages and cumulative score. In additions, the questionnaire was based on texture, colour, appearance, design and over all acceptability using a 9 point Hedonic scale ranging from like extremely, like very much, neither like nor dislike, dislike very much and dislike extremely.

Result and discussion

Two samples were given in the presentation and analyzed. People assessed the product for colour, texture, functionality, design and overall acceptability. The results of the assessment collected was analyzed and summarized below.

Respondents rating on sample A (Office suit made with Adire Eleko)

Colour: Table 4.1. below indicated that 72.00% of the respondents like the colour extremely, 18.00% likes the colour very much, while the remaining 10.00% likes the colour moderately. It indicated that the respondent appreciate the colour of suit made with adire eleko.

Texture: It was observed that 56.00% of the respondents like the texture extremely, 38.00% like the texture very much while the remaining 6.00% like the texture moderately. The majority of the respondents likes the texture of the sample.

Functionality: It was indicated from the table that 40.00% of the respondents extremely, 46.00% like the functionality very much and 14.00% like the functionality of the office suit made with adire eleko moderately.

Design: It was observed that 50.00% of the respondents like the design extremely, 46.00% like the design very much while the remaining 4.00% like the design moderately. This implies that the respondents appreciate the design of the office suit made with adire eleko.

Overall acceptability: It was observed that 90.00% of the respondents like the overall acceptability extremely, while the remaining 10.00% like the overall acceptability very much.

Table 3.1: Table showing the respondents rating on sample A (Office Suit made with Adire Eleko)

Ranking acceptability	**Colour**		**Texture**		**Functionality**		**Design**		**Overall**	
	F	%	F	%	F	%	F	%	F	%
Like extremely	36	72.0	28	56.0	20	40.0	25	50.0	45	90.0
Like very much	9	18.0	19	38.0	23	46.0	23	46.0	5	10.0
Like moderately	5	10.0	3	6.0	7	14.0	2	4.0	-	-
Like slightly	-	-	-	-	-	-	-	-	-	-
Neither like nor Dislike	-	-	-	-	-	-	-	-	-	-
Dislike slightly	-	-	-	-	-	-	-	-	-	-
Dislike moderately	-	-	-	-	-	-	-	-	-	-
Total	50	100	50	100	50	100	50	100	50	100

Conclusion and recommendation

Conclusion

From the result, the following conclusions were drawn:

1. The overall acceptability of the samples had a significant effect.
2. It was observed that the samples were accepted by the respondents
3. From the result, it was discovered that the respondents accepted office suit made with Adire Eleko.

Recommendation

From the results, it is recommended that entrepreneurial training for the youths and government should be supported in such training to make it a successful business to enable production to increase the commercial scale, production and reduce the rate of unemployment and eradicate poverty in Nigeria.

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ANALYSIS OF WOMEN LABOUR UTILIZATION IN CROP PRODUCTION AND PROCESSING IN IBARAPA EAST LOCAL GOVERNMENT AREA OF OYO STATE, NIGERIA

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Abstract
The role women play in agriculture and the rural society is fundamental to agricultural and rural development in sub- Saharan Africa. Therefore, this study analysed women labour utilization in crop production and processing in the study area. The study was carried out in Ibarapa East Local Government area. Agriculture is the major occupation of people of Ibarapa east local government area. The population of the study will comprise of women that engage in crop farming and processing of crops. Multistage sampling technique was used in selecting 90 respondents. The data were analysed using descriptive statistics. The result revealed that large numbers (52.20%) of the respondents were married with the mean age of approximately 46 years. It was discovered that majority (81.12%) of respondents were literates. Majority of the women in the study area engaged in farming as their primary education with the average farming years of experience of 11years. It was also revealed that few of the respondents 5.56% engaged in land preparation which ranked 11th with WMS of 0.06. All women (100.00%) engaged in crop processing and majority of the women (91.11%) engaged in transportation. All of the respondents 100% strongly agreed that discrimination against women is one of challenges women faced for engaging in agricultural activities which ranked 1st with WMS 5.0. Majority (85.56%) agreed that lack of government commitment is challenges women faced which ranked 2nd with 4.59. Less than average of the respondents 47% agreed that low wages is one of is the challenges women faced which ranked 5th with WMS of 4.32. In conclusion, this study provided strong evidence that, women labours were utilized in all aspect of crop production and processing. It was recommended that good policies that protect and encourage more involvement of women in crop production should be put in place by government.
Keywords: Women, Labour, Utilization and production

Introduction

Agriculture has been the main source of human survival and economic growth since the ages past. Agriculture accounts for about 2.9 percent of National Gross Domestic Product (GDP) (Mazulie, 2010). It accounts for employment of Nigerians (men and women). The discovery of soil sector, changed the phase of people interest and participation in agriculture and thus decline in food out-put. FAO (2009) noted that abled youths/men, left the bulk of farming activities for women in search of supposed lucrative oil jobs in the city. Mazulie (2010) ranked Nigeria among the mostly richly endowed nation of the world in term of natural resources and human resources to manage her agricultural resources, but the discovery of oil left, the bulk of agricultural work in the hands of women.

Rural women often manage complex households and pursue multiple livelihood strategies. They constitute a significant proportion of the labour on their family farms - whether producing for household consumption or for enterprise or both (United Nations Development Fund for Women, 2005). Their activities typically include producing agricultural crops, tending animals, processing and preparing food, working for wages in agricultural or other rural enterprises, collecting fuel and water, engaging in trade and marketing, caring for family members and maintaining their homes. They also, work in

permanent and temporary employment and work along a rural-urban continuum and cross-border context, with increasing numbers of rural women migrating for daily, seasonal, or permanent work in urban areas (Hill, 2011). Although, rural women work long hours but many of their activities are not defined as "economically active employment" in national accounts but are to the well-being of their households (Food and Agricultural Organization, 2011).

Therefore, the involvement of women in agricultural activities cannot be underestimated as they play vital roles in food production chain and food security. The role women play in agriculture and the rural society is fundamental to agricultural and rural development in sub- Saharan Africa. The Technical Centre for Agriculture and Rural Cooperation (CTA, 1993) reported that women in Africa make up more than one-third of the farming work force. In another report by Fresco (1998), rural women accounted for 70% of agricultural workers, 80% of food producers, and 60%-90% of them engaged in marketing and food processing. Also, 4- 10% agricultural workers in the world were also reported to be women (United Nations, 1986).

In Nigeria, women produce 60-80 % of the agricultural food in the country (Ogunbameru and Pandy, 1992; Buckland and Haleegoah, 1996). According to Ironkwe and Ekwe (1998) more than 60% of the agricultural production is carried out by women in the Nigerian traditional setting. Mijindadi (1993) estimated that women are responsible for 70% of actual farm work and constitute up to 60% of the farming population in Nigeria. This report was supported by Yahaya (2002) who observed that 76% of women from Oyo and Bauchi states were actively involved in farming activities or were engaged in their husbands' farms.

Problem statement

Unfortunately, despite the stated roles of women in agriculture and rural development, more than two-third of the world poorest who relied solely on agriculture and related activities are women (Madeley, 2008). In spite of the contributions of women to household welfare, agricultural productivity and economic growth, they continue to be marginalized and undervalued in many agricultural and economic policies while men's contributions remain central, often the sole focus of attention.

Objectives of the Study

The main objective of the study is to analyses women labour utilization in crop production and processing in Ibarapa East Local Government area of Oyo State while the specific objectives are to: describe the socio-economic characteristic of women involvement in crop production inthe study area**,** itemized the activities women engage in agriculture in the study area and identify the challenges faced by women in agriculture in the study area.

Methodology

Study Area

The study was carried out in Ibarapa East Local Government area. Ibarapa East Local Goverment is made up of Eruwa and Lanlate. Ibarapa East is a Local Government Area in Oyo State, Nigeria, made up of the Latitude 7 36 29° N and Longitude 3 29 31 E. It has an area of 838km^2 and a population of 118,226 at the 2006 census. Agriculture is the major occupation of people of Ibarapa east local government area with several crops such as yam, maize, oil palm, and melon cultivated in the area.

Population of the Study
The population of the study will comprise of women that engage in crop farming and processing of crops.

Sampling procedure and sampling size
Multistage sampling technique was used in selecting the respondents.
Stage1: purposive selection of 5 wards. 3 wards were selected in Eruwa and 2 wards in Lanlate. Stage 2: involved randomly selection of 18 rural households from each of selected wards to give (5 x 18) 90 respondents

Instrument for Data Collection and Data Analysis
The data was collected with the aid of structured questionnaires. Descriptive statistics such as frequency table, mean, standard deviation and percentage was used.

Result and discussion

Distribution of respondents by socio – economic characteristics

Age: Table 1 showed that 15.56% of the respondents in the study area were between the ages of 21-30 years, 14.44% of them were between the age ranges of 31-40 years, 24.22% were between 41-50 years of age and the remaining 45.56% are above 51 years of age. The mean age was approximately 46 years. This implies that they were in their active ages. This is in contrary with the work of Jibowo *et al. (*2005), who felt like the youths have apathy for the agriculture.

Marital Status: It was revealed by table1 that 15.56% of the respondents in the study area were single, 52.2% were married, 17.78% were widowed, and the remaining 14.44% were separated. This showed that majority of women who engaged in agricultural activities were married.

Religion: Table 1 showed that 44.4% of the respondents were Christians, 44.4% were Muslims, while the remaining 11.11% were traditional worshippers. This showed that three major religious practices in Nigeria were present in the study area.

Education Background: Table 1 showed that 18.89% had no formal education, 20.00% had secondary leaving school certificate, 15.56% had primary school leaving certificate, while the remaining 45.56% were graduate of Tertiary institutions. This showed that majority of respondents were literate.

Household Size: Table 1 showed that 4.44% of the respondent have 1–3 household size, 54.4% have 4-6 household size, while the remaining 41.1% have above 6 household size. The mean household size was 6 persons.

Main Occupation: Table 1 also showed that 55.6% of the respondents have farming as their primary occupation, 14.44% were Artisans, 14.44% were civil servants while the remaining 15.56% were traders. This implied that majority of the respondents engaged primarily in farming than any other occupation.

Type of Farming: Table 1 revealed that 38.4% of the respondents practice mono-cropping, 10% practice Crop rotation while the remaining 55.7% practice mixed cropping. This showed that majority of the respondent practice mixed cropping.

Years of Experience: Table 1 showed that 48.89% of the respondents had 6-10 years farming experience, 11.10% had 1–5 year farming experience while the remaining 40.0% had 10 years and above farming experience with the mean of 11years.

Table 1: Distribution of respondents by socio – economic characteristics (N=90)

Variable	Frequency	Percentage	Mean
Age (years)			
21 – 30	14	15.56	
31 – 40	13	14.44	

41 – 50	22	24.44	**45.5**
51 and Above	41	45.56	
Marital Status			
Single	14	15.56	
Married	47	52.22	
Widowed	16	17.78	
Separated	13	14.44	
Religion			
Christianity	40	44.44	
Islam	40	44.44	
Traditional	10	11.11	
Educational Level			
No formal education	17	18.88	
Primary	14	15.56	
Secondary	18	20.00	
Tertiary	41	45.56	
Household size			
1-3	4	4.44	
4-6	49	54.44	**5.89**
Above 6	37	41.11	
Main Occupation			
Farming	50	55.56	
Artisan	13	14.44	
Civil servant	13	14.44	
Trading	14	15.56	
Type of farming			
Mono-cropping	30	38.38	
Crop rotation	9	10.00	
Mixed cropping	51	55.67	
Years of Experience			
1-5 years	10	11.11	
6-10 years	44	48.89	**11.22**
Above 10 years	35	40.00	

Source: Field survey, 2023

Farming Activities in which Women provide Labour

Table 2 revealed the activities of women labour on farm operations and off-farm activities. All women (100%) engaged in crop processing which ranked 1st with weighted mean score of 1.0 which indicates that they were into processing of harvested good as their top labour activities. Majority of women (91.11%) engaged in transportation which ranked 2nd (WMS = 0.91). Most of the respondent (85.56%) engaged in storage and transplanting ranked 3rd with WMS of 0.85 each. More than half of the respondent (81.10%) engaged in marketing which was ranked 4th with WMS of 0.81, more than average of the respondent (77.78%) engaged in harvesting ranked 5th as their chosen labour activities in the study area with WMS of 0.78. Also, planting ranked 6th with WMS of 0.66, Nursery management ranked 7th with WMS of 0.64. Chemical application ranked 8th with WMS of 0.48. Also less than average of the respondents (46.67%) engaged in weeding which ranked 9th with WMS of 0.47. About 28% of the respondent engaged in supplying or tilling of crops with the WMS of 0.29 while only 5.56% were engaged in land preparation which was ranked 11th with the WMS of 0.0556.

This indicated that few of the respondents 5.56% engaged in land preparation which ranked 11th with WMS of 0.06. All women (100.00%) engaged in crop processing and majority of the women (91.11%) engaged in transportation.

Table 2: Farming Activities in which Women Provide labour

Activities	Response	WMS	Standard deviation	Rank
Processing	90 (100.00)	1.0000	0.000	1st
Transportation	82 (91.11)	0.9111	0.2862	2nd
Transplanting	77 (85.56)	0.8556	0.3535	3rd
Storage	77 (85.56)	0.8556	0.3535	3rd
Marketing	73 (81.11)	0.8111	0.3936	4th
Harvesting	70 (77.78)	0.7778	0.4180	5th
Planting	59 (65.56)	0.6556	0.4778	6th
Nursery management	58 (64.44)	0.6444	0.4813	7th
Chemical application	43 (47.78)	0.4778	0.5023	8th
Weeding	42 (46.67)	0.4667	0.5017	9th
Supply/Tilling	26(28.89)	0.2889	0.4558	10th
Land preparation	5 (5.56)	0.0556	0.2303	11th

Source: Field survey, 2023.

Challenges Facing Women for Engaging in Agricultural Activities.

Table 3 showed the challenges women used to face for engaging in agricultural activities. All of the respondents 100% strongly agreed that discrimination against women is one of challenges women faced for engaging in agricultural activities which ranked 1st with WMS 5.0. Majority (85.56%) agreed that lack of government commitment is challenges women faced which ranked 2nd with 4.59. Lack of capital ranked 3rd with WMS of 4.68. Low productivity ranked 4th with WMS of 4.59.

Less than average of the respondents 47% agreed that low wages is one of is the challenges women faced which ranked 5th with WMS of 4.32. Lack of time ranked 6th with WMS of 3.28. Easily get tired was the least challenges women were facing which ranked 7th with WMS of 3.39

Table 3: Challenges Facing Women for Engaging in Agricultural Activities.

Challenges	Strongly Agree	Agree	Undecided	Strongly Disagree	Disagree	WMS	Rank
Discrimination against women	90(100.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)	5.00	1st
Lack of government commitment	77 (85.56)	0(0.00)	0(0.00)	0(0.00)	13(14.44)	4.59	2nd
Lack of capital	61(67.78)	29(32.22)	0(0.00)	0 (0.00)	0(0.00)	4.68	3rd
Low productivity	53 (58.89)	37(41.11)	0(0.00)	0(0.00)	0(0.00)	4.59	4th
Low wages	47 (52.22)	30(33.33)	8(8.89)	0(0.00)	5 (5.56)	4.32	5th
Lack of time	29 (32..22)	4 (4.44)	20 (22.22)	0(0.00)	37(41.11)	3.28	6th
Easily get tired	25 (27.78)	12(13.33)	26(28.89)	0(0.00)	27(30.00)	3.39	7th

Source: Field survey, 2023

Note: values in parentheses are percentages.

Conclusion and recommendations

Based on the findings of this study, the following conclusions were drawn: large numbers (52.20%) of the respondents were married with the mean age of approximately 46 years. Majority (81.12%) of respondents were literates. Majority of the women in the study area engaged in farming as their primary education with the average farming years of experience of 11years. Few of the respondents 5.56% engaged in land preparation which ranked 11th with WMS of 0.06. All women (100.00%) engaged in crop processing and majority of the women (91.11%) engaged in transportation. All of the respondents 100% strongly agreed that discrimination against women is one of challenges women faced for engaging in agricultural activities which ranked 1st with WMS 5.0. Majority (85.56%) agreed that lack of government commitment is challenges women faced which ranked 2nd with 4.59. Less than average of the respondents 47% agreed that low wages is one of is the challenges women faced which ranked 5th with WMS of 4.32.

It was recommended that good policies that protect and encourage more involvement of women in crop production should be put in place by government.

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GENDER INVOLVEMENT IN CASSAVA PROCESSING ACTIVITIES IN OYO STATE

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Abstract
The study assessed gender involvement in cassava processing activities in Oyo State. Interview schedule was used to retrieve data from one hundred and twenty (120) respondents. Frequency counts and percentages, Chi Square and PPMC were the tools used in analyzing the data. It was discovered that the average age of respondents was 40 years. Average household size was 7 persons. About 35.00 percent, 60.00 percent, 46.67 percent, 23.33 of male respondents in the study area were fully involved in washing, cassava milling, cassava pressing and cassava grating activities, respectively while 68.33 percent, 63.33 percent, 46.67 percent and 38.33 percent of female respondents in the study area were fully involved in cassava drying, cassava frying, sieving and cassava peeling activities, respectively. Furthermore, 5.83 percent, 12.50 percent and 1.67 percent of male respondents were partially involved in cassava grating, sieving and frying activities as against 10.00 percent, 2.50 percent and 14.17 percent of female participants that were partially involved in drying, frying and cassava pressing activities, respectively. However, 62.50 percent, 54.83 percent, 75.00 percent, 60.00 percent and 35.00 percent of the respondents reported that lack of fund, poor marketing, high cost of labour, low storability and intensive labour requirements were very serious constraints to cassava processing. The study concluded that both male and female were fully involved in cassava processing among which were cassava washing, peeling of the cassava, grating, pressing, and milling. It was recommended that cassava processors should form cooperative societies through which they can put their financial resources together for reinvestment and benefit from microcredit schemes to boost their cassava processing enterprise.
Keywords: Cassava, Gender, Involvement and Processing

Introduction

Cassava is the most important crop in Africa in both production weight and value and it provides a similar source of calories as rice. Its drought-tolerance, resilience on marginal agricultural land and ability to be stored in the ground up to three years makes it an important food security crop for smallholder farmers (FAO, 2004; Sayre *et al.*, 2011). It is a staple and also a famine reserve crop. It can be an important food source when drought and conflict prevent production of other food crops. However, gender is a term often associated with roles and responsibility of males and females in the society as a social classification of sex. It is the socio-cultural differences between males and females as against the biological differences (Sinkaiye and Jibowo, 2005). Men and women perform presupposed different roles, have unequal decision-making power as well as differences in access to and control over agricultural productive resources. As a result of these differences, their views, needs, priorities and constraints to improving their productive potentials differ. This could affect their various outputs even in cassava enterprise development. Hence, the understanding of gender participation in cassava processing in Oyo State, Nigeria. This research work therefore assessed gender involvement in cassava processing activities in Oyo State and it specifically provided answers to the socio-economic characteristics of the respondents,

various activities performed by the respondents in cassava processing, level of involvement of male and female respondents in the processing of cassava, different forms into which cassava is being processed and the constraints to cassava processing in the study area.

Methodology

The study was carried out in Oyo State. It is bounded in the North by Kwara State, in the east by Osun State, in the south by Ogun State and in the west partly by Ogun State and partly by the Republic of Benin. Oyo State covers approximately an area of 28,454 square kilometers and it is ranked 14th by size. The climate is equatorial, notably with dry and wet seasons with relatively high humidity. The climate in the State favours the cultivation of crops like maize, yam, cassava, millets, rice, plantains, cocoa, palm produce, cashew etc. Population of the study comprised all male and female cassava processors in Oyo State. Based on the objectives of the research work, interview guide was used to elicit information from male and female respondents in the study area. Multistage sampling technique was used in selecting respondents as follows: Stage 1: Oyo State Agricultural Development Programme (ADP) was divided into four zones- Ibadan/Ibarapa, Saki, Oyo and Ogbomoso zones. Stage 2: 50% of the zones were purposively selected. Stage 3: 10% of the blocks in each chosen zone were randomly selected. Stage 4: 5% of the cells in the blocks was randomly selected. Stage 5: From the extension agent register, 5% male and female cassava farmers were randomly chosen to arrive at 120 respondents. Descriptive statistics such as percentage, frequency count and Mean were used to describe the socio-economic characteristics of the farmers while inferential statistics such as chi-square and Pearson Product Moment Correlation (PPMC) Coefficient were used to test the hypothesis.

Results and discussion

Socioeconomic characteristics of the respondents

The socioeconomic characteristics of the respondents were presented in Table 1. The results showed the average age of respondents to be 40 years. This implies that majority of the respondents were in their active age (productive age) and were expected to perform more effectively within the available resources. In term of their marital status, 60.00 percent of the respondents were married while 25.00 percent and 2.5 percent of them were single and widowed respectively. In term of household size, 20.83 percent of the respondents had household size of less than 5, 62.50 percent had household size of between 5 and 9 while 16.67 percent of the respondents had household of more than 9 members. Average household size was 7 persons. The results revealed further that farming (62.50 percent) was the major primary occupation of the respondents while agro-processing (60.0 percent) was the major secondary occupation of the respondents.

Table 1: Socioeconomic distribution of the respondents (n = 120)

Variables	Frequency	Percentage	Mean
Age (Years)			
Less than 30	16	13.33	
30-40	75	62.50	
41-50	15	12.50	**40**
55-60 years	9	7.5	
Above 60 years	5	4.17	
Marital Status			
Single	30	25.00	
Married	72	60.00	
Divorced / Separated	3	2.5	

Widow	15	12.50	
Sex			
Male	72	60.00	
Female	48	40.00	
Primary Occupation			
Farming	75	62.50	
Gathering	3	2.50	
Trading	15	12.59	
Civil Servant	2	1.67	
Artisan	5	4.17	
Agro-Processing	20	16.67	
Secondary Occupation			
Farming	23	19.17	
Gathering	2	1.67	
Trading	3	2.50	
Civil Servant	-	0.00	
Artisan	20	16.67	
Agro-Processing	72	60.00	
Household Size			
Less than 5	25	20.83	
5-9	75	62.50	**7**
Above	20	16.67	
Educational Level			
No Formal	30	25.50	
Primary	22	18.33	
Secondary	63	44.33	
Tertiary	5	4.17	
Religion			
Christianity	47	39.17	
Islam	66	55.00	
Traditional	7	5.83	

Source: Field Survey, 2021

Activities carried out in cassava processing

The distribution of respondents according to activities carried out by gender in cassava processing was presented in Table 2. Various activities involved in cassava processing such as washing, peeling, grating, pressing, sieving, milling, frying and drying were carried out by male and female in the study area. About 82.00 percent (female) and 18.33 percent (male) of the respondents engaged in cassava washing, while 91.67 percent (female) and 8.33 percent (male) participated in peeling of the cassava. Also, grating of cassava was carried out by 8.33 percent female and 91.67 percent male while 60.00 percent female and 40.00 percent male were engaged in cassava sieving. The distribution of gender (female and male) participation in milling, frying and drying showed that 8.33 percent, 60.00 percent and 81.67 percent of female respondents participated in milling, frying and drying activities respectively while 91.67 percent, 40.00 percent and 18.33 percent of the male respondents participated in milling, frying and drying activities, respectively. This corroborated Sayre *et al* (2011) that cassava processing activities are carried out by male and female though, most of processing activities are carried out by female.

Table 2: Distribution of respondents according to activities carried out in cassava processing (n = 120)

S/N	Activities*	Female		Male	
		Frequency	Percentage	Frequency	Percentage
1	Washing	98	81.67	22	18.33
2	Peeling	110	91.67	10	8.33
3	Grating	10	8.33	110	91.67
4	Pressing	44	36.67	76	63.33
5	Sieving	72	60.00	48	40.00
6	Milling	10	8.33	110	91.67
7	Frying	72	60.00	48	40.00
8	Drying	98	81.67	22	18.33

Source: Field Survey, 2021 *multiple response

Level of Involvement in Cassava Processing

Table 3 presents the level of involvement of respondents (male and female) in cassava processing in the study area. About 35.00 percent, 60.00 percent, 46.67 percent, 23.33 of male respondents in the study area were fully involved in washing, cassava milling, cassava pressing and cassava grating activities, respectively while 68.33 percent, 63.33 percent, 46.67 percent and 38.33 percent of female respondents in the study area were fully involved in cassava drying, cassava frying, sieving and cassava peeling activities. Furthermore, 5.83 percent, 12.50 percent and 1.67 percent of male respondents were partially involved in cassava grating, sieving and frying activities as against 10.00 percent, 2.50 percent and 14.17 percent of female participants who were partially involved in drying, frying and cassava pressing activities, respectively. This agreed with Sinkaiye (2005) that level of involvement in cassava processing activities varies amongst gender.

Table 3: Distribution of respondents according to level of involvement in cassava processing (n = 120)

S/N	Level of Involvement	Fully Involved		Partially Involved		Not Involved	
		Male Freq (%)	Female Freq (%)	Male Freq (%)	Female Freq (%)	Male Freq (%)	Female Freq (%)
1	Washing	42(35.00)	52(43.33)	2(1.67)	15(12.50)	5(4.17)	4(3.33)
2	Peeling	12(10.00)	46(38.33)	20(16.67)	20(16.67)	12(10.00)	10(8.33)
3	Grating	28(23.33)	35(29.17)	7(5.83)	15(12.50)	15(12.50)	20(16.67)
4	Pressing	56(46.67)	12(10.00)	25(20.83)	17(14.17)	7(5.83)	3(2.50)
5	Sieving	14(11.67)	56(46.67)	15(12.50)	22(18.33)	2(1.67)	11(9.17)
6	Milling	72(60.00)	5(4.17)	12(10.00)	3(2.50)	8(6.67)	20(16.67)
7	Frying	25(20.83)	76(63.33)	2(1.67)	3(2.50)	4(3.33)	10(8.33)
8	Drying	10(8.33)	82(68.33)	5(4.17)	12(10.00)	4(3.33)	7(5.83)

Source: Field Survey, 2021 Percentages are in parentheses

Major processed products

The distribution of respondents according to processed products was presented in Table 4. Majority (91.67 percent) of the respondents processed product was Garri while 62.50 percent, 19.17 percent, 81.67 percent and 16.67 percent of the respondents processed products were Fufu, Tapioca, Cassava Flour and Starch respectively. This finding is in tandem with FAO,

(2004) that most of products realized from cassava processing includes garri, fufu, Tapioca and starch.

Table 4: Distribution of respondents according to processed products (n = 120)

S/N	Products*	Frequency	Percentage
1	Garri	110	91.67
2	Fufu	75	62.50
3	Tapioca	23	19.17
4	Cassava Flour	98	81.67
5	Starch	20	16.67

Source: Field Survey, 2021 *****Multiple response

Constraints to cassava processing

The distribution of respondents according to constraints in cassava processing is presented in Table 5. The constraints included lack of fund, lack of processing machines, high cost of labour, low storability of cassava products, poor marketing, inadequate improved cassava varieties, high cost of transportation, poor products quality and intensive labour requirement with Weighted Mean Score of 2.80, 2.87, 3.04, 2.65, 2.21, 2.71, 2.78, 1.78, 2.29 and 2.13, respectively. This is similar to the finding of Ajala *et al. (*2013) that cassava processing are faced with series of challenges which included labour requirement, inadequacy of fund, high cost of processing equipment amongst others.

Table 5: Distribution of respondents according to constraints to cassava processing (n = 120)

S/N	Constraints	Very Serious Freq (%)	Serious Freq (%)	Not Serious Freq (%)	WMS
1	Lack of fund	69(57.50)	22(18.33)	29(24.17)	2.80
2	Lack of processing machines	72(60.00)	23(19.17)	25(20.83)	2.87
3	High cost of labour	75(62.50)	34(28.33)	11(9.17)	3.04
4	Low storability	60(50.00)	25(20.83)	35(29.17)	2.65
5	Poor marketing	23(19.17)	55(54.83)	42(35.00)	2.21
6	Improved varieties	43(35.83)	65(54.17)	12(10.00)	2.71
7	High cost transportation	90(75.00)	23(19.17)	7(5.83)	2.78
8	Poor branding	12(10.00)	34(28.33)	74(61.67)	1.78
9	Poor products quality	22(18.33)	65(54.17)	33(27.50)	2.29
10	Intensive labour requirement	35(29.17)	23(19.17)	62(51.67)	2.13

Source: Field Survey, 2021 WMS = Weighted Mean Score Percentages are in Parentheses

Test of Hypothesis

HO_1: There is no significant relationship between selected socioeconomic characteristics of the respondents and their level of involvement in cassava processing

The test of significant relationship of selected socioeconomic characteristics (age and household size) of the respondents and their level of involvement in cassava processing was presented in Table 6. Pearson Correlation analysis revealed that age ($r = 0.410$, $p < 0.05$) and household size ($r = 0.230$, $p < 0.05$) exert a significant relationship with their level of involvement of the respondents in cassava processing. This implies that the age of the household age and household size strongly have a positive significant influence of level of involvement of the respondents in cassava processing. This shows that the higher these

variables, the more they will be involved in cassava processing. Therefore, the null hypothesis was rejected.

Table 6: Pearson Correlation analysis showing relationship between selected socioeconomic characteristics of the respondents and their level of involvement in cassava processing (n = 120)

Socioeconomic characteristics	r-value	p-value	Remark
Age	0.410	0.040	S
Household Size	0.230	0.032	S

Source: Field Survey, 2021 S = significant; NS = not significant

Chi-square test establishing relationship between selected socio-economic characteristics of the Respondents and their level of involvement in cassava processing

The result of Chi-square test in Table 7 showed the significant relationship between selected socioeconomic characteristics and their level of involvement in cassava processing. The result showed that there was a significant relationship between sex (X^2 = 23.23, p < 0.05); marital status (X^2 = 12.03, p < 0.05); primary occupation (X^2 = 11.32, p < 0.05), educational level (X^2 = 11.90, p < 0.05) and their level of involvement in cassava processing. This shows that the level of involvement of the respondents in cassava processing is greatly affected by sex of the household head, primary occupation of the respondents and educational level.

Table 7: Chi-square test establishing relationship between selected socio-economic characteristics of the respondents and their level of involvement in cassava processing.

Socioeconomic characteristics	x^2-value	Df	p-value	Remark
Sex	23.23	18	0.05	S
Marital status	12.03	16	0.05	S
Religion	13.10	15	0.25	NS
Primary occupation	11.32	20	0.05	S
Secondary occupation	17.72	18	0.45	NS
Educational level	11.90	13	0.05	S

Source: Field Survey, 2021 Significant level: p < 0.05

Conclusion and recommendations

The study concluded that various activities were performed by male and female in cassava processing which included cassava washing, peeling of the cassava, grating, pressing, milling, frying and drying. Also, the level of involvement of the respondents in cassava processing showed that majority of both gender were fully involved in washing activities, cassava peeling, frying and drying. The study therefore recommended that:

1. Extension services on improved cassava processing technologies should be intensified in the study area by offering services that will encourage high adoption of mechanical peeler and fryer.
2. Cassava processors should form cooperative societies through which they can put their financial resources together for reinvestment and benefit from microcredit schemes to boost their cassava processing enterprise.

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EFFECT OF SOAKING TIME ON ACCEPTABILITY OF BATIK USING HAND DESIGN

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Abstract
The study was conducted to assess the acceptability of batik on fabric using hand design. The method involved melting of wax and applied to the fabric by hand to form a design, wet the fabric before dying to ensure drying, boil water for the period of 5-15 minutes, prepare the dye with right quality of dye stuff in ratio (2:2:1), mix a cup of water to the chemical (dye, hydrosulphite and caustic soda), stir with spatula, pour cold water and immersed the fabric inside the chemical, leave for about 15-25 minutes, remove the fabric from the dye, rinse thoroughly in cold water until the water runs clean, remove the wax by boiling, wash and rinse the fabric and starch. However, twenty five respondents were selected from both teaching and non-teaching staff of Oyo state College of Agriculture and Technology, Igboora using simple Random Sampling Technique. The result of the findings showed that most of the panelist that assessed the product attests that the product was magnificently superb. Generally, it was acceptable by the respondents. The study therefore, recommended that there should be greater emphasis on production and use of batik for hand design as an entrepreneurial skill to reduce the poverty rate and unemployment in the country and its utilization will go a long way in creating employment for youth and promote cultural heritage.
Keywords: Production, Batik, Design, Fabric, Hand design

Introduction

Design is a plan or drawing produced to show the look and function of something before it is built or made. It is also the purpose planning or intention that exists behind action, fact or material objective. Design is a look functioning of a garment, fabric or other object typically by making a detail drawing on it. It is an arrangement of lines and shape as a decoration.
Ralph and Ward, (2009) opined that design is specification of an object manifested by an agent intended to accomplish goals in particular environment, using a set of primitive component satisfying a set of requirement, subject or contains. Design is a road map or a strategic approach for someone to achieve a unique expectation. According to Foster (2006) Design often considering the functional object and design process which involves modeling, research work, adjustment and redesign. Tie-dye is a process of tying and dyeing a piece of fabric usually cotton, typically using bright colour. It is possible to create a wide variety of designs and patterns, such as strips spirals, marbled patterns and swirling design (Amarras, 2012). Tie-dyeing is accomplished by string or raffia thread. Dye is then applied to only part of the materials that are not tied. The tie prevents the entire materials from being dyed.
Batik dyeing is a process whereby design subsequently immersed in a dye to absorb the colour on the un-waxed portion (Kosly, 2011). There are two methods, the technically more difficult and more artistic design are drawn by hand. The patterns are generally in geometric floral, birds or animal motifs, but the artistic imagination may introduce other fanciful designs. The motif is drawn on the cotton cambric or fabric, then melted wax mixed with a resin is drawn on the areas not to be dyed with a tatting, which is small instrument made of a short, straight need handle to which is attached a small funnel shape copper cup with one or more sports. Batik is an indigenous cultural wears that influenced by the creativity of a single

or collective human actions inspired by natural surroundings. Batik is predominant in various indigenous communities in south east Asia, Arica, India and China. The chain of batik lies in its power of pictorial story telling where batik motifs depict nature as well as everyday lives and practices. Batik making has evolved into a socio-economical uplift within indigenous communities and has long existed as a cottage industry.

Dyeing textiles with indigenous dye is a popular traditional craft among many Nigerians; including Hausa, and Nupe in the northern Nigeria, as well as the Tiv in the middle belt region and the Yoruba in the western Nigeria. Batik and tie-dye are considered resist techniques. The resist dyeing technique is a process of protecting some areas of the fabric from the penetration of dye to create light pattern on a dark background (Osinowo, 1996: Meilach 1973).This can be produced on the fabric using either batik or tie-dye method. Batik/tie-dye method of fabric design has long played an important role in Nigerian social and economic life. Batik/tie-dye is a traditional craft develop to meet people's day-to- day aesthetic needs. Batik/tie-dye clothes serve as social, domestic and economic functions. The fabrics are used for everyday activity such as cover cloths against cold and mosquitoes, casual wrappers to be worn to markets, baby ties, work clothes, play clothes or use for cultural/ prestigious ceremonies as *aso-ebi* (family/group attire for easy identification and association with a celebrant) to mark important occasion like chieftaincy/ coronation,weddings, naming ceremonies, funerals of important individuals within the society and other social functions(Amubode, 2009).

The Yoruba have various forms of textiles; dyed fabrics, woven fabrics, printed fabrics as well as embroidered works(Adewale, 2011). The production of various hand crafted textiles is made possible with the availability of raw materials. The textile artisans have access to cotton, silk, dyes and imported yarns (Amubode, 2006, Ogunduyile, 2002). Consequently, the handcrafted textile industries flourish in many parts of the Yoruba land. This project therefore, aim to know the Effect of soaking time on acceptability of batik using hand design.

Materials and methods

Batik is the application of fluid or semi-fluid substance, which solidifies on the fabric making it impervious to dye penetration and later removed. According to (Adewale, 2011), In batik, the resist is obtained by applying hot wax to either sides or only one side of the fabric. Once removed, it gives the pattern or design on the fabric. The wax areas repel or resist dye penetration. Contemporary batik technique is divided into two types; kampala and cassava resist method. According to (Amubode, 2006), In kampala technique, this technique is dipped into hot wax and spills wax smoothly on the fabric. A wooden stamp of engraved motif or brush can also be used to transfer design on the fabric. After thorough waxing the cloth is then dyed. The dyed cloth is boiled to remove the wax, rinse in cold water, sun dry and ironed. Unlike the kampala technique, cassava resist method requires some additives like candle wax. candle are then put into the boiling water to dissolve while the starch paste is poured in and constantly stirred until it hardens up. The additives help to increase the resistant properties of the starch. This can also be called adire-eleko. The starch is often applied through a stencil, cut out of a thin sheet of zinc or the metal lining of an old packing case. The stencil is placed on the fabric and the starch spread on the exposed parts using flat wood.

This study assesses the effect of soaking time on acceptability of batik produce using hand design from a combination of resist dyed. The practical steps involved the production of designed fabric using batik and tie-dye techniques on a white cotton fabric that was purchased in the market. The cotton fabric was de-sized by rinsing in water to remove the industrial starch in other to allow easy absorption of the dyeing stuff. Sundry and ironed the fabric. The motif was transferred on the fabric with the aid of a nib (a designed foam) dipped

in dye solution and dyed for 5, 10, 15 and 20 minutes respectively, de-waxed in boiled water, rinsed with clean cold water, sundried and ironed.

Sensory Evaluation

The batik clothes produced in this research was subjected to sensory evaluation as follows: Texture, colour, appearance, usefulness and overall acceptability. The main attributed score was calculated using percentages. For this study, the total of twenty five (25) respondents consists of both teaching staff and non-teaching staff of Oyo State College of Agriculture and Technology, Igboora, Oyo State were randomly selected. This Category of staff assessed the batik produced using designed questionnaire on a five (5) scale rating. (Excellent, Very Good, Good, Average and Poor.

Result and Discussion

Result

TABLE 1: Effects of Soaking time on Consumers Acceptability of the batik produces using hand design

Rating	Appearance				Texture				Overall acceptability			
Excellent	5	10	15	20	5	10	15	20	5	10	15	20
Very good	0	0	10	90	0	0	18	82	0	0	10	95
Good	0	80	5	0	0	0	10	0	0	0	10	0
Average	15	10	0	0	5	25	0	0	0	20	0	0
Poor	85	5	0	0	95	75	0	0	0	80	0	0
Total	100	100	100	100	100	100	100	100	100	100	100	100

Discussion

Appearance: The table reveals fabric being soaked for five minutes, the rating 1,2 and 3 respectively showed the appearance to be poor and the colour combination did show appropriately. It can however be deduced that the design of the batik produced within the soaking time of twenty minutes had a favourable acceptable combination at the rating 1.

Texture : From the result, it shows that the texture of the fabrics soaked for five minutes, with the rating 1,2 and 3 respectively had a negative percentage of 0 which indicated that using soaking time of five minutes will totally destroy the texture of the fabric. Similarly, the batik fabric soaked within the soaking period of 15 to 20 minutes respectively was widely accepted and the texture was superb.

Overall Acceptability: The overall acceptability of 95% indicated a favourable acceptance of the soaking time of twenty minutes (20) to soak fabric in the already prepared dyed to revealed the expected and desired designed.

Conclusion and Recommendation

Conclusion

From the results obtained, it appears that using soaking time of five minutes will totally destroy the texture of the fabric. Similarly, the batik fabric soaked within the soaking period of 15 to 20 minutes respectively will be widely accepted and the texture will be highly superb.

Recommendation

Based on the finding of the research work there should be greater emphasis on production and uses of batik using hand design as an entrepreneurial skill to reduce the poverty rate and unemployment in the country and its utilization will go a long way in creating employment for youth and promote cultural heritage.

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