TECHNOSCIENCE REVIEW

(An international science, engineering, technology & development academic research journal)

ISSN: Print: 2250-9046, Online: 2536-6912

Website: *Technosciencereview.org*

The **aim** of the ***Technoscience Review (TR)*** derives from the **mission** and **objective** of the Publishers, ***Welfare & Industrial Promotions (WIPRO) International,*** as follows: **Mission:** Confronting the abounding development challenges in developing countries. **Objective:** Using research, publication, conference, enterprise development and awareness creation to develop the total man in developing countries.

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EDITORIAL

For many centuries, technological advances of great significance were made without benefit of knowledge from science. The iron production, printing, and hydraulic engineering, including dams, canals, irrigation systems, water wheels, canal locks, barbed wire, food preservation, fermentation and many metallurgical processes are instances where technology ran ahead of science. The steam engine was commonplace before the science of thermodynamics elucidated the physical principles underlying its operations.

With the growth of the chemical and electrical power industries in the 19th century, scientific knowledge was of direct use in solving of problems and the development of products, although it was rarely sufficient on its own. Later, the communication and electronic industries manifested the effectiveness of a close relationship between science and technology, as indeed did the experience of World War II and subsequent more local military conflicts. By the second half of the 20th century, much modern technology was intimately related to scientific knowledge, and science itself had become increasingly linked to technology through its dependence on complex instrumentation to explore the natural world.

More similarities than differences can be found between science and technology. Both terms imply a thinking process, both are concerned with causal relationships in the material world, and both employ methodology that results in empirical demonstrations that can be verified by repetition. The symbiotic and synergistic relationship between modern science and modern technology has thrown up the term "technoscience" to describe the essentially merged, even hybrid, enterprise.

So far, academic journals appear to dissect and concentrate on various aspects of technoscience, rather than merge them. Thus, there are journals of science, technology, engineering, and others. There is the need for an academic research journal of technoscience, to integrate the various aspects of technoscience, which have become hybridized, especially at the rapid rate of technoscientific development and growth. The aspiration to fill this gap has birthed *Technoscience Review*.

This Volume 8 Issue 2 of November 2017, contains papers on very topical issues. In the first article (pp. 3-16), titled *Application of geoinformatics in assessing landuse changes resulting from deforestation on selected variables in parts of Kogi east, Nigeria*, Ocholi, I.U. (Ph.D.) and Idoko, O. of the Department of Geography and Environmental Studies, Kogi State University, Anyigba opined that decline in forest structure and quality prompted the study, essentially to examine the spatial effects of deforestation on the edaphic components of the environment of Kogi East, Kogi State, Nigeria. It focused specifically on soil and vegetation, while it assessed the implication of the destructive interference by humans with the natural ecosystem based on the results of preliminary investigation. Results showed thatt in many parts of the study area, substantial hectares of the forest landscape had been primarily logged and abandoned. Over a 100,000 hectares of vegetation cover was lost annually, most of which were deliberately removed to make way for agriculture, mineral exploitation, urbanization and expansion of settlements, among others. Reforestation efforts reportedly replenished only 25,000 hectares. In order to investigate this trend, Classified Satellite Imageries of Kogi state covering 1990-2010 were acquired to assess land use information. The process involves land use mapping and the detection of changes using remote sensing and GIS techniques. Additional land use information were acquired through field observation and theoretical survey. When categorized and analyzed, the four main land use components (soil, vegetation, water and the built environment) covered in this study demonstrated significant effects relationship with deforestation. Implicatively, the results of this analysis shows that there had been significant increases in the effects of these land uses on the forest landscape thus resulting in forest depletion, soil degradation and observed destruction of the ecosystem. It was thus concluded that land use practices in the study area must be carried out within the limits of forestry standard for a sustainable forest management.

In the second article (pp. 17-24), titled *Physico-chemical characteristics of some commercial lubricants sold in market around Surulere, Lagos State, Nigeria*, Ogbuagu, A.S. (Ph.D.) and Ofuokwu, A.N. of the Department of Pure and Industrial Chemistry, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria reported on physic-chemical qualities of samples of brands of monograde and multigrade lubricants motor oil sold in market in parts of Lagos State. The parameters tested were kinematic viscosity, viscosity index, specific gravity, flash point and total base number (TBN). The test results obtained were further compared with standard ratings of the Society of Automobile Engineers (SAE). Analysis of variance (ANOVA) was determined to know if differences existed among the means of samples properties. It was observed that sample A3 had the lowest TBN of 4.21 mgKOH/g, while A6 had the lowest viscosity index of 87 and did not meet the minimum statutory requirement. Sample A7, A9 and A10 had flash point values of 218°C, 219°C & 218°C respectively, which were less than the minimum requirement. Sample A_2 had the highest mean specific gravity of 0.8981at 15°C. Most of the accessed products did not meet the minimum standard requirement.

In the third paper (pp. 25-30), titled *E-waste pollution in Africa and the urgent need for appropriate response*, Onyenekenwa Cyprian Eneh (Ph.D) of the Institute for Development Studies, University of Nigeria, Nsukka and Prof. Ndowa Ekoate S. Lale, Vice-Chancellor, University of Port Harcourt, Choba, Rivers State, *Nigeria* observe that

increasing ICT adoption leads to rocketing acquisition of ICT facilities which results in rapid e-waste generation and attendant environmental pollution and health hazards. The volume of e-wastes being generated grossly outweighs the existing capacity to manage it in an environmentally sustainable way. Uncontrolled burning, disassembly, and disposal of e-wastes cause a variety of environmental problems, such as ground water contamination, atmospheric pollution, and water pollution either by immediate discharge or due to surface run-off. Bonfire refuse of e-wastes are discarded into drainage ditches or water ways feeding the ocean or local water supplies. This does not only contaminate water bodies, but also results in blockage of drainages, leading to flooding that destroys fauna and flora, lives and properties, and causes health hazards, deterioration of health quality, air and noise pollution, diseases and economic wastes. The situation necessitates the need for urgent and appropriate response to bring about efficient management and control of e-waste for sustainable African environment.

In the fourth article (pp. 31-48), titled *A survey of publisher compliance with bibliographic practices in Nigeria*, Tralagba, Chris Eriye, the University Librarin, Evangel Univerity Akaeze, Ebonyi State, Nigeria observed that inability of Nigerian publishers to conform to international standards of publishing is the bane of publishing in Nigeria. The study investigated publisher compliance with bibliographic codes and standards in Nigeria. Also interrogated were challenges faced by publishers in accessing these codes and standards, those faced by National Library of Nigeria in administering these codes and standards and implementing the legal deposit obligations, as well those affecting the compilation of the National Bibliography of Nigeria (NBN). The descriptive research adopted the random sampling technique to select 410 publishers, librarians, authors and printers. The targets were reached with questionnaires, interviews, observation of records and interaction for data gathering. Findings show unfounded fears by publishers regarding some perceived difficulties in getting these codes and conventions from the National Library of Nigeria, a general apathy among publishers towards the issue of legal deposit and the attendant difficulties in the compilation of the National Bibliography of Nigeria (NBN). Recommendations include discouraging all-comers from flooding the publishing business. The National Library of Nigeria needs to reach out to the Nigerian publishers in a massive media campaign for training, semimars, conferences and workshops on issues bordering on bibliographic control, legal deposit and other sundry matters in the publishing industry. The National Library Decree No. 29 of 1970 is long overdue for revision. Government needs to introduce import wavers and duty-free importation of essential printing/publishing materials and equipment.

In the fifth article titled *Leather wares factories in Aba, Nigeria: challenges and way-forward*, Ezinwa, Vincent Chi and Ikechukwu, Arinze Ernest of General Studies Division, Enugu State University of Science and Technology, Agbani, Enugu State, Nigeria studied Ariaria International Market in Aba, Abia State of Nigeria, with a view to x-raying the cluster of leatherworks factories that manufacture exported wares and their challenges. Key informant technique was used to elicit data from 17 respondents. The data were analyzed with the help of simple statistical tools. Results showed high exchange rate and other costs of importation of machinery and raw materials was a key challenge. Other challenges include lack of entrepreneurial spirit in graduate youths, poor doing business facilities and infrastructure, irregular electricity power supply, competition from imported goods, and lopsided development. Others are policy reversals, high and double taxation, difficulties in procuring business approval from government, high inflation rate, and unstable foreign exchange rate, in addition to corruption and fraud. The study recommends government encouragement of the leatherworks sub-sector with the right equipment and support.

In the sixth article (pp. 49-59) titled Comparative analysis of the proximate and amino acid compositions of “ogiri” from soya beans (*glycine max*), castor oil seed (*Ricinus communis*) and from melon seed (*Colocynthis vulgaris*), Ogiri soya (OS), Nzelu, I.C. of Food Technology Department, Federal Polytechnic, Oko, Anambra State, Nigeria, Agu, H.O. of Food and Science Technology Department, Nnamdi Azikiwe University, Awka, Anambra State Nigeria and Dimejesi, S.A. of Microbiology Department, TANSIAN University, Umunya, Anambra State, Nigeria reported on proximate and amino acid compositions of “ogiri” from soya beans (*glycine max*), castor oil seed (*Ricinus communis*) and from melon seed (*Colocynthis vulgaris*). Quantitatively, crude protein and ash contents were highest in Ogiri soya which had the highest (39.58±0.10% and 6.40±0.00%), while Ogiri Ugba had the highest quantities of crude fat (43.16±0.13%) and 12.52±0.16% crude fibre. Ogiri Egwusi had 10.55±0.93% carbohydrate. The three samples had high quantities of energy ranging from 2362.32KJ/100g in Ogiri soya to 2435.38 KJ/100g in Ogiri egwusi. Among the eighteen amino acids assayed, the highest concentrations obtained in g/100g unit, Aspartic acid 17.49±0.04, 11.53±0.00. 6.82±0.02 for OU, OS and OE respectively while their respective values for Glutamic acid were 16.05±0.05, 15.89±0.02 and 11.28±0.08 for OU, OS, and OE. Ogiri soya had higher values in terms of the essential amino acids while OE had higher values for arginine 6.80±0.38, Glycine 3.61 and Threonine. The use of Ogiri condiments from these substrates is recommended for consumers.

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APPLICATION OF GEOINFORMATICS IN ASSESSING LANDUSE CHANGES RESULTING FROM DEFORESTATION ON SELECTED VARIABLES IN PARTS OF KOGI EAST, NIGERIA.

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ABSTRACT

Decline in forest structure and quality prompted the study, essentially to examine the spatial effects of deforestation on the edaphic components of the environment of Kogi East, Kogi State, Nigeria. It focused specifically on soil and vegetation, while it assessed the implication of the destructive interference by humans with the natural ecosystem based on the results of preliminary investigation. Results showed thatt in many parts of the study area, substantial hectares of the forest landscape had been primarily logged and abandoned. Over a 100,000 hectares of vegetation cover was lost annually, most of which were deliberately removed to make way for agriculture, mineral exploitation, urbanization and expansion of settlements, among others. Reforestation efforts reportedly replenished only 25,000 hectares. In order to investigate this trend, Classified Satellite Imageries of Kogi state covering 1990-2010 were acquired to assess landuse information. The process involves landuse mapping and the detection of changes using remote sensing and GIS techniques. Additional landuse information were acquired through field observation and theoretical survey. When categorized and analyzed, the four main landuse components (soil, vegetation, water and the built environment) covered in this study demonstrated significant effects relationship with deforestation. Implicatively, the results of this analysis shows that there had been significant increases in the effects of these landuses on the forest landscape thus resulting in forest depletion, soil degradation and observed destruction of the ecosystem. It was thus concluded that landuse practices in the study area must be carried out within the limits of forestry standard for a sustainable forest management.

Keywords:*Forest structure and quality,Spatial effects of deforestation,Edaphic components of the environment, Anthropogenic activities.*

INTRODUCTION

Deforestation is a critical environmental problem of many regions in the world. Studies have shown that the extent and magnitude at which the menace grows is worrisome, particularly in the tropical countries of the world. Many developing countries, including Nigeria, are confronted with the effects of deforestation on their environment, particularly now that the issue of sustainable development is top on the agenda of governments.

In deed, the people and their land, including the resources therein, have fallen victims of a number of environmental hazards occasioned by deforestation. Importantly, Hagan (2006) outlined settlement expansion, business establishment and development,

industrialization, transport and infrastructure development, mining and agricultural development as the leading causes of deforestation across the globe. With increased intensity in land use activities (agricultural, industrial, cultural, political, commercial recreational, etc.), substantial hectares of the forest land in many parts of the study area have been lost to the outlined landuses. Prominent components that constitute these landuses include soil, vegetation, water and built environment. The effects of deforestation on these land components and its attendant consequences in this part of the country is worrisome, as substantial environmental resources(forest trees, soil nutrients, soil flora and fauna, fruits, seed fibre) of the people have been lost.

In order to give this study a spatial coverage, the application of Geographic Information System was considered relevant in view of the growing sophistication in spatial analysis of landuse features as well as the nature of the problem that requires data of multivariate structure. Landuse/land cover mapping and detection of changes using remote sensing and the Geographic Information software is of paramount importance to geographers, planners, policy makers and environmentalists.

Preliminary findings have shown that Landuse activities have been seen to constitute the greatest human influence on the ecospace and the most dependable assess to this type of study, particularly because of its multivariate applications. Landuse categorization and planning are indeed crucial to environmental resources management and needed to be embraced.

Studies have shown that an activity that culminates in deforestation remains a critical problem in Kogi East where many families and constituted authorities are constantly faced with the challenge of landscape development. *Encyclopedia Britannica* (2011) reported and confirmed that the world's timberlands have been subjected to astonishing abuse in the 19th century where great quantities of valuable timberland have been disposed off under the public land laws as agricultural lands. There is, therefore, no doubting the fact that the prominence of deforestation in this part of the world proved to be a cause of concern to Kogi East people in view of the immense danger it posses to soil and other land resources to which the tropical forests take the lead.

As FAO/UNEP (2009) put it, deforestation activity that destroys economic trees mean an injury to a nation's soil and economy. This type of development was seen by Ocholi (2015) as a form of disinvestment to affected nations. According to the National Bureau of Statistics (NBS, 2007), between 2000 and 2005, Nigeria witnessed the highest deforestation rate in the world, having lost substantial areas of its primary forests. Reforestation efforts, it says, replenished only 25,000 ha., out of the 600,000 ha. which is just 4% of such efforts.

Our preliminary field survey shows that the indiscriminate felling of trees in the area for fuel wood has caused soil impoverishment, loss of soil nutrients and advanced desertification; destroyed wildlife habitats and numerous damages to a number of land resources.Such human interferences presumably were responsible for persistent damage to the outlined environmental resources on which depends life sustenance (e.g. plants, water, animals and their habitats).

Asthana and Asthana (2005) and Essoka, *et al* (2010) see the destruction of the top soil, habitats of plants and animals and biodiversity losses as a result of deforestation as critical environmental problems in many parts of Nigeria. Deforestation reduces forest structure, soil quality, the biochemical structure of soils and the biomass that sustains the soil's biological resources to an extent that allows for an alternative land use (Ocholi, 2007). In addition to the physiochemical

degradation of the soils, Abdulkadir (2007) had recognized loss of food and medicinal herbs, depreciation and outright wiping off of genetic pool, building up of greenhouse gases and drought as general effects of deforestation. In order for a sustained resource usage and the environmental resources development, efforts must therefore be made to reduce the negative effects of deforestation on these vital components of the environment of Kogi East, essentially in line with the principle of the Millennium Development Goals (MDGs). It is against this backdrop that this research has been agitated.

Tropical deforestation was responsible for the loss of an estimated 5-15% of the world's species between 1990 and 2002. Between 2002 and 2004, the United Nation's Food and Agricultural Organization estimated that average annual tropical deforestation was 11.4 million hectares per year. Out of this amount, 7.4 million hectares of closed forests were lost per year (FAO/UNEP, 2006). A break down of this decline in forest structure shows that 4.2 million hectares (10.4 million acres) a year are lost in Latin America, 1.8 million hectares (4.4 million acres) in Asia and 1.3 million acres in Africa.

In many parts of Nigeria, the forest is primarily logged and then abandoned, timber was cut becausethere was need for it, and lower grade portions of trees were not used. In this part of the world too, about 600,000 hectares of vegetation cover is lost annually, most of which is deliberately removed to make way for agriculture, shifting cultivation, firewood collection, excessive logging, mineral exploitation, development of infrastructure and expansion of settlements (FAO, 2006; Adedayo et al, 2008;Oroka, 2009).

Farmers have often misused the forests largely due to ignorance of their chemical and physical composition, Considering the consequence thereof, the FAO says that low crop yield in most nation's soil is traceable to the abandonment of the culture of building up of soil organic matter through nutrient restorative bush fallow system or shifting cultivation (Obi, et al, 2005 and Jimme et al, 2010).

It was found that no step towards avoiding forest depletion and degradation had been seriously addressed by the people. The declining state of the forest has indeed been a subject of discussion in many parts and legislative seats in the study area as the people continue to remain victims of many ecological problems connected with deforestation. In deed, farming in the area is the main occupation of the people where nearly over 80% of the populationare farmers. Such anthropogenic activities on the forest environment has exposed the land to rapid soil erosion and associated soil degradation visible in the study area. Accelerated water and wind borne erosion, flooding, and threats of extinction on economic trees, are indeed attenuated by the people's quest for ecosystem services that involves deforestation

In Kogi East, the appropriate models to deal with deforestation issues have not yet been developed. Not much work has equally been done on the use of GIS software in soil studies. Unknowingly, the State Forestry Department lacks comprehensive data base on the two most critical variables connected with deforestation: the rate of deforestation and data on degraded edaphic components in the area. It is therefore expected that through this study, we hope to unravel these miseries and basically to advise government on the need to secure a data bank on an environmental issue of this nature. Such advice and information could be used for varied purposes: research activities, strategic planning, advisory roles, project justification and environmental resources management, among others. Objectively, the study relied on two visions in order to

criticallyexamine the rate and the spatial pattern of deforestation in parts of Kogi East, and to criticallyanalyse the rate of degradation caused by outlined Landuse practices in the study area.

REVIEW OF RELATED LITERATURE

Kogi East is located between latitudes 06° 05'and 08° 00' N; and longitude 06° 07'and 07° 05' E (Ukwedeh, 2003)(Fig.8.1). The study area is located in the tropical region, specifically in the middle belt of Nigeria.Kogi East Senatorial District situates in the eastern flank of Kogi State. The study area covers 8 LGAs of Igalaland. It is about 89% of the entire Kogi East. It includesAnkpa, Dekina, Ibaji, Idah, Igalamela/Odolu and 0fu. Others are Olamaboro and Omala LGAs.The area, which is mainly dominated by the Igala speaking people, covers an area of 19,200 sq km (Egbunu, 2009). It is the largest senatorial district in Kogi State.

Fig.8.1: Land use/Land cover of Kogi East
Source: NARSDA, ABUJA. (2010).

Kogi East is drained by the two giant rivers: the Niger to the West and the Benue to the north. It is also drained by numerous rivers and streams (e.g., Imabororiver, and streams such as Okura, Inachalo, Ofu, Itemie, Onne, etc.). It shares boundary with the Federal Capital Territory in the north, Benue state in the East, Enugu state in the south and with its neighbors, the Central and Western senatorial districts in the West.

The region lies within the warm humid climatic zone of Nigeria with a distinctive wet-dry season dichotomy. The climate of the area is thus affected by two main air masses: the tropical maritime, Mt, and the tropical continental, cT. Rainfall is heavy within the rainy months with an average of about 1500-2000mm annually (Ocholi, 2007).

Kogi East has a mean annual temperature of 24.5^{o}C. Ocholi (2010) defined the rocks of Kogi East as older sedimentary rocks of the secondary age. These comprise limestone, sandstones, shale and coal. Also present are tertiary rocks comprising of sands and clays dominating parts of the study area, particularly the axis of Ankpa, Omala and Dekina LGAs. The general relief of the area comprises essentially of highlands and lowlands. In the northern and central axis, occur numerous chain of hills and ridges at considerable heights.

The dominant vegetation communities remain the tropical savanna woodland of secondary types and mixtures of scattered tropical trees and grasses formations. Vegetation distribution in this area follows a pattern that is similar to that of rainfall distribution (Ekwedeh, 2003).The floristic composition of the area is derived from three principal features:as a natural transition zone between the tropical grassland of Northern Nigeria and the rain forest down south (preferably called the middle belt region); cultivation in this zone is extensive; and conspicuously consistent and clearly rampant burning which regardless of its purposes, gives grasses propagative edge over herbaceous species(Musa and Ocholi, 2016).

There are numerous socio-economic, social, cultural, political and judicial activities going on in the region. These have engaged a significant number of the people to an extent that the population remains an active one all the year round.The population of the region is unevenly distributed. While some areas are densely or thickly populated, particularly the built up areas, others are moderately or scantily populated. Based on the projected 2006 Population Census figure, the total population of Kogi East is estimated at 1,659,269 persons(NBS, 2007).

MATERIALS AND METHODS

The nature and category of data required to address the basic objectives of the study involve data acquired from satellite images covering 1990-2010 (a 21-year period). The data provided would be used for planning and management purposes and for taking corrective measures against environmental problems prominent among which is soil deterioration, soil erosion, vegetation loss and general degradation of the soil (Ogidiolu, 2003).Scientific study of soil too is a pre-requisite for realistic development because through such study, the genesis, the distribution, classification, capability and suitability, use and management of information can be documented.

The need to work on soil as a land resource and as one of the major components of the biophysical environment was considered from a wide array of backgrounds. It is in that regard

that the Agenda 21 of the UN General Assembly did emphasize global land degradation and pollution thence the increased demand for soil data in order to inform the development of environmental policies (FAO/UNEP, 2009).

Reconnaissance Survey

Preliminary sample surveys were carried out from which the people testified that a number of human activities related to land /soil degradation are ongoing. These include farming activities, lumbering, plantations establishment and settlement expansion among others. The sampled population has agreed that farm outputs have reduced and a number of useful forest products (wood, fruits, nuts, fibers and leaves) have disappeared and many settlement areas have emerged and taking over the previously existing forest lands.

Research Design and sources of data

Land use/cover study of the area was conducted with base maps and satellite imageries. These base maps were digitized into the GIS environment with the application of on screen digitization. These tools were used to determine the extent of forest lands that have been cut, changed or lost during the period of study. Information acquired from this study process was primarily meant to assess the extent of degradation caused by deforestation on these edaphic components in the study area. The Google Earth Images of 1990, 2000 and 2010 years were acquired from the internet for this purpose. The analyses involved the use of computer assisted interpretation of the maps and the imageries.

Land use and management practices have major impact on natural resources including soil nutrients, plants, animals and water (Ati, 2008). Similarly, land use information can be used to develop solutions for natural resource management, such as soil salinity and quality, vegetation and water quality. With the advent of earth mapping technology and computerization, it was possible to monitor and manage both rural and urban land use changes in view of the connection they have with deforestation. Scientists use GIS images as models, making precise measurement, classification of data and the analysis thereof becomes more relevant in order to discover significant areas of degradation of the earth resources as they are brought about by deforestation.The imageries in question have been graphically expressed in Figures 2-4 to account for the distribution of these components during the period of study.

For the GIS analysis, the study depended on the computer assisted interpretation of the maps and satellite imageries. Likewise, field survey was performed throughout the study area using Global Positioning system (GPS) in other to obtain and measure the accurate location points. The adoption of these techniques is paramount; first for originality of data and second for reliability of results hence data on soil provides a forum for an original access to the edaphic environment in which deforestation activities has the greatest effects. We therefore consider this technique as the most relevant scientific process through which objective results could be acquired.

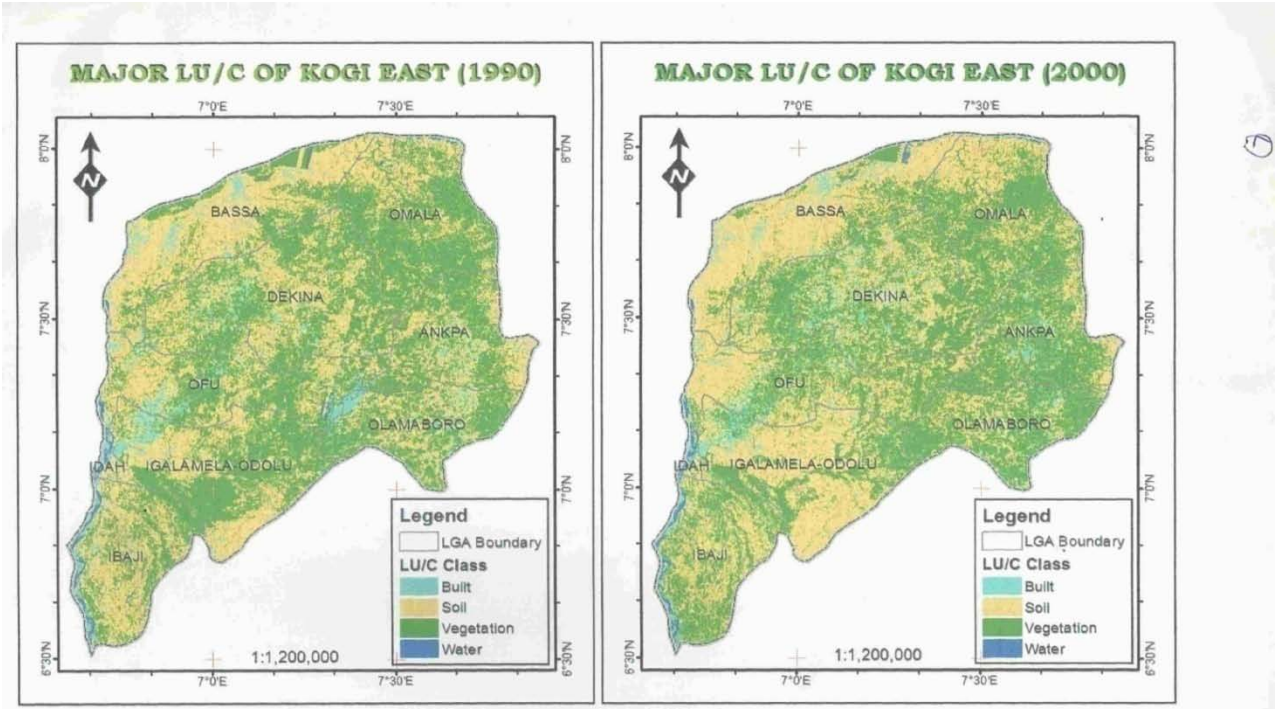
RESULTS AND DISCUSSON

Land Use Study and Socio-Economic Survey of Kogi East

Land Use Study of Kogi East with Satellite Imageries

The period of study covered twenty one years (i.e. 1990-2010). The analysis essentially focused on four prominent environmental components: soil, vegetation, water and built environment. The components in question assume to have intricate relationship with themselves, hence what affects one segment affects the other. In other words, the variables/components are

interconnected and the mechanism with which they relate involves exchange of organic nutrients, a prominent feature of biological growth. The use of this model is entirely complimentary to the other techniques used in this study.



Figs.2-4: Major LU/LC of Kogi East (1990- 2010)
SOURCE: MASRDA, ABUJA (2010)

Table 8.1: Classified landuse/landcover of Kogi East 1990-2010 ((km^2)

S/N	Year (km^2)	Built	Relative (%)	Water	Relative (%)	Vegetation	Relative (%)	Soil	Relative (%)
1	1990	733.4	23	178.6	34.8	6049.8	34.1	6889.5	34.2
2	2000	810.6	26	148.9	29	5813.1	32.8	7078.7	35.1
3	2010	1612.9	51	186.2	36.2	5862.2	33.1	6190.1	30.7
	Total	3156.9	100	513.7	100	17725.1	100	20158.3	100
	% Diff.		7		1		43		49

Source: Field work (2012)

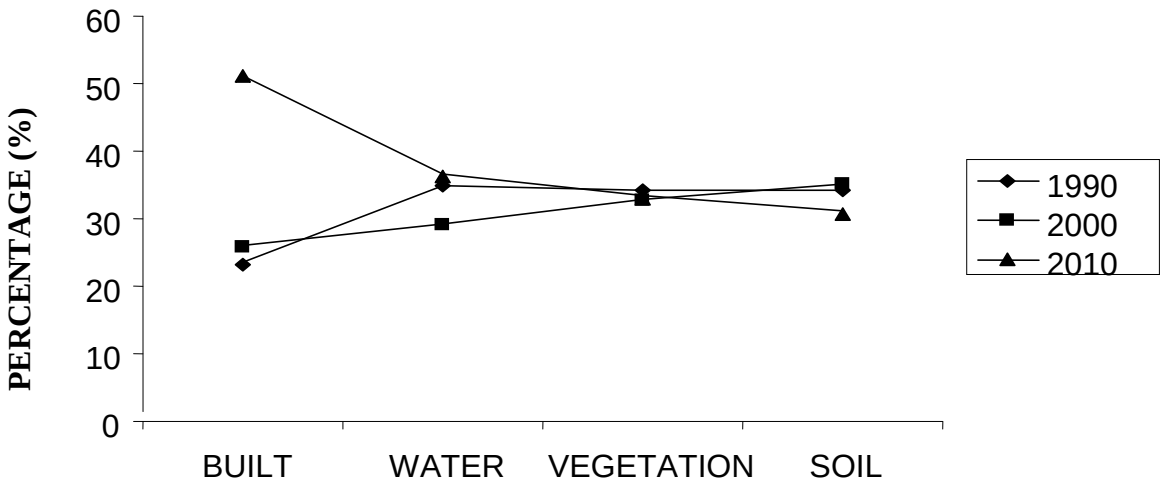


Figure 5: Classified Landuse/Land cover of Kogi East (1990-2010) Km^2
Source: Field Work (2012)

Description of the Land uses

The four main land uses in the study area have been described as follows:

Vegetation: Vegetation in this usage refers to all categories of plant species such as trees, shrubs, herbs, grasses and creepers. Vegetation is represented by green color. It occupies about 6049.8km^2 representing 34.1% of the total land mass of the study area in 1990. By 2000, vegetation covered an area of about 5, 813.1km^2 representing 32.8% of the land area. In 2010 it occupied about 5,862.2km^2 representing 33.1% of the total land area. By this analysis, vegetation structure and composition significantly showed a decline in the year 2000 than in the previous and later years. That means it declined in 2000 and rose again in 2010, an indication of significant afforestation practices and reforestation programmes.

Soil: This feature is represented by pink color. It includes undeveloped soil and rocky landscapes. It covers an area of about 6889.5km^2 in 1990 representing 34.2% of the land. In 2000, soil covered 7078.7km^2 representing 35.1% of the entire land area. In 2010, it was 6190.1km^2 representing 30.7% of the total land area. By this analysis, it was noticed that the Kogi East land area covered with soil was higher in 2000 by 35.1% than the other years. Between 2000 and 2010, this Landuse occupied less proportion of the land area than the year 2000, less by 0.9% in 1990 and by 4.4% in 2010.. This shows a significant rise in soil usage by the people and thus culminating in soil

degradation within the last 11 years and between 1990 and 2010, the early years of the study.

Built up areas: In this category, the facilities/features include socio-economic features such as houses, markets, shops, inland ports, playing fields, farms, stadia, educational, health and cultural institutions. These features are represented by light green color and they constitute 733.4 square kilometers, constituting about 23% of the total land area in 1990. In 2000, built up areas covered about 810.6 square kilometers and this covered 26% of the total land area of Kogi East. In 2010 built up areas covered about 1,612.9 square kilometers representing 51% of the total land mass. When ranged, the built environment component ranked first with 28km^{2,} the water component ranked 2nd with 7.2 km^2, soil, 3rd with 4.4 km^2 and vegetation 4th with 1.3 km^2 respectively. This ranging attested to the fact that in the last 21 years, there has been a drastic reduction in vegetation cover, perhaps, the original vegetation hence the lowest range.The results of this analysis thus show that there has been a significant rise of the effects of this land use in the last 21 years in the study area. By this we mean, more houses and perhaps new settlements have emerged. With this trend increase, the effects of this expansion or increase means a reduction of available land/soil space for farming purposes. The increase in urbanization means increased deforestation, perhaps a reduction in vegetal cover.

Water Body: This includes rivers, streams, lakes and ponds. Water bodies are represented by blue color on the map. It covers about 179km^2 in 1990 representing 34.8% of the total area. However, the most significant of the hydrologic features in the study area are the rivers and streams. In 2000, the size was 149km^2, but less than that of 1990 and it represents 29% of the landscape. In 2010, it covered an area of 186.2km^2 and represents 36.2% of the total landuse.

Having analyzed thus, it was confirmed that, among the four landuses covered in this study, soil and vegetation scored the highest proportion at 49.7% and 43.7% in 1990; 51% and 42% in 2000; and 44.7% and 42.3% in 2010 respectively. Both land uses put together covered 93.4% in 1990; 93% in 2000; and 87% in 2010 respectively. Due to human activities, these landuses declined between 1990 – 2010. When all the land uses were compared, it shows that the landscape of Kogi East degraded due to intensity of use. The area of coverage by vegetation and soil at 6049.8 km^2 (43.7%) and 6889km^2 (49.7%) in 1990 respectively shows a decline of structures and composition of these prominent components of the environment, in this case attributed to high deforestation rate. The proportions of 179km^2 (1.3%) and 733.4km^2 (5.3%) were covered by water and built environment for the same period.

Persistent Landuse/Land Cover of Kogi East

Having classified the landuses of the study area during the study period, the level of changes have been configured and compressed for two persistent years (i.e. between 1990 and 2000 and between 2000 and 2010) against the preceding years. The need for this compression and classification was meant to marginally assess the levels or rates of changes that have occurred in order to mark out the critical periods of greater and specific effects of the land uses in the area during these study periods. In this classification therefore, soil and the built environment components showed positive trends in their effects relationship with the environment. That means more human influence in terms of farming, urbanization, infrastructure development; settlement expansion, plantations agriculture, etc were wrought on the environment than the vegetation and water component, which demonstrated negative effects relationship. By 2010, ten years

later, perhaps in the later years, more of the landuses (vegetation, built and water components) positively demonstrated effects relationships with human influence. The soil was negatively affected. But when the records of the previous (+) and later years (-) were compared, a difference of 5.0% shows that the soil still remains critically depleted. However, some levels of soil restoration practices were been put in place in the area during the study period. Nevertheless, the higher levels of degradation was shown by vegetation (42.3%, +), urbanization /built (1.6% +) and water (1.4% +) components than the soil component (44.7 %-).

Table 8.2 and figures 6 and 7 below have been acquired to show the cumulative percentage distribution of the prominent landuses in the study covering 1990-2010.

Table 8.2: Persistent LU/C of Kogi East (1990 – 2010)

LU/LC Class	1990		2000		2010	
	Area (km^2)	%	Area (km^2)	%	Area (km^2)	%
Built	733.4	5.3	810.6	5.9(+)	1612.9	11.6(+)
Water	179	1.3	148.9	1.1(-)	186.3	1.4(+)
Vegetation	6049.8	43.7	5813.1	42(-)	5862.3	42.3(+)
Soil	6889.5	49.7	7078.7	51(+)	6190.2	44.7(-)
Total	13851.7	100	13851.7	100	13851.7	100

Source: adopted from NARSDA, Abuja (2010)

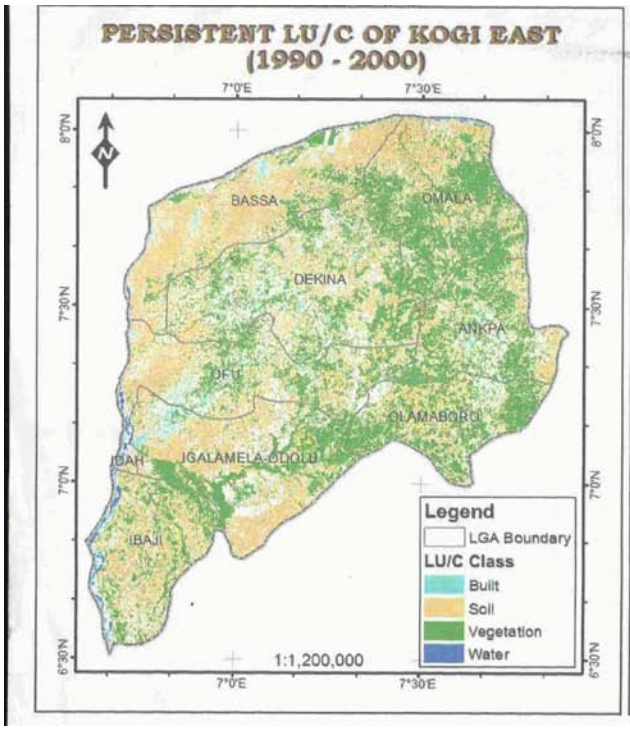


Fig.8.6: Persistent LU/C of Kogi East (1990-2000)
Source: **NASRDA ABUJA (2010)**

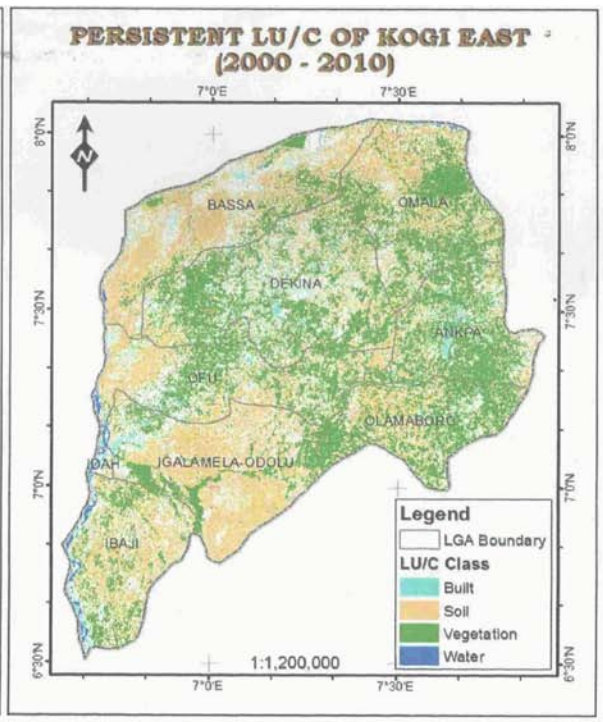


Fig.8.7: Persistent LU/C of Kogi East (2000-2010)
Source: **NASRDA ABUJA (2010)**

Trend Description of Land uses (1990 - 2010)

Table 8.3 and Figure8.8 below have been used to demonstrate these levels of changes that have occurred in the study area over the last 21 years considering four outstanding landuse components. The adoption of the trend description was meant to analyze the sequence of changes (positive and negative), in the land use categories with a view to determining the rate of changes that have taken place during the study period.

The + and - signs in the analysis shows alternate changes in land use characterization. The + sign means a positive change which invariably means an increase in the number or size of a variable. The - sign means a negative change which in other words means a decrease in the number or size of a variable. On this basis, the changes in the first class or category (Built-up areas) are positive all through. The interpretation is that, the people were actively involved in setting up structures, expanding settlement and engaging in rapid urbanization. In effect, the more the rate of such development, the more they deforest. Likewise, the more the level of deforestation, the more degrading the edaphic components become. This has been significantly proved by the computation on land use analysis.

Table 8.3: Trends Description of Land uses (1990-2010)

	A	B	Range (km^2)	
Land use	1990-2000(km^2)	2000-2010(km^2)		Trend Description
Built	77.2	802.3	730	Higher in B than A
Water	30	37.3	7.3	Higher in B than A
Vegetation	236.7	49.1	188	Higher in A than B
Soil	189.2	888.6	699.4	Higher in B than A

A = Year (1990 – 2010)
B = Year (2000 – 2010)
Source: Field work, 2012.

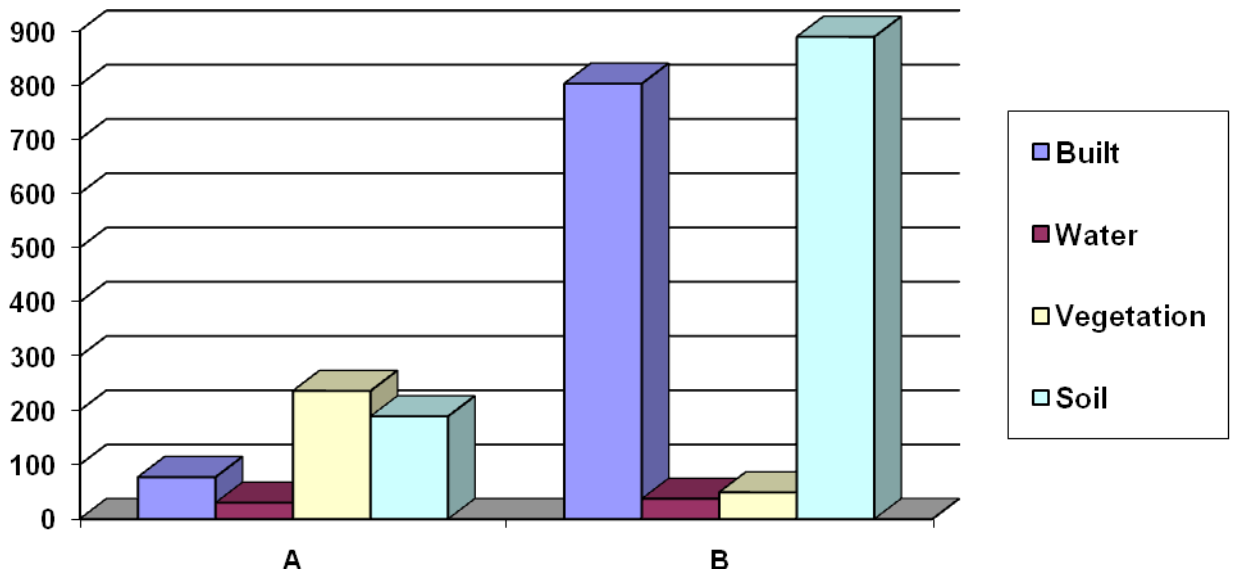


Figure 8.8: Trends Description of the land uses (1990-2010)

Having exhaustively analyzed the results of the landuse studies and in comparative terms, it was discovered that among the land uses, the built environment witnessed

the highest effects of deforestation at the rates of 9.2 (+)% and 49.7(+)% between 1990-2000 and 2000-2010 respectively. Between 2000 and 2010, soil ranked first or highest among the land uses. Though, the other variables (water and vegetation) demonstrated some measures of effects relationships with deforestation, these effects were minor and thus insignificant when compared with 'built' and 'soil' components. We can thus conclude from this particular analysis that human settlements or habitation and soil which are linked with these other land uses constitute the most important segments of the environment that caused significant environmental degradation in the study area in the last 21 years. When all the land uses are compared for 1990 – 2000, it shows that 'built' component consumed more forest land than the other land uses at 9.2%. It was followed by water at 5.8%. The third and fourth components are vegetation scoring 1.3% and soil scoring 0.9% respectively. Between 2000-2010, the 'built' component consumed 49.7%, while water consumed 7.2% of the forest land of Kogi East to rank first and second in the category of the most influential variables on deforestation in the later years respectively.

Vegetation and soil components ranked third and fourth at 0.3% and 0.10% respectively. Comparatively, the trend description shows that the influence of this land uses are higher in the last ten years (i.e. 2000-2010) than in the previous years (1990-2000).They could mean that landuse characterization in the study areas grows correspondingly with population increase and expansion of settlements. This trend differences are 75% higher in the last ten years of study than the previous years (i.e. 1990-2000= 23%; 2000-2010= 75%). When all the landuses were put into consideration, it was found that 12% of the total landscape of the study area was degraded. This calculated rate of change was computed by subtracting the negative values of the trends analysis from the positive ones. The difference now becomes the calculated rate of change thus:[15550.8km^2(+), 56% - 12152.2km^2(-), 44%] = 3398.6km^2(12%). This trend is indeed reflected in the built, water and soil components of the environment. However this rate is indeed substantial enough to confirm the ongoing human impact on the edaphic components of the environment of Kogi East.

CONCLUSIONS AND RECOMMENDATIONS

This study has shown that the results of the analysis on the effects of deforestation on the edaphic components of the environment in parts of Kogi East are the products of the interaction of a significant number of forces. It was thus confirmed that in most parts of the study area, deforestation has been a recurrent event and its effects on the edaphic components have become pronounced over the last 21 years.

The result also shows that the effects of deforestation on soils in the most habited areas are more pronounced than those in the less habited areas. This thus explains that human activities that constitute deforestation demonstrated higher effects in the deforested areas than in the non- deforested areas, hence landuses in this usage involves deforestation.

These findings prove to be a testimony to the age long deforestation in the study area. Realistically, 12% of the Kogi East landscape or forest land (comprising of vegetation, soil, water and built environment) suffered degradation in the last 21 years based on the results obtained from the classified imageries. Deducting from this study, it is therefore imperative for the people to focus on forest management policy in order to establish more plantations, develop existing ones

which houses both indigenous and exotic species of forest products.

In order to fully realize this goal, the growth of wood must at least equal the amount of timber felled, hence the people constitute the greatest degraders of the forest landscape. It is important therefore to advise that forest exploiters should be mandated to ensure that where they cut one tree, two or more trees should be planted to replace the ones cut. It has thus been posited in this work that human influence in the geospace grows correspondingly with the dangers posed to environmental resources. Likewise, the edaphic components of the environment of Kogi East seems to be the worse hit among all other environmental resources of the study area as substantial parts of the forest environment have been depleted thereby subjecting a significant proportion of the soil and vegetation to profusely degraded state. The need for this study was of course predicated on the dear need of the people that recognize their forests and the resources they contain as resources of great value. They are therefore regarded as less productive for further use unless serious reforestation efforts are embarked upon to restore the degraded components; hence an increase in human influence corresponds with increase effects on the forest ecosystem. Such measures could only succeed within the framework of ecological security, social equity and ecosystem sustainability which indeed must be in line with the principle and standards set by the Millennium Development Goals (MDGs). In order to realize these objectives and perhaps the vision 2020, any fight against deforestation in Kogi East must be a collective one and a task that must be done considering the fact that these edaphic components have crucial roles to play in sustaining the life of the people.

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PHYSICO-CHEMICAL CHARACTERISTICS OF SOME COMMERCIAL LUBRICANTS SOLD IN MARKET AROUND SURULERE, LAGOS STATE, NIGERIA

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ABSTRACT

Physicochemical analysis was carried out on Ten (10) different brands of motor oil, in which six (6) were monograde and four (4) multigrade lubricants. The parameters tested were Kinematic viscosity, Viscosity Index, Specific gravity, Flash point and Total base number (TBN). The test results obtained were further compared with standard ratings of the Society of Automobile Engineers (SAE). Analysis of variance (ANOVA) was determined to know if differences exited among the means of samples properties. It was observed that sample A3 had the lowest TBN of 4.21mgKOH/g, while A6 had the lowest viscosity index of 87 and did not meet the minimum statutory requirement. Sample A7, A9 and A10 had Flash point values of 218˚C, 219˚C& 218˚C respectively, which were less than the minimum requirement. Sample A_2 has the highest mean specific gravity of 0.8981at 15^0C. Most of the accessed products did not meet the minimum standard requirement.

Keywords:*Lubricants, Physico-chemical characteristics, Nigeria*

INTRODUCTION

Since the Roman era, many liquids, including water, have been used as lubricants to minimize the friction, heat, and wear between mechanical parts in contact with each other. Today, lubricating oil, or lube oil, is the most commonly used lubricant because of its wide range of possible applications[1].

Automobile lubricants are generally composed majorly of base oil (most often petroleum fractions, called mineral oils) and a minority of additives (chemicals). They can be in form of gas, liquid or solid. One of the single largest applications for lubricants, in the form of motor oil is to protect the internal combustion engines in motor vehicles and powered equipment [2]. Lubricants were at one time almost exclusively animal or vegetable oils or fat, but modern requirements in both nature and volume have made petroleum the main source of supply. The inherent problems of vegetable oils, such as poor oxidation and low-temperature properties, can be improved by attaching functional groups at the sites of unsaturation through chemical modification [3]. Fatty oils still have their uses although generally in ancillary role. The main function of a lubricant is to reduce the friction between the moving surfaces and so facilitate motion. Its second most important function is to remove heat generated in the equipment being lubricated, such as piston engine, enclosed gears and machine tools.

Modern motor engine oils are based upon oil refined from crude petroleum, synthetic oil treated with various compounds, or a mixture of one or two grades of mineral base oil and chemical additives [4]. It was also known

that additives which consist of different chemical substances are included in the oil formula to extend its range of performance [5]. In bearing lubrication, a rust and oxidation inhibitive additive system is used in the oils. Also antifoam and pour point depressants may also be present. Rust and oxidation oils tend to have better water separation characteristics, which is beneficial [6].

A good lubricant helps to enhance the shelf life of the moving parts of engines, hence, the work reported in this paper shows a study of the lubricant properties such as specific gravity, viscosity index, kinematic viscosity, flash point and total base number, comparing them with standard ratings of the Society of Automobile Engineers(SAE), and statistically determining the differences in the sample properties means.

MATERIALS AND METHOD

Materials

Ten different Commercial Engine Oils designated as A1 to A10 were obtained from markets around Surulere, Lagos State, Nigeria. Sample A1 to A6 weremonogrades consisting of SAE 40 and HD 40 grade oil while sample A7 to A10 weremultigrades consisting of SAE 20W-50 oil grade. The instrument used in the analysis include Analytical balance (Kern 120- Germany), Kinematic viscometer bath @ ˚C40 and 100˚C (Koehler, KV3000 series – USA), Canon Fenske Viscometer (Koehler, USA), Hydrometer, Open cup hot plate (Cleveland, K13900 - China), Suction device, Retort stand, Beaker and Burette.

Methods

The samples were tested for parameters such as specific gravity, viscosity index, kinematic viscosity, flash point and total base number, based on the indicated American Standard for Testing and Material (ASTM) methods, using standard and properly calibrated industrial laboratory equipment as listed above.

Specific gravity

Using ASTM D1298-85, Specific gravity was conducted by inserting a Hydrometer into a measuring cylinder containing a 900mL of oil and a thermometer to check temperature. It was then allowed to stand for 10mins after which the temperature was recorded. The hydrometer numbers with the temperature recorded were used to obtain the specific gravity @ ˚C15 by checking with a standard measuring table.

Kinematic viscosity

Using ASTM D0445, Kinematic Viscosity was determined by using a*Canon fenske* viscometer, in which oil was drawn into the smaller bulb by suction, and then allowed to flow down through the capillary into the upper bulb. The marks above and below indicate a known volume. The times taken for the level of the fluid to pass between these marks were proportional to the kinematic viscosity. This was accessed by placing the viscometer into a controlled kinematic viscometer bath, after the kinematic viscosity has been determined, viscosity index was checked using a viscosity index table.

Flash Point

Using ASTM D92-90, Flash Point was conducted by using the open cup hot plate in which 250mL of oil was measured and taken into the open cup and a small flame was passed through the open cup at regular times. The temperatures at which a flash appeared on the surface of the samples were recorded to be the flash point.

Total base number.

Using ASTM2896-15, Total Base Number was ascertained by introducing5.0g of the sample into a beaker, 10ml of toluene;

25ml of Glacial acetic acid, 2-3 drop of p-napthtolbenzene indicator solution were added to the beaker. This was thoroughly mixed and titrated with standard 0.1N perchloric acid solution until a bright green end point was formed. The quantity of 0.1N perchloric acid solution used was recorded. A blank solution consisting of a mixture of 10ml of Toluene, 25mL of Glacial acetic acid and 2-3 drops of indicator solution was also titrated with 0.1N of perchloric acid. The quantity of acid used was recorded. Total Base Number was calculated using the formula below:

$$\text{TBN (mg KOH/g sample)} = \frac{(A-B) \times N \times K}{W}$$

Where A is Titre value
B is Blanck value
N is Normality of perchloric acid
W is Weight of sample
K is Constant (56.1)

The data obtained were subjected to Analysis of Variance (ANOVA) as well as multiple comparism with harmonic mean at 95% confidence level.

RESULTS AND DISCUSSION

The results obtained from the analysis of these commercial lubricating oil samples are given in Table 8.2.2.1.

Table 8.2.2.1: Physico-chemical parameters of oil samples

Characteristics	Appearance	Specific gravity at 15˚C	Kinematic Viscosity		Viscosity Index (VI) (min)	Total Base Number mgKOH/g(min)	Flash point, COC˚C (min)
			at40˚C cst (mm^2/sec)	at100˚C cst (mm^2/sec)			
A1	Bright and Clear	0.8958	154.58	14.86	95.00	5.68	230.00
A2	Bright and Clear	0.8981	151.61	14.58	94.00	5.63	254.00
A3	Bright and Clear	0.8898	153.26	15.45	102.00	4.21	243.00
A4	Bright and Clear	0.8935	154.16	14.90	96.00	5.14	239.00
A5	Bright and Clear	0.8968	155.12	15.04	97.00	5.23	239.00
A6	Bright and Clear	0.8871	179.03	15.58	87.00	5.20	240.00
A7	Bright and Clear	0.8954	124.40	13.63	106.00.	7.26	218.00
A8	Bright and Clear	0.8825	161.61	18.35	128.00.	6.69	220.00
A9	Bright and Clear	0.8881	174.30	19.61	180.00	9.43	219.00
A10	Bright and Clear	0.8954	124.40	13.53	106.00	7.26	218.00

Specific gravity: The value of specific gravity of each of the commercial oils presented in Table 8.2.2.1 falls within the range of the specific gravity of mineral oil, which is from 0.85 to 0.90 [7], the standard for SAE 40 and HD 40 engine oil specifies a minimum value of 0.88 SG at 15°C while that of SAE 20W-50 engine oil specifies a minimum value of 0.885 SG at 15°C. Hence, the values obtained meet the requirements mentioned and a few including A1, A2, A4, A5, A7 and A10 are closer to the upper limit, which means that these commercial oils will require the use of high powered pumps for good flow and circulation within the engine.

Kinematic viscosity: The kinematic viscosities (KV) at 100°C of the samples A1-A6 were within the SAE 40 range (which is 12.5 cSt to 16.3 cSt, while the KV at 40°C was found to be highest (179.03) in sample A6) for monograde oils. For multigrade oils, samples A8 & A9 were within the SAE 20W-50 standard (which is 16.3 cStto 21.9 cSt, while KV at

40°C was found to be highest(174.03) in sample A9), however sample A7(13.63)& A10(13.53) did not meet up to the standard at 100°C. Sample A7 & A10 (having 124.40 cSt at 40°C), followed by sample A2 (having 151.61 cSt at 40°C), then sample A3 (having 153.86 cSt at 40°C) are the most preferred from the viscosity at 40°C point of view, because oil with reduced viscosity, especially at low temperatures can maintain good hydrodynamic oil film. Looking at the viscosities of the oilsamples at 100°C, sample A9 offers better separation between interface asperities within the regions of high temperatures compared to the rest, because it has the highest viscosity at this temperature region[8].

*Viscosity index(VI):*As shown in Table 8.2.2.1, from the first six tested samples, the viscosity index of A2 and A6, did not meet up to the minimum statutory requirement of 95 for monograde, also, A7 and A10 did not meet up to the minimum statutory requirement of 120 for multigrade lube oil. This implies that no or less efficient VI improver might have been used in the formulation; or that the base oil is of such a low quality that it lacks solvency to dissolve the VI supplement used in the formulation[9]. This kind of mediocre viscosity index cannot meet up with the rising demands on lubricating oils by new generation combustion engines, because the viscosity will be too low at high temperatures (above 120°C) giving room for asperity contacts between tribological pairs. Also, sample A3 monograde and A9 multigrade both have exceptionally high VI, implying that it must have been treated with high performance, and good dose of VI improver(s). Although, oil treated with high dose of VI improvers may exhibit susceptibility to mechanical shearing [10].

Flash point:From Figure 8.2.2.1, it can be observed that the flash points of all the oil samples meets the minimum specified standard for both SAE 40 and SAE 20W-50 oils of 220°C except for A7, A9 & A10 which are less than the minimum specified reading 210°C, 219˚C and 218˚C respectively. Those above 220°C implies that these oils have relatively low volatility and can be run safely in internal combustion engines[11].The low volatility equally means lower oil consumption (i.e. engine oil getting reduced in volume in the course of its utilization) rate [11], and lower evaporation loss. The differences in their flash points should be majorly base stocks related.

Total base number (TBN): The TBN number reveals the same information with the Total Acid Number(TAN). The TBN of new crankcase oil normally ranges from 5 to 15g KOH/mg [12].According to SAE standards, TBN for SAE 40 grade minimum specification is 5 while that of SAE 20W-50 is 6.5.From the reported result in Figure 8.2.2.2, all of the oil samples meet the minimum requirement except sample A3 which will tend to deplete faster than others in terms of Alkalinity content. Sample A3 has the lowest TBN which could be that they may have been blended with additive packages which have very poor or no corrosion/rust inhibitors, and dispersants. Another reason may be the use of wrong proportion and/or combinations of rust inhibitors and antiwear additives which could raise the acidity of the oil thereby reducing their TBN. It should be noted that oil with TBN number below 3 g KOH/mg is recommended for a change [12] because it could expose the engine to very early corrosion and rust, and the oil to early or faster oxidation if not changed.

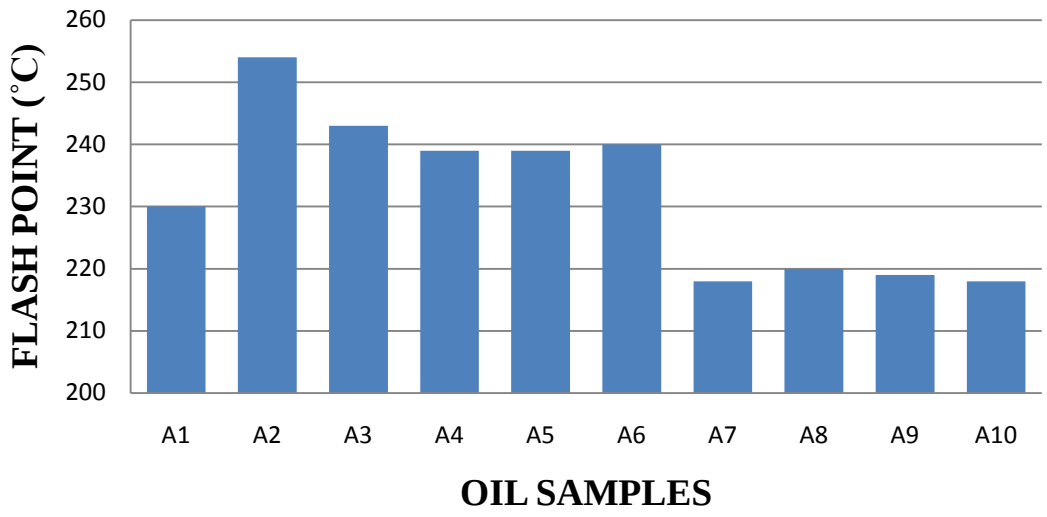

Figure 8.2.2.1: Flash point of the oil samples

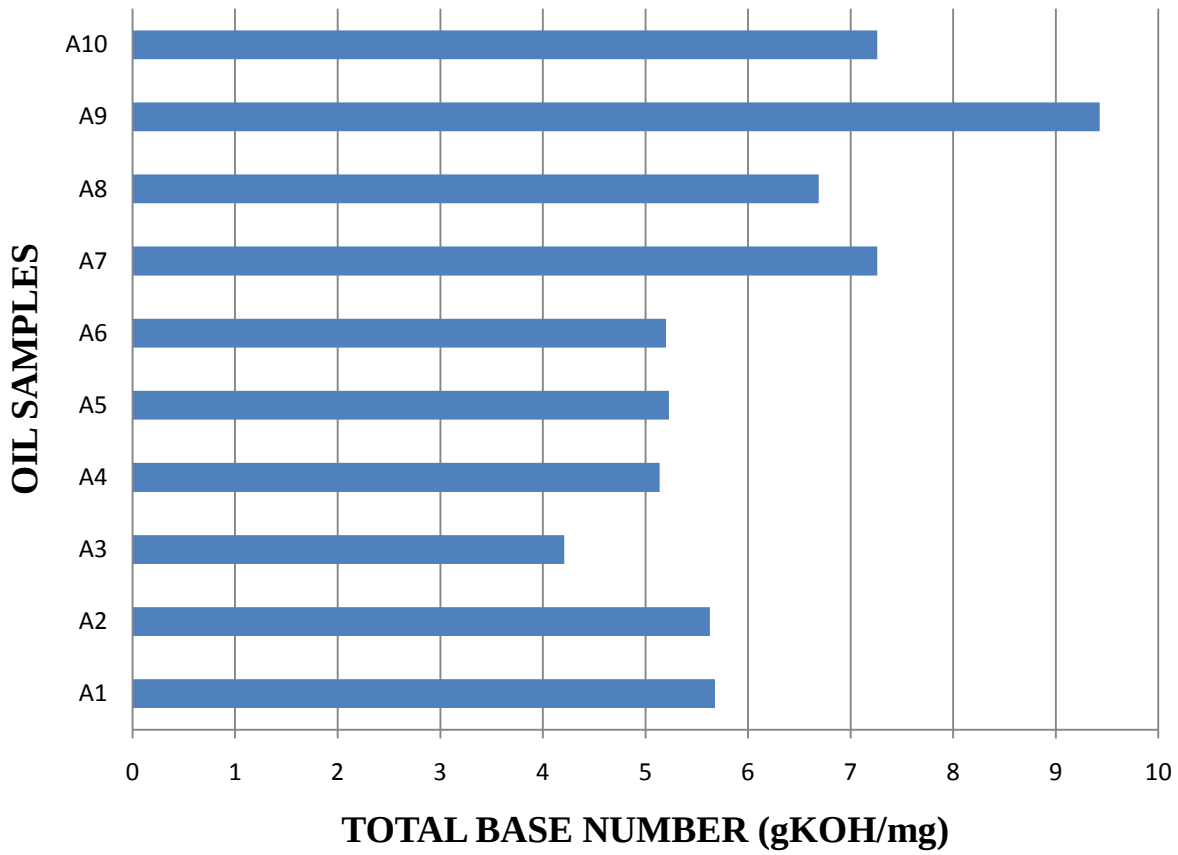

Figure 8.2.2.2: Total Base Number of the oil samples

ANOVA summaries

Table 8.2.2.2 shows ANOVA values of mean specific gravity.

Table 8.2.2.2: Mean specific gravity

Spesific gravity					
	Sum of squares	**df**	**Mean square**	**F**	**Sig.**

Between groups	0.001	9	0.000	55.555	.000
Within groups	0.000	20	0.000		
Total	0.001	29			

Table 8.2.2.3 shows ANOVA values of mean kinematic viscosity at 40°C

Table 8.2.2.3: Mean kinematic viscosity at 40°C

Kinematic viscosity at 40^{0}C					
	Sum of squares	**df**	**Mean square**	**F**	**Sig.**
Between Groups	7087.772	9	787.530	71.113	.000
Within Groups	221.486	20	11.074		
Total	7309.258	29			

Table 8.2.2.4 shows ANOVA values of mean kinematic viscosity at 100°C

Table 8.2.2.4: Mean kinematic viscosity at 100°C

Kinematic viscosity at 100°C					
	Sum of squares	**df**	**Mean square**	**F**	**Sig.**
Between Groups	48.226	9	5.358	10.705	.000
Within Groups	10.011	20	.501		
Total	58.238	29			

Table 8.2.2.5 shows ANOVA values formean viscosity index

Table 8.2.2.5: Mean viscosity index

Viscosity index					
	Sum of squares	**df**	**Mean square**	**F**	**Sig.**
Between Groups	3306.300	9	367.367	18.839	.000
Within Groups	390.000	20	19.500		
Total	3696.300	29			

Table Table 8.2.2.6: shows ANOVA Table values formean flash point

Table Table 8.2.2.6: ANOVA Table values formean flash point

Flash point					
	Sum of squares	**df**	**Meansquare**	**F**	**Sig.**
Between Groups	4481.200	9	497.911	25.754	.000
Within Groups	386.667	20	19.333		
Total	4867.867	29			

Table Table 8.2.2.7 shows ANOVA Table values formean Total Base Number

Table Table 8.2.2.7: ANOVA Table values for mean Total Base Number

Total Base Number					
	Sum of squares	**df**	**Mean square**	**F**	**Sig.**
Between Groups	61.598	9	6.844	122.154	.000
Within Groups	1.121	20	.056		
Total	62.719	29			

From the statistical analysis shown in Figures8.2.2.1-2 and Table 8.2.2.2-7, t-test were used to test group variance against a null hypothesis, and is often used to determine whether any group of trials differs significantly from an expected value. Hypothetically, null hypothesis, H_o indicatethe mean sample properties of the different oil samples is equal alternative hypothesis H_1: Not all the means are equal.

Significance level, $\alpha = 0.05$

From the decision Rule, we reject H_o if p-value is less than the significant level (α) and accept H_1.The p-value 0.00of each samples properties means obtained were less than αwhich depicts that they are significantly different at 0.05 level of significance.

CONCLUSION

This work has shown that not all commercial engine oils sold in Nigeria lubricant market conform to SAE standards. There are associated risks, including negative impacts on engine durability, especially if one sticks to one of the defective products.

RECOMMENDATION

Based on these observations and the conclusions which were drawn, it isrecommended that a closer monitoring and enforcement capacity for the quality regulating bodies are to be ensured so as to avoid products which do not conform to standards to be in Nigeria market.

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E-WASTE POLLUTION IN AFRICA AND THE URGENT NEED FOR APPROPRIATE RESPONSE

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ABSTRACT

Increasing ICT adoption leads to rocketing acquisition of ICT facilities which results in rapid e-waste generation and attendant environmental pollution and health hazards.The study gathered that the volume of e-wastes being generated grossly outweighs the existing capacity to manage it in an environmentally sustainable way. Uncontrolled burning, disassembly, and disposal of e-wastes cause a variety of environmental problems, such as ground water contamination, atmospheric pollution, and water pollution either by immediate discharge or due to surface run-off.Bonfire refuse of e-wastes are discarded into drainage ditches or water ways feeding the ocean or local water supplies. This does not only contaminate water bodies, but also results in blockage of drainages, leading to flooding that destroys fauna and flora, lives and properties, andcauseshealth hazards, deterioration of health quality, air and noise pollution,diseases and economic wastes. The situation necessitates the need for urgent and appropriate responseto bring about efficient management and control of e-waste for sustainable African environment.

INTRODUCTION

The information communications technology (ICT), which encompasses all communications devices and applications, drives the 21st century globalizing economy[1]. The infusion of computer into human activity, plus advances in the telecommunications arena, especially digitization, characterizes the information revolution, which has transformed the world into a global, knowledge-based society, referred to as the information society [2].

The developing countries, known for information poverty or as the "information-haves-not", are in a hurry to adopt ICT in the bid to bridge the information gap and the resultant marginalization in the global market system. Indiscriminate adoption and usage of ICT informs the rising consumption of ICT in developing countries [3-9]. The 2006 global e-readiness rankings of some African countries positioned South Africa 35th, Egypt 55th, Nigeria 60th and Algeria 63rd. This confirms a wake-up to the broadband race [10].

Side-by-side with rocketing acquisition of ICT facilities, e-waste is being generated (sometimes by as much as 500%).According to Rogers [11] and Carr [12], the reason for high rate of generation of e-wastes includethe faster rate of adoption of ICT, compared with the previous technology innovations. Responible for the higher rate are (a) more available critical mass of adopters who convince the mainstream teachers of the technology's efficacy; (b) more regular and frequent use of ICT; and (c) different ways and purposes to which ICT is applied

as part of a dynamic process that may involve change, modification and reinvention by individual adopters.

Another reason for the explosive rate of e-waste generation in developing countries is very high level of poverty of citizens, who can only afford the cheap, inferior and second-hand ICT facilities.Virtually all the used ICT components that escape recycling and incineration in the developed countries find their way tosub-Sahara Africa (SSA)[13].

Aside these reasons, the developed countries take advantage of weak regulation in developing countries to dump outright e-wastes or fairly used or near-end-of-life ICT productsin developing countries. Forge [14] reported that e-waste is routinely exported by developed countries to developing ones, often in violation of international law. Inspections of 18 European seaports in 2005 found as much as 47% of illegal waste, including e-waste, destined for export. In the U.K. alone, at least 23,000 metric tons of undeclared or 'grey' market e-waste was illegally shipped in 2003 to Asia (China and India) and also to Africa. In the USA, it is estimated that 50-80% of the waste collected for recycling is being exported in this way. In 1987, about 3,880 metric tons of toxic and hazardous wastes of Italian origin were transported in five shiploads and dumped in Koko, Delta State, Nigeria by a foreign firm in collusion with Nigerian businessmen[15].

To make the matter worse, rapid technology change, low initial cost, and planned obsolescence have resulted in a fast growing problem of increasing e-waste generation.ICT products manufacture is designed to increasingly reduce the life-cycle of the products. They come as new software, which render older models/versions obsolete, with the new models creating problems of incompatibility with old ones. In most cases, the service parts of the old models are no longer in stock, thus systematically discouraging the usage of even functional products and encouraging the throw-away mentality of Africans with the attendant hazards on the environment. This also causes economic waste on the largely economically challenged African population.

About 50 million tonnes of e-wastes are generated worldwide each year. Increasing at a rate of 3-5% per year (faster than any other category of waste), the global volume of e-wastes produced annually is soon expected to double[16].

The volume of e-wastes being generated grossly outweighs the existing capacity to manage it in an environmentally sustainable way[17]. The developing countries in Africa lack the waste management culture and infrastructure to manage e-wastes in a manner that is environmentally sustainable, moreso as developing countries are technologically backward and lack the capacity. In most cases, e-wastes are treated and/or dicarded improperly, posing a serious environmental and health danger.In most developing countries, the waste management authorities dump the wastes in open fields near residences without any form of cover, and at best incinerate them. In some cases, they are used to fill construction pits. This appears to be economical and convenient in the short run, but it poses serious health and environmental danger in the long run, both on the people and the environment because, toxic chemicals in electronic products can leach into the land over time or are released in the atmosphere, impacting nearby communities and the environment. In developing countries, e-wastes containing plastics are commonly littered in collection points for days before they are actually collected. Plastics in electronics easily leach off in hot weather, especially when left outside. The record

levels were 93 times higher than in soil without contact with e-wastes.

The uncontrolled burning, disassembly, and disposal of e-wastes can cause a variety of environmental problems, such as ground water contamination, atmospheric pollution, and water pollution either by immediate discharge or due to surface run-off (especially near coastal areas)[18]. Tossing e-waste equipment into an open fire in order to melt plastics and to burn away invaluable metals, are harmful and wasteful. The process of burning e-waste releases carcinogens and neurotoxins into the air, contributing to acrid, lingering smog. These noxious fumes include dioxin and furans. In Nigeria, for instance, bonfire refuse and other e-wastes are disposed of into drainage ditches or water ways feeding the ocean or local water supplies. This does not only contaminate water bodies, but also results in blockage of drainages, leading to flooding, destruction of lives and properties within flooded areas, causing diseases and economic wastes [19]. Industrial activities, lead to pollution of water resources, destruction of fauna and flora, health hazards and deterioration of health quality, air and noise pollution, as well as destruction of traditional economic infrastructure within communities [20].

Stream pollution endangers local sources of water supply. The problems associated with inadequate water resources in Nigeria threaten to place the health of about 40 million people at risk and would cost in excess of 10 billion US Dollars a year to correct, if ground and surface water contamination goes unchecked [21].

While legislations are used in the developed countries to control this manner of disposal, the developing countries are considered weak at such and particularly lack the capacity for such enforcement, as even some multinationals that contribute to the environmental degradation are more powerful than the government of some African countries.

With growing African population, growing adoption of the ICT culture and the attendant escalation of the quantity of waste electrcal electronic equipment (WEEE) willfurther heighten the danger posed by e-wastes on African environment. Already, mountains of these wastes are spotted in major ICT trading centres in African cities, e.g. the Computer Village in Lagos, Nigeria. Besides, almost all households and most offices in Nigeria still harbour outdated and unserviceable ICT products, such as gramophones, analogue telephone sets, wall clocks, wrist watches, radio sets, cassette player sets, and cartridge player sets. Others are grinders, micro-wave, video player sets, compact disk (CD) sets, digital versatile disc or digital video disc (DVD) sets, black and white television sets, and turn-table sets. Yet others are mobile phones, computers and the accessories, cameras, refrigerators, freezers, hair driers, washing machines, pressing irons, shavers, toys and more.

In support of this identified threat and the need for planned appropriate response, the United Nations Environmental Programmeme (UNEP)forecasts rocketing sales of cell phones, gadgets, and appliances over the next 10 years in developing countries and the urgent need to prepare the countries for surge in e-wastes. UNEP predicts that by year 2020, e-waste from old computers would have jumped by 200%-400% from year 2007 levels in South Africa and China, and by 500% in India. By the same year, e-waste from discarded mobile phones will be about 7 times higher than year 2007 levels in China, and 18 times higher in India. Again, e-waste from televisions will be 1.5 to 2 times higher in China and India, while e-waste from discarded refrigerators will double or triple in India. China already produces about 2.3 million tons (2010 estimate) domestically,

second only to the United States of America with about 3 million tones. And, despite having banned e-waste imports, China remains a major e-waste dumping ground for developed countries. Moreover, most e-waste in China is improperly handled, much of it being incinerated by backyard recyclers to recover valuable metals, like gold – practices that release steady plumes of far-reaching toxic pollution and yield very low metal recovery rates compared to state-of-the-art industrial facilities [22].

With the waste from electronic products growing exponentially in developing countries, sometimes by as much as 500%, UNEP on 22 February 2010 advocated proper e-waste collection and recycling to key recovering valuable materials, in order to protect health and build new green economy. It warns that unless action is stepped up to properly collect and recycle e-waste materials, many developing countries face the serious consequences for the environment and public health.

The adverse health effects associated with pollution related to hazardous chemical components of e-waste materials isa negation of sustainable development, which ICT use aims to promote.There is the need to protect health and build new green economy against the serious danger to the environment and public health posed by e-waste pollution in Africa.

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A SURVEY OF PUBLISHER COMPLIANCE WITH BIBLIOGRAPHIC PRACTICES IN NIGERIA

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ABSTRACT

The inability of Nigerian publishers to conform to international standards of publishing has been identified as the bane of publishing in Nigeria. The study investigated publisher compliance with bibliographic codes and standards in Nigeria. Also interrogated were challenges faced by publishers in accessing these codes and standards, those faced by National Library of Nigeria in administering these codes and standards and implementing the legal deposit obligations, as well those affecting the compilation of the National Bibliography of Nigeria (NBN). The descriptive research adopted the random sampling technique to select 410 publishers, librarians, authors and printers. The targets were reached with questionnaires, interviews, observation of records and interaction for data gathering. Findings show unfounded fears by publishers regarding some perceived difficulties in getting these codes and conventions from the National Library of Nigeria, a general apathy among publishers towards the issue of legal deposit and the attendant difficulties in the compilation of the National Bibliography of Nigeria (NBN). Recommendations include discouraging all-comers from flooding the publishing business. The National Library of Nigeria needs to reach out to Nigerian publishers in a massive media campaign for training, semimars, conferences and workshops on issues bordering on bibliographic control, legal deposit and other sundry matters in the publishing industry. The National Library Decree No. 29 of 1970 is long overdue for revision. Government needs to introduce import wavers and duty-free importation of essential printing/publishing materials and equipment.

INTRODUCTION

African publishers often find and nurture black writers only to lose out to the bigger mainstream Western publishers because of their inability to secure the financial backing that would guarantee African writers reasonable income. If African writing is to retain its originality and universal values, then African government and the business community must do more to support writers and the publishing industry in Africa. This important task of writing our own history has tended to be left to generous Western donors who often come with their own agenda for publishing those stories (Achebe, 1978).

There is no doubt that when bibliographic standards, codes, methods and instruments are mentioned, they mean different things to different publishers in Nigeria. This certainly does not mean that there are no professional publishers in the country. These codes and standards of practice are accepted by publishers and used all over the world. However, in Nigeria the story is not the same as it was reported that an ISBN was used for other products in a production line. This suggests that the manufacturer assumed ISBN to mean a different thing entirely. Similarly, it was also reported that an ISSN was used for another product.

Besides, records made available to this researcher at the National Library of Nigeria, National Bibliographic Control Department reveals very discouraging response by publishers to their legal deposit obligations to the National Library Decree No 29 of 1970 and the use of the cataloguing in publication (CIP) which is issued free of cost. This is an indication of poor perception of these publishing codes and standards.

It is for these reasons that the study seeks to find out publisher compliance with bibliographic codes and standards in Nigeria and the attendant problems faced by the publishers in accessing these codes viz-a-viz the problems encountered by the National Library in administering these codes, implementing the legal deposit obligations and the compilation of the National Bibliography of Nigeria (NBN). A discussion of the advantages of having a well-developed indigenous publishing industry follows, along with recommendations for establishing and promoting such an industry.

The significance of this study is based on the fact that so far this seems to be the only comprehensive attempt by an officer who had worked with the Nigerian Publishers for a period of (10) years between 1995-2005 at the National Bibliographic Control Department (NBCD) of the National Library of Nigeria, therefore, this study could be useful to the National Library of Nigeria, Nigerian Publishers Association (NPA), Policy Makers, librarians, Printers and Authors.

It is therefore my fervent hope that the data derived from this study and the researcher findings would be useful and contribute to the improvement of publishing and bibliographic control vis-à-vis Universal Availability of Publication (UAP) and Universal Bibliographic Control (UBC).

Operational definitions

Bibliographic control comprises every technique of identifying and recording data for making materials available to the public and ensuring universal availability. It is therefore closely tied to the compilation of the National Bibliography by the National Library of Nigeria which is at the epic centre of all the activities. Bibliographic Control is carried out internationally at various levels by the various National Libraries all over the world with the support of International Institutions and Organizations concerned with the standardization of publications. In practical terms it has to do with the conformity of publications to International Standards, Conventions and Ethics. Some of these standards and codes are Universal Bibliographic Control (UBC), Universal Availability of Publication (UAP), International Standard Book Number (ISBN) and International Standard Serial Number (ISSN). ISSN is issued to all national centres from Paris, France for all serial publications. Legal deposit refers to material deposited in compliance with the National Library Decree No. 29 of 1970.

REVIEW OF RELEVANT LITERATURE

The history of books publishing started with the development of writing, and various other inventions such as paper and printing, and continues through the modern day business of book printing. The earliest history of books actually predates what would conventionally be called "books" today and began with tablets, scrolls, sheets and papyrus. Then hand bound, expensive and elaborate books, called codices appeared. These gave way to press-printed volumes and eventually led to the mass printed tones prevalent today (Wali, 1996).

Clay tablets were used in Mesopotamia in the 3rd Millennium BC. The Calamnus, an instrument in the form of triangle, was used to make characters in

moist clay. The tablets were fired to dry them out. At Nineveh, 22,000 tablets were found, dating from the 7th century BC. This was the archive and library of the kings of Assyria, who had workshops of copyist and conservationist at their disposal. This presupposed a degree of organization with respect to books. Consideration was given to conservation, classification, etc. Tablets were used right up until the 19th century in various parts of the world, including Germany, Chile, Philippines and the sub-Saharan region (Ifediba, 1990).

Half a century ago, writing from Africa was unheard-of in the wider world. Though the history of the African Writers' Series is commendable in encapsulating the history of the African struggle to rid itself of Colonial domination and post-colonial oppression, contemporary Africa still needed a voice to tell its own post-modern stories. By presenting to the world stories written by Africans in which Africans were themselves subject of their own history. Contemporary Africans publishers were positioning themselves as visionaries in the movement to represent an African identity in the modern world.

Book publishing in Nigeria is one of the oldest businesses in the history of the nation. Before the 1914 amalgamation of the diverse peoples into the geographical entity named Nigeria, publishing had been in existence some 68 years earlier. In 1846, the first printing press in Nigeria was established in Calabar, the present Cross River State capital, by Rev. Hope Waddell of the Presbyterian Church of Scotland Mission. The primary aim of this press was to print bible lessons but it was later used to print arithmetical books for schools (Ajibade, 2003).

In 1859, Henry Townsend of the Church Missionary Society (CMS) established another press in Abeokuta, the present capital of Ogun State to print the first newspaper in Nigeria which was known as *Iwe-lroyin* (a dialect newspaper). From then on, publishing started growing in Nigeria with different objectives defined by the genre of books. Some publishers publish specific books, while others undertake general publishing without bias.

This was followed in 1928 by Oxford University Press (now University Press Plc.) to establish a press in Nigeria. This was followed by Longman in 1961, Heineman Nigeria Publishers in 1962, Macmillan Nigeria Publishers in 1965, Evans Brothers Publishers Ltd. in 1966, among others.

These multinational publishers adhered to bibliographic standards and control to a large extent, except that the microfilm copy of the *Iwe-lroyin* did not particularly follow any form of bibliographic standard control. For instance, *Things Fall Apart* by Chinua Achebe was published by Heineman Publishers of London in 1958 in compliance with international bibliographic standards. The entrance of indigenous authors and publishers in the publishing scene changed the Nigeria publishing landscape dramatically, causing a paradigm shift, thereby making the coast clear for competition. The indigenous entrepreneurs/publishers, like Onibonoje Publishers, Ilesanmi Publishers, Africana Fep, Fourth Dimension Publishers, Sterling Holden Publishers and others have tremendously contributed to publishing in Nigeria.

Considering the long history of publishing in Nigeria, it is expected that the business of publishing should be competing favourably with international standards. Being in business for 168 years (from 1846 to 2014) is enough to have made the business grow and become a major revenue earner for the government and the publishers at all levels. The economic empowerment aside, Nigerians are expected to derive from similar opportunities provided by private operators and stakeholders in the business.

This is not so in Nigeria for many reasons, such as lack of technical support to manage and maintain machines for publishing. Many printing presses, including the ones owned and managed by government and parastatals, are littered with out-dated or grounded machines. This naturally puts off any light-hearted comer into the industry. Other closely related issues of publishing in Nigeria are poor production, marketing and maintaining International Standards in publishing.

According to Wali (1991), Nigeria shares with developing countries a variety of problems in providing adequate numbers of high-quality books. Unqualified author-publishers, poor production, inadequate distribution, and lack of capital are all evident. Ajeluorou (2014) found the problems of publishing in Nigeria to some economic policies, starting from the Structural Adjustment Programme (SAP) of 1986 which hit the economy badly, and it appeared that the book publishing industry was worse hit. The foreign publishing houses could not repatriate their invested funds. Local purchasing power became drastically low such that purchase of books dropped drastically. Self-publishing evolved in the Universities as books became scarce.

Also, the three paper mills at Iwopin, Jebba and Oku Iboku gradually grinded to a halt, as paper import became the norm and still remain so till date with its attendant economic hemorrhage for the country. Foreign publishers had to pull out of Nigeria. Local investors faced the challenge of saving an endangered business. According to Emenanjo (2014), Nigeria produces less than 1% of her books per year, based on a modest estimate of four-six books per child in primary school for 20.4 million pupils, eight books per secondary school student for 6.4 million students, and eight books per student for close to one million students in tertiary institutions. Yet, imported books and other reading materials have the problems of socio-cultural disconnect which are better addressed by the indigenous authors and publishers.

Publishing in Nigeria faces the challenges of maintenance of bibliographic standards. A good number of books published in Nigeria do not conform to international bibliographic standards and best practices. These standards include the use of International Standard Book Number (ISBN) for (books), International Standard Serial Number (ISSN) for Journals, cataloguing in publication (CIP), the submission of the number of copies of publications stipulated by law regulating the National Bibliography of Nigeria (NBN).

One of the main goals of a national library is the fulfilling of its part of the common international goal of Universal Bibliographic Control, which entails the bibliographic control of all the books or book-like documents published in a particular country or about that country which are made easily available and accessible to information seekers anywhere in the world without hindrance. The first part of the goal is achieved through the means of legal deposit laws (as in the United States of America, USA) by a host of different programmes such as cataloguing and classification services. By this service, the national library gives a complete catalogue entry of a book to any publisher who requests for the service and sends galley proof of a book currently in production. The deposited items are compiled for the publication of the National Bibliography of Nigeria (NBN). Nicholson (2015) highlighted the importance of legal deposit as an internationally recognized practice within the global library community which ensures that the documentation of the cultural heritage of a nation is collected, accessioned, stored, protected, preserved and made accessible for the benefit of its citizens and future generations. Earlier,

Bazan (2004) stated that the implementation of legal deposit laws and compliance was important for the national bibliography and universal bibliographic control.

Aguolu (2002) stated that many publishers in Nigeria do not comply with legal provision of the National Library Decree because they regard the deposit law as an unnecessary bureaucratic interference in their business, if not an unjustifiable punitive measure to reduce their sales and profit. According to Lariviere (2000), most Commonwealth countries, Nigeria inclusive, patterned British Copyright Act of 1842, even after becoming independent states. Ailwood and Sainsbury (2014) are of the view that adopting this act without any consideration of its impact after independence was not a wise idea. Omekwu (2003) opined that accessing documents published in developing countries (Nigeria inclusive) was always difficult because of lack of bibliographic tools and control framework, low awareness of legal deposit legislation and sub-standard nature of publications.

The second part of the goal is achieved through acquisition programmes and collection development policies which target the book markets in other nations that foster international agreements with other countries' national libraries that have bibliographic control as one of their goals. In this case exchange and access protocols are clearly defined permitting these countries to read through each other catalogues and to standardize catalogue entries thus making it easier for each National Library to become aware of every published document which might concern that country.

The International Bibliographic Control is one aspect of the main Universal Bibliographic Control. The main goal of any National Library is the "export aspects" and the collaborative sides of the universal bibliographic control of all books published in the world. This is done by the exchanges of accords and also by fostering the creation of standard conceptual tools such as cataloguing and classification systems and rules. The most commonly used of these tools is the International Standard Bibliographic Description (ISBD). It applies to all books and periodicals, but also has variants for other book-like materials such as the ISBD (ER) for electronic resources or digital documents which are published after the birth of printing but before the industrial era of publishing which started in the 1920s.

The Universal Availability of Publications (UAP) is an International Federation of Library Association (IFLA) Programme. The IFLA Universal Availability of Publication (UAP) core activities and the Office for International Lending (OIL), which have been hosted by the British Library at Boston Spa, United Kingdom since the late 1970s, closed on the 31st of |March, 2003. The Universal Availability of Publication (UAP) is both an objective and a programme. The objective is the widest possible availability of published materials (that is recorded knowledge issued for public use wherever and whenever needed and in the format requested. Published materials here include not only printed materials, but the so-called grey literature, audio-visual materials and publications in electronic forms. To work towards this objective, the programme aims to improve availability at all levels from the local to the international.

Unlike the UAP, the birth of the International Standard Serial Number (ISSN) could be traced to the need for a universally accepted unambiguous, brief and unique identification code for all serial publications. Reasons are that by the very nature of serial publications often pruned to changes in titles, frequency, format and coupled with the unbridled growth in the world of publishing output which makes it increasingly very difficult to identify such

titles. As the size and complexity increases, peoples and libraries all over the world that are involved in publishing and distribution of printed materials started turning to computers as solution to managing the ever-increasing growth of serials publications.

To facilitate the easy exchange of information about serials between computers networks of different organizations posses the requirement for a standard code that should be numeric as a single number alphabet can be commonly used by most of these organizations. Care has been taken to ensure that the ISSN should not in any way attempt to incorporate any significance other than the unique identification of a serial title. In pursuance of this objective, 1971 witnessed a draft International Standard Organization (ISO). Standard for the creation of the International Standard Serial Number (ISSN) was, therefore, drawn up. The control for the registration of serials and assignment of ISSN is vested in the International Serials Data System (ISDS) established with the framework of United Nations Educational Scientific and Cultural Organization (UNESCO) and World Science Information Programme (UNISIST). The ISDS is an international network of operational centres jointly responsible for the creation and maintenance of computer-based data banks which contain essential information for the network with an international centre in Paris, France and national centres in individual member states. To facilitate the participation of Nigeria in the scheme, the National Library of Nigeria in 1976 accepted UNESCO's request through the Nigerian National Commission for UNESCO and established the National Centre for Nigeria which is now known as Nigerian ISSN Centre. The centre is responsible for registering and numbering serials published in Nigeria and fulfilling requests for ISSN for any serial.

The National Library of Nigeria, in its capacity as the Bibliographic Control Centre for Nigeria, started arrangement to set up an ISBN Agency in 1974. An application was sent to the International ISBN Agency in Berlin Germany and a group identifier "978" was allocated to Nigeria. Contacts were made with the Nigerian Standard Organisation (NSO) and the Nigerian Publishers through the secretariat of the Nigerian Publishers Association (NPA). Several Publishers have since applied and obtained ISBN. A comprehensive list of the publishers can be obtained in the Nigerian ISBN Publishers Directory and users manual.

The establishment of the National Library of Nigeria was muted at the Nigerian division of the West African Library Association in 1962 which gave birth to the Library Advisory Committee established in the late 1950s. This committee had the assignment of working out plans for Library services in the country and to persuade the government to agree to set up a National Library as proposed by the Association.

Ford Foundation of America stepped into the matter and agreed to finance and provide the necessary expertise for a feasibility study. The report was fully accepted by the Federal Government and action was taken for its implementation. Ford Foundation recruited a number of technical personnel from America to assist in the groundwork of setting up the national library. The Federal Government provided indigenous support staff. Within two years, a basic collection for a growing library was set up and schedule of duties for foundation staff was laid down. The government also enacted the first legislation in September, 1964 (cited as the National Library Act 1964), which provided for the establishment of the National Library of Nigeria, but its activities were limited to the federal capital territory. The Act did not make the Library a national depository nor make it

mandatory for it to publish a National Bibliography. The University of Ibadan Library continues to perform some of the functions which the National Library was supposed to perform. The partnership between the Federal Government and the Ford Foundation spanned over a period of nine years (1962-1971).

The first Board of the National Library of Nigeria was inaugurated in 1966. The Act was repealed and substituted with the National Library Decree No 29 of 1970. There have been amendments in minor areas in 1976 and 1978. The National Library was formerly a department of the Federal Ministry of Information, but now a parastatal of the Federal Ministry of Education. The Headquarter was accordingly moved to Abuja as requested in section 2(2) of the National Library Decree No 29 of 1970. Currently, the National Library of Nigeria has twenty-two (22) functional state branches spread across the six geo-political zones, viz, Cross River, Imo, Enugu, Edo, Ondo, Kwara, Ogun, Oyo, Plateau, Bauchi, Taraba, Adamawa, Niger, Osun, Kano, Sokoto, Benue, Lagos, Abia, Gombe, Katsina and Kaduna. The 23rd branch is in Abuja.

IFLA (2012) International Congress on National Bibliography (ICNBS) recommended that all bibliographic records should be based on internationally recognized standards. It further directed National Bibliographic Agencies of participating countries to adopt national and international standards and principles for cataloguing identification system such as ISBN and ISSN, character encoding, authority control, classification schemes, metadata and persistent naming of digital object. National bibliographic agencies should be encouraged to work on the harmonization of bibliographic standards established in respect of all forms of publications.

Fourie and Burger (2007) observed that countries like South Africa have made efforts currently unmatchable by any African country. Bibliographic control activities have generally developed randomly in Africa over the years. A few African countries are likely to have gotten retrospective national bibliographies before 1940, and it was individuals who made personal efforts to compile national bibliographies for these countries. According to Musikers (2005), Mende Isohn's South Africa Bibliography was published in 1910 making South Africa the first to have a national bibliography. This was a conserted effort made by South African librarians towards the attainment of Universal Bibliographic Control (NBC). According to Aje (1977), Sierra Leone was the next African country to have a national bibliography in 1925, followed by Ghana's restrospective bibliography created in 1932.

Amosu (1964) explained the issue of availability of bibliographies of all types on African subjects and national bibliographies produced on Africa. The first national Bibliography of Nigeria was published in 1973. Obasi (2006) dealt with current efforts to control the amorphous range of newsprint, ephemeral documents that have dominated the Nigerian literary market for nearly thirty years. The materials which are of inestimable value to various subject specialists originate from various sources. Some of the major sources are identified and the lack of any conscious and adequate attempts by their producers to bibliographically control these publications.

Adesanya (1988) see book publishing as a profession, occupation or trade and as an academic discipline, which seems to share a number of characteristics with education and medicine that should have maintained standards and control. This position was first presented by Okwilagwe (1984), who submittd that books are medium of mass information and communication. Like other mass

communication medium, it plays the roles of patterning the society's human activities to conform to the world for the individual members of the society, defines the individual's own position in relation to other members of the society which calls for publishing standards and control. Wali (1989) and Tralagba (2003) averred that the average Nigerian publisher is not too mindful of standards of publishing and bibliographic control.

Egbuchulam (2004) reported that the average Nigerian publisher is ignorant of the benefits deriveable from co-operating with bibliographic control activities of the National Library of Nigeria. This has made difficult the implementation of the legal deposit provisions of the National Library Decree No. 29 of 1970. Tralagba (2003) also submitted that some publishers in Nigeria could do anything possible to obtain ISBN, ISSN or CIP without putting it to use. They would rather laminate the letter of assignment as certificate of registration. The National Library Decree No. 29 of 1970 provides a weak penalty for not depositing publications with the National Library of Nigeria. Igbosuah (1998) and Nwosu (2002) shared the same view, that the use of ISSN, ISBN and CIP does not translate to mean bibliographic control except such publications are deposited at the expense of the publisher and published in the National Bibliographic of Nigeria.

IFLA (1997) and Tindey (2004) gave summary of the principles of Universal Bibliographic Control (UBC) and Universal Availability of Publication (UAP) as the contribution to ensure a world-wide system by accepting responsibility for making bibliographic records of publications emanating from that country in accordance with set international standards, available and accessible universally to information seekers and researchers. To achieve this objective, national libraries and other depository organisations all over the world have to perform the functions of collection of mandatory deposits (legal deposits), adopting set standards and norms of publishing and documentations, compilation of National Bibliography, National Union Catalogue, and National Union List of Serials.

Non-compliance by publishers and printers with Legal Deposit Law is a common phenomenon in many African countries. According to Fourie and Burger (2007), in the spirit of legal Deposit Committee and the creation of Official publications, failure to comply with Legal Deposit Laws in many African countries has been noted as big problem, and Nigeria is no exception. The Publication Ordinance of 1950 and the National Library Act of 1970 made similar stipulations which have been adhered to with levity. There is no set machinery for enforcing the laws. These have created a gap in the comprehensive compilation of the National Bibliography of Nigeria.

Libraries in African countries such as Nigeria, Ghana and South Africa, had formed a consortium within their countries for producing the National Union Catalogue (NUC). The most successful of these projects appeared to be that of South Africa. National Library of Nigeria handles the project in Nigeria with main aim as a central collection of all the catalogue entries for every book acquired by all libraries in the country. The project ran into hitches as many of the member libraries did not comply or co-operate due to poor funding, among other reasons.

According to Fourie and Burger (2007), the coalition of South Africa Library Consortia (COSALC) was established in July, 1999. Its main focus was to gain access to electronic information through establishment of the National Site Licensing Initiative (SASLI). It should be noted that no library or information centre performs bibliographic functions alone but combines with many other activities to achieve its

organizational goals of bibliographic control.

One other way of realizing bibliographic control of publications in Africa and Nigeria in particular is the establishment of the Virtual Library Project. According to Daniel (2002), Nancy Schillar was the first writer to use the term vrtual library in defining library without walls, that is, libraries through the Internet with the potentials of gaining access to other libraries using Wide Area Network (WAN) which bridges the gap between the local, national and the international publications. Nigeria has begun the Virtual Library Project which is sited in Abuja and run by National Library of Nigeria. The project is expected to deliver bibliographic control to the nation by co-ordinating the activities of all libraries in Nigeria. The achievement of this goal depends on the strength of the National Library to network libraries and universities in various states.

Soyinka (2004) also found access to national collections by way of union list in need of central co-ordination to eliminate duplication of efforts and to enable utilization of already existing machine readable files. This co-ordination is a responsibility of the National Library, being the national bibliographic centre, but the planning and implementation can be shared with other libraries in the country. Chukwudozie (1977) referred to the publication laws in Nigeria and noted that the existing one is not properly enforced. Government printers, private and quasi-government printing and publishing organisations all share in the publication of Nigerian government document. Some ministries handle their own publishing alone.

According to Ifeduba (2004), there had been archeological discoveries in parts of Nigeria suggesting that some kind of writing existed as far back as the 10th century AD. One of the ancient forms of writing discovered somewhere in the present Anambra State was called “Nsibidi”, and linguists, archeologists and historians have battled for years to interpret the writing.

The major instruments used for bibliographic control all over the world are the International Standard Book Number (ISBN) and the International Standard Serial Number (ISSN). Both use numericals that are differently structured. Besides these numbers, there is the documentation of the sum total publishing output known as the national bibliography. Each participating country publishes its own national bibliography. Without the compilation and publication of the national bibliography and the same sent to the International ISBN Centre in Berlin, Germany the process is not complete. For this reason, the National Library of Nigeria compiles and publishes the national Bibliography of Nigeria (NBN). The materials listed in the National Bibliography are those publications deposited (Legal Deposit) with the national Library in compliance with the national Library Decree no. 4 of 1970.

The compilation and publication of the National Bibliography of Nigeria requires meticulous processing of received materials. The administration of the International Standard Book Number (ISBN) has a very complex structure and procedure from the international centres to the national centres. For instance, an ISBN used to consist of ten digits, but now thirteen (13) digits preceded by the letter ISBN. The ten digits number is divided into four parts of variable length which must be separated clearly by an hyphen or spaces.

Example: Before ISBN 978 900002-5-7 or ISBN 978 90000257.
Example: Now ISBN 978-978-900002-5-7

The numbers in the first part of the digits is known as group identifier (-978-) International Centre. The second part is

group identifier. The third part is publisher's prefix or identifier and the last part is the title identifier and check digit. e.g. ISBN 978-978-5428 01-7. From this imaginary number:

978 – International Centre Identifier
978 – Group identifier
5428 – Publisher's prefix (identifier)
10 – Title identifier
7 – Check digit

The number of digits in the group number and in the publishers prefix is determined by the quantity title planned to be produced by the publishers or publisher group with larger title outputs suggested by fewer digits.

The first part of the ISBN identifies the country area or language participating in the ISBN system. Some members from language areas (e.g. group number 3 is German language group) or regional units (e.g. South Pacific is group number 982). A group identifier may consist of up to five (5) digits. The group identifiers are allocated by the international ISBN Agency in Berlin.

The group identifier for Nigeria is 978. The second part of the ISBN identifies a particular publisher within a group. The publisher prefix usually indicated the exact identification of the publishing house and its address. If a publisher exhausts its initial contingent of title numbers, they may be allocated an additional publisher prefix. The publisher prefix may comprise up to seven digits. Publisher prefix are assigned by the ISBN Agency responsible for the management of the ISBN system within the country, area or language where the publisher is officially based.

Unlike the ISBN, an ISSN consists of eight (8) digits, made up of seven digits acting as a unique and unambiguous title number plus one check digit. ISSN should always be quoted in two parts of four digits separated by an hyphen preceded by the letter ISSN, example, ISSN 4567-8910. The check digit is located at the extreme right positions to guard against errors caused by the incorrect transcription of an ISSN. Unlike the ISBN, the ISSN does not incorporate any significance other than the unique identification of a serial. When ISSN is assigned to a serial, a corresponding bibliographic record is simultaneously created.

The ISSN is inseparably linked to the serial title in order to avoid duplication. The ISSN and the key title are equivalent; they both identify without ambiguity the same serial title. The bibliographic record contains, in addition to the ISSN and the key title, some thirty (30) data elements enabling the unambiguous identification of a serial title. ISSN and ISBN serve a very unique purpose for the universal bibliographic control masterplan and universal availability of publications. It is the belief of the originators of these programmes that with the ISSN and ISBN firmly entrenched in global publishing order, publications could not only be easily controlled by easily tracking down from an established network of registry. For instance, with the assignment of ISSN and ISBN to specific titles the following can be achieved.

A single ISSN or ISBN assigned to a title in whatever part of the world or in whatever language can be identified by that number. This is made possible because all publications will be assigned a very unique number which distinguishes it from any other. An ISSN or ISBN can be used in libraries for identifying titles for ordering and checking in a publication for the purpose of claiming missing issues.

ISSN and ISBN simplify inter-library loan system and union cataloguing operations, reporting and listing. The numbers can be employed as standard numeric identification code, can be used in computers for updating and linking of files, reviewing and transmitting data. ISSN and ISBN provide a useful and economical method of communication between publishers and suppliers, making trade and distribution system faster and more efficient. The numbers can be employed as instruments for accurate citing of journals and books by scholars, researchers, arbitrators and librarians. The registers for these numbers can serve as a bibliographic utility which may be used as a major source of information about the world or serials and book publications all over the world.

The ISSN network is the operational structure and its main functions cut across the following:

i Collecting the materials that need identification
ii Assigning the ISSN and the key title to a derail for an unambiguous identification.
iii Creating the bibliographic records in ISSN format.
iv Making available the bibliographic records and promote the application and wariness of the ISSN.

The network consists of national centres and international centres in Paris.

National centres

ISSN national centres are mainly located within the national libraries spread across the globe. The main criteria for determining the choice are that the centres should have access to all new serials published in that country either through legal deposit or through connections with the national bibliography.

National centres perform the function of identification of serials published in their countries and the assignment of ISSN. They also maintain local ISSN data bases together with advertisement and promotion of the system. Records created by the national centres are transmitted to the international centres.

International Centre, Paris

The International Centre is based in Paris which co-ordinates the network by controlling the activities of the ISSN national centres. It is also in-charge of ISSN assignment for serials published by international organizations, institutions and by countries without national centres. All national centres obtain their ISSN from the International Centre in Paris, which collects and checks all bibliographic records to update in a consistent way the ISSN registers in order to avoid duplication.

ISSN in Nigeria

The ISSN System was started by R. R. Browker Company which assigned ISSN in large quantity to a number of serials published throughout the world and listed in the Ulrich International Periodical Directory and New serial title cumulation 1950-1970. In 1971, the registration and assignment of ISSN was vested in the International Serial Data System (ISDS) established within the framework of UNESCO's world Scientific Information Programme (UNISIST) in 1976. National Library of Nigeria joined the system on behalf of Nigeria in 1976. The Nigeria ISSN Centre started registering and numbering all new serials publications in Nigeria. The basic functions of the centre include:

i The assignment of ISSN to serials published in Nigeria.

ii Generating information profile on serials publications in Nigeria and sending same to the International centre towards the establishment and maintenance of the International file.
iii Promoting the use of ISSN in Nigeria and providing the link between serial publishers and the ISSN Network.

ISBN network – Group administration
The administration of ISBN is carried out on three levels; international, group or national and publishers level.

INTERNATIONAL ADMINISTRATION
International ISBN Agency
Staatsbibliothek Zuiturubesitz
D – 10772 Berlin, Germany
Tel: (+4930266-2496-2338)
Fax: (4930266-2378)
Email ISBN @sbb spk brelin.de
URL: itttp-11 ISBN spk-berlin.de

The International ISBN Agency is assisted by an advisory panel consisting of representatives from the International Organization for Standardization (ISO), the International Publishers Association (IPA) the International Federation of Library Association (IFLA) and individual ISBN group agencies.

The International ISBN Agency organizes an annual International ISBN Agency Advisory Panel meeting at which representatives of the group agencies and standards experts discuss current issues of the ISBN System. The Advisory panel has created an executive committee consisting of representatives of five agencies in order to bridge the gap in-between the annual meeting. The International Agency performs the following functions:

i To promote, co-ordinate and supervise the world-wide use of ISBN.
ii To approve the definition and structure of group agencies.
iii To advise group agencies on the allocation.
iv To allocate group agencies identifiers.
v To advise group agencies on allocation of international publishers' identifiers.
vi To publish the assigned group numbers and publishers prefix in an up-to-date form.

ISBN network - Group administration
The administration of the ISBN system within a publisher group agency, which may operate on a national or regional basis, or within a linguistic group according to local rules and needs. Within a group there may be several, national agencies.

Summary of literature review and literature gaps
The review of the literature revealed that there is a dearth of empirical research on publisher compliance to bibliographic control practices in Nigeria. Available research works concentrated mainly on legal deposits and legal deposit provision. These studies dealt mainly on legal deposit provision, legal deposit collections and the attitude of the publishers. Other studies were on the access points of these legal deposit materials, the need for cataloguing and classification. And a large chunk of literatures was found on IFLA conferences and congress on universal bibliographic control and universal availability of

publications and universal bibliographic control. Most of these studies were centered on the historical background of bibliographic control and not the current dynamics of compliance to national and international standards of control in this ICT driven world order. Therefore, this study focused on publisher compliance to bibliographic control practices in Nigeria.

RESEARCH METHODOLOGY

The study adopted descriptive research design. The random sampling technique was used to select 400 publishers from the ISBN User Manual and Publishers' Directory and the ISSN issuance records. Although the International Publishers Directory online has only 26 registered publishers, the ISBN User's Manual has over 10,000 publishers. At the second stage the researcher adopted random sampling to select the 410 from the 36 states of the federation and the federal capital territory, Abuja. Thereafter, a total of 410 publishers, librarians, authors and printers formed the sample size for the study. This was done in accordance with Aliand (2000) and Kalinger (2004) who averred that there are no single rules that can be applied to cases regarding the size of a sample but that reasonable size should be considered between 2%-5% when a population runs into hundreds and thousands. The research instrument used for data collection for this study was a questionnaire developed by the researcher and tagged "Survey on Publishers Compliance with Bibliographic Control Practices in Nigeria Questionnaire (QSPCBCPN)"

SUMMARY OF FINDINGS

There is an unfounded fear by publishers of some perceived difficulties in getting these codes and conventions from the National Library of Nigeria. Publishers complain of difficulties in obtaining these codes and standards. In addition, it was also observed that there is a general apathy among publishers towards the issue of legal deposit which may not be unconnected with the poor returns of publications for legal deposit and the attendant difficulties in the compilation of the National Bibliography of Nigeria (NBN). Publishers also claim to have difficulties to deposit their publications with the National Library due to logistic problems. Finally, an assessment of the National Library of Nigeria in terms of human resources, technology and its capacity to meet with publishers' needs and maintenance of minimum acceptable standards was found not to be adequate. The combination of these factors has imparted negatively on the administration of these code.

Results also showed a very worrisome development in publishing in Nigeria. Apart from some of these established publishers, the study showed that in almost all the cities and tertiary institutions and corners of every street in Nigeria, there are omnibus publishers without any regard to publishing standards and bibliographic control.

Findings further revealed that the publishing industry in Nigeria lacked the appropriate technology, qualified and trained man-power and suffers from inadequate funding. This indeed is the bane of publishing in Nigeria. The study also showed that the bibliographic control agency, National Library of Nigeria, has tried in its over three decades of bibliographic control activities with just little to show for all its efforts. This is not the fault of its own, but can be attributed to the Nigerian factor. For instance, in spite of the popularity of ISSN/ISBN/CIP, not many publishers understand the purpose and meaning of these bibliographic control

instruments. For now less than 60% of what is published in Nigeria is received as legal deposit. This indeed is rather low and a far cry from meeting the Universal Bibliographic Control (UBC) and Universal Availability of Publications (UAP). Publishers in Nigeria claimed lack of awareness of the benefits of these programmes to the Nigeria publishers and implored the National Library of Nigeria to organize training programmes for the Nigerian publishers in addition to regular stakeholders meetings. These measures require funding, increased manpower and logistics.

CONCLUSION

Not many Nigerian publishers really understand the use of ISSN/ISBN/CIP and legal deposit. Some publishers source for these services from other publishers and unwittingly fall prey to fraudsters. Publishers in Nigeria are not even willing to deposit the required legal deposit copies with the national library. A greater number of the respondents want the legal deposit copies to be paid for.

On the issue of the publication of the National Bibliography of Nigeria, the National Library of Nigeria has made tremendous improvement. The 2014 edition is in advance stage of completion. The hard copy is now simultaneously published with the CD-ROM version. Publishing and bibliographic control in Nigeria need to observe and respect national and international bibliographic control standards, instruments and conventions to which Nigeria is a signatory.

RECOMMENDATIONS

In the developed world publishing is not a business for all-comers, who pay little or no attention to bibliographic standards and control. Most of the bibliographic control materials are easy to obtain at the ISSN/ISBN Centre/Agency. The issuance of the ISSN has been decentralized as all the twenty-two (22) state and Abuja branches now issue ISSN/ISBN in order to bring their services to the doorsteps of the Nigerian publishers. And, publishers can deposit their publications in the state or Abuja branch nearest to them.

The National Library needs to reach out to the Nigerian publishers in a massive media campaign, training, semimars, conferences and workshops on issues bordering on bibliographic control, legal deposit and other sundry matters that will benefit the Nigerian publishers, authors and the nation in a symbiotic manner.

Since publishers are not willing to deposit their publications, the National Library of Nigeria should initiate programmes to encourage the publishers to deposit their publications. The rested legal deposit award needs to be revived, in addition to creation of an enforcement unit for the legal deposit division and the section for International Programmes.

The National Library Decree No. 29 of 1970 is becoming rather difficult to enforce in respect of all manner of publications especially electronic publications. The low penalty prescribed for defaulters is too merger to serve as deterrent. The law, therefore, is long overdue for revision. Perhaps one thing that needs urgent attention in the enforcement of bibliographic control and growth of publishing in Nigeria is the computerization of the legal deposit and the ISSN/ISBN sections. This, no doubt, shall enhance the efficiency of these

activities and encourage networking in the long run.

More qualified, trained and well motivated staff is required to handle the schedule of legal deposit, ISSN/ISBN/CIP and the compilation of the National Bibliography of Nigeria. This will go a long way in achieving bibliographic control compliance, universal bibliographic control and universal availability of publications. For the National Library to achieve a least 90% legal deposit collection of the sum total publishing output of the nation, adequate funding, provisions of logistics and staffing is required. This is in addition to holding regular stakeholders meetings, consultations, training, among others, to create a good working relationship.

Finally, government policies should give due regards to the Nigerian publishers in terms of import wavers and duty free importation of essential printing/publishing materials and equipment.

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CLOTHE INDUSTRY IN ABA, NIGERIA: AN EXPOSITORY STUDY

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Abstract
After food and shelter, clothing is the next most important basic need of man. Kent in Aba, Abia State, Nigeria is the melting pot of clothe making, a hub of fashion, design and creativity. This is an expository investigation of the clothe industry in Kent in Aba, aimed at highlighting the industry and setting forth arguments concerning the industry. It adopted a participant observtion technique to garner information, based on which it discussed the current challenges faced by the industry and tried to proffer solutions for the way forward.
Keywords: *Aba clothe making industry, Economic diversification, Economic self-reliance, Employment generation.*

INTRODUCTION

After food and shelter, clothing is the third basic need of man since the creation. Clothe making in Aba takes seeks to meet this vital need of man. It believes that good dressing adds flair and glamour to the physical, cultural and social look of people. Dressing speaks of a person, hence the saying that people address one the way one dresses.

Kent in Aba, Abia State, Nigeria is the melting pot of clothe making, a hub of fashion, design and creativity. A visit to Kent-Aba is thrilling, exciting, gripping, rousing, sensational, stimulating and stirring with African culture, tradition and pride expressed in made-in-Aba clothes. Kent is obviously comparable to Milan of Italy, where Domenico Dolce and Stefano Cabbana lived to make their marks in fashion designing (Ifeanyi, 2017).

The maiden edition of the nation-wide Micro, Small and Medium Enterprises (MSMEs) Clinic held in Aba, March 20-30, 2017 is an event to ever remember. Following his admiration of the display of creativity, craftsmanship, ingenuity, inventiveness, resourcefulness, talent and artistry of the clothe making industry in Aba, Abia State, Southeast geo-political zone of Nigeria, Professor Yemi Osibanjo, the Vice/Acting President of Nigeria, could not hide his feelings, but said, “Aba exemplifies such Nigerian attribute of being inventive. Aba has what it takes to compete with China” (Ifeanyi, 2017).

In a time the dwindling Nigerian economy has hit a recession mark from which it is just recovering and the federal government is tauting diversification of Nigeria’s monolithic (petroleum) economy, a highlight on Aba clothe industry is essential. This study is an expository report on the clothe industry in Kent in Aba. It is aimed at investigating the industry, evaluating its evidence, expounding on the industry, and setting forth arguments concerning the industry in a clear and concise manner. It adopted a participant observtion technique to garner

information for an analytical report that also discusses the current challenges faced by the industry and tries to proffer solutions for the way forward.

REVIEW OF RELATED LITERATURE

Clothe industry has a long history in Aba and Igbo land in general. The earliest type of clothe was made from animal skins, the back of trees, such as *aji* in Igbo land, and raffia palm tree leaves. Later, locally grown cotton became the main raw material for clothe making (Eluwa et al, 2005).

There is no doubt that clothe making is a great antiquity in Igbo land. An excavation at Igbo-Ukwu, Aguata Local Government Area of Anambra State, Southeast geo-political zone of Nigeria, dated to the 9th century AD shows that by that time cotton clothe was already being produced in Igbo land. Among the Igbo people, the Elugwu people of northern Igbo land, Akwete women and the West Niger Igbo produced cotton clothe. Akwete cloth has remained popular and unique because of it lends itself to product differentiation based on colour and pattern. It is now regarded as a symbol of Igbo culture (Eluwa et al, 2005).

At the time, clothe making industry was seen and described as indigenous for a number of reasons. The raw materials and tools required for the industries were generally locally produced. They were usually small scale and their organization was closely tied up with the lineage organization in which the skills and technique were passed on from father to son or from mother to daughter. Moreover, this industry pre-dated the coming of the white man in Igbo land and so could be regarded as not foreign but local and indigenous. Historians would prefer to call them local industries or local craft (Eluwa et al, 2005).

It was this local clothe craft industries in Igbo land that transformed and metamorphosed into the modern day Aba clothe making industry in the 21st century. With the coming of the European colonial masters to Igbo land, the Aba clothes industry has been blended and intermixed with post-colonial experience, fashion, civilization and modernization, even though the industry is propelled and driven by Igbo ingenuity and creativity. Today, the clothe making industry in Kent in Aba comprises mostly large clothe production concerns that are closely tied to modern skills and technique of fashion designers (Ifeanyi, 2017).

RESEARCH METHODOLOGY

The expository study adopted the participant observtion technique to garner information for analysis with simple statistical tools and for discussion of the current challenges faced by the industry and an attempt to proffer solutions for the way forward.

RESULTS AND DISCUSSION

Products of Aba clothe industry

The products the clothe industry in Kent in Aba include diverse apparel, attire, custome, dress, garments outfits, togs, vesture, wardrobe, shirts, trousers and weeds for men and women.

Operation pattern and style of the clothe industry in Kent in Aba

Most of the Aba clothe makers or fashion designers do not produce to sell. Kent in Aba, like Ariaria, also in Aba, is not purely

a market. The market part is only for clothe making materials, while the industrial part is where production and sale of different clothes take place for both national and international outlets. However, Kent is not the only clothe making cluster in Aba, but only used as a case study in this research. The close location of Kent to the raw materials used in clothes making makes it the most vibrant among the rest and ideal for a casestudy. Fashion designers in Kent work in three patterns and techniques, namely customer specification, manufacturer design and market taste examination.

Customer specification

Most of the customers who come to Aba to get their clothes give their specifications and characteristics of the designs they order. The Aba cothe industrialists work with these specifications and demands for the customized wears. Customers from America and other places send their suits and shirts designs in drawings to the Aba cothe industrialists. When the industrialists are done with the production of the prescribed order, the customers pick the goods from Aba for sale in their countries.

A taste made known to Aba tailors, whether in drawing or in oral description, will be produced to the satisfaction of the customers. Customers specification is the major line for most tailors in Aba. Customers come because they know and trust that whatever they ask for shall be produced creatively for them. So, customer specification is the largest method of production in Kent and other clothe making clusters in Aba.

Manufacturer design

Most of the Aba fashion designers or tailors make clothes for people who only know the name of the type of clothe they want, but have no picture of what they have in mind. A manufacturer creates a design and picture from the customer's expressed imaginations.

Most people just come around and want to wear clothes, but lack the ability to paint a picture of what they want. Trained designers look at them and make designs that appeal to their imaginations and taste. Fashion designing is rooted in creativity, artistry, imaginativeness, inventiveness and talent. People who are not abreast with fashion and cannot describe to the tailor what they want to wear for a specified occasion are helped by manufacture designers. For example, a customer who is unsettled about what attire to wear for traditional marriage will get satisfactory help from manufacture designers, who suggests fabric, colour and designs based on either occasional demands or trends that fit the occasion.

Market examination

On their own, Aba tailors create designs in attempt to attract some segments of the market. The designs may entice prospective customers, magnetize them, induce patronage. This is a favourite method that allows some of the Aba clothe industrialists to give to the society rather than just peoducing what the society specifies to them. Aba designers love to know the current market taste, especially for students. It is important to note that most fashionable funkies in vogue, modish, stylish, swagger, and up-to-date students want to try crazy things that no one has done before. Most Aba fashionable products in this regard are shifted to Lagos, Port Harcourt, Enugu, Calabar, Abuja and Kaduna where you have more students and from where dealers access them for distrution to other markets.

For example, when the University of Nigeria, Nsukka hosted the West African University Games, Aba designers used that opportunity to show students

from other countries what they are missing as they rushed for the Aba-designed stylish, popular and prevailing wears. In this way, Aba designers usually produce and laiase with wholesalers, retailers, boutiques and other clothe sales outlets to sample the designs for profitable sales for them. If the demand for the designs are high, mass-production follows to the magnitude of the demand.

The mass-production is guided by the mean body measurement for large-scale construction of garment. Ohaka, Iloeje & Lemchi (2018) established the mean body measurement for a large-scale garment construction for school-age boys in Imo State, Nigeria.

Market examination

The creation of designs based on the observation of market taste by Aba tailors seems to derive from the contextual concept of technology. According to Eneh (2011), the contextual concept places emphasis on the cultural factors which have influenced, and have been influenced by, the the design. The economic, social, and political ambience in which the fashion or taste develops influences the design.

Sources of raw material for clothe making industry in Aba

Most of the raw materials used by the clothe making industry in Aba are sourced from Aba. Usually suppliers take them to the industrialists. Akwaete, Nsulu and Eke-Oba are available in notable markets in Aba city, like shopping centre and Ariaria market. Aba shopping centre has a variety of quality materials, such as buttons, zips, leather, fabric, wool materials and others.

Patronage for made-in-Aba clothes

Patrons from the neighbouring West African and Central African countries constitute the bulk of customers for the products of Aba clothe industry. The international business and commerce connections between the Abiriba people of Abia State and most countries like Togo, Ivory Coast, Ghana, Cameroon, Mali, Equatorial Guinea and Gabon make Aba clothes making industry attractive and well known by these African countries (Ifeanyi, 2017).

Most Aba fashion designers at Kent do not engrave their names and trademarks on their products. Rather, they engrave the label and trademark of the dealers, most of whom are big boutique owners in Africa and Europe. Both national and foreign dealers in made-in-Aba clothes get their stocks from Aba. Some of the Aba-based businessmen and women act as agents and middlemen between the Aba skillful industrialists and the dealers. Some of the sample clothes brought to Aba skillful tailors have Indian, American and European fabrics, showing their foreign origin.

The Aba clothe making industry gives the best design with the skillful and talented tailors at Kent-Aba. There is hardly any design of dress one cannot source from Aba. Consumers troop to Aba to get the best clothing for their loved ones. Aba is indeed the Japan of Africa.

Challenges facing Aba clothe industry

The most profound challenge of Aba clothe making industry is lack of electricity power supply. Eneh (2011) and Isife (2010) submitted that Nigeria is unable to provide sufficient energy for domestic and industrial uses of its citizenry. In most parts of Nigeria, citizens receive an average daily supply of 6 hours of electricity. National electrical power grid is yet to reach many rural areas in the country. Only 60% of the 150 million Nigerians are connected to the grid system. About 40% of the population connected to the grid lack power supply over 60% of

the time. Low access to electricity remains a constraint to social services, such as health and education. Most citizens still rely on some other sources of energy, like fuel-wood combustion, which results in emission of poisonous gaseous substances. Nigeria is one of the world's largest producers of carbon emissions, closely associated with global warming. Citizens, who can afford it, acquire privately owned electric power generators, which are barely cost-effective, and emit poisonous gases that pollute the environment. According to Eneh (2017), electric power per capita consumption in Nigeria is a paltry 0.03 KW, as against 0.265-3.2 KW for other countries. Yet, there is the major issue of pollution of the environment by smoke from the generator which is dangerous to human health

The industrialists have clusters that collaborate to provide electric power generating sets and fuel as standby alternative source of electric power. However, the cost of generator maintenance and fueling is too high and in most cases unaffordable.

Poor transport and communication is another challenge and facing the Aba clothe making industry in Aba, Abia State, Nigeria. There are no airport, seaport and functional railway system in the state. The roads are in bad shape. Hence, movement of people and goods is hindered.

The talented and skillful Aba tailors lack the capital to import modern factory machines used by fashion designers in Europe and America. This is a huge setback for Aba clothes making industry. With all their creativity, the products of Aba tailors lack the refined finishing touches for smoothness and perfection of masterly proficiency of the products, in line with international best practices of world class fashion designers.

Aba clothe making industrialists lack the collateral security required by banks to access loans. Worse still, the interest rate charged by the commercial banks, which is about 28-40 per cent, is too high, compared to 3-5 % interet rates obtained in other countries of the world. Most of the industrialists have no assets to serve as collateral security, and property owners have no need for bank loans (Eneh, 2017, 2005). Sometimes, the Aba clothe makers lack clarifications on loan facilities of government financial institutions, like Bank of Industry that assist small industries to grow their enterprises. There is also the problem of high and multiple taxations.

Recommendations on tackling the challenges: Way-forward

- Government should achieve uniterruptible power supply. Until this is done, tauting industrialisation and diversification of the economy will remain lip-services.
- Provision of good roads network, airport, seaport and functional railway system and rehabilitation of existing roads in Abia will help boost Aba clothe business.
- Government should partner with Bank of Industry to assist Aba clothe making industry for the much-needed loan to access modern factory clothes producing machines. This will improve the quality of the Aba clothe products to meet up with their counterparts from other climes.
- Government should also establish industrial training centres where skillful and talented tailors can impact the spirit of economic self-reliance and entrepreneurial development to young tailors in Aba, so that the clothes making industry ingenuity, innovations, invention and originality shall not die, but the skills should be transferred from one generation to the other as a legacy,

endowment, inheritance bequest to the younger generation in Igbo land.

- The government should promote and encourage ease of doing business among Aba clothes makers and other professional creative talents. It is the responsibility of the government to protect infant industries to grow from strength to strength, to ensure employment generation and poverty reduction in the country, in order to curb the menace of social vices in our society.

CONCLUSION

The study has highlighted the clothe making industry in Aba in Abia State, Southeast Nigeria as a welcome development in the 21st century, but needs government encouragement and support for growth. To address the challenges of the industry, the government should be committed to fixing the commercial city of Aba to become the Japan of Africa. This is in line with government diversification policy and international best practices for industrialization. This is the right step to take now that the Nigerian economy is experiencing serious challenges due to the unabated fall in global oil prices and unemployment problems.

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COMPARATIVE ANALYSIS OF THE PROXIMATE AND AMINO ACID COMPOSITIONS OF "OGIRI" FROM SOYA BEANS (*GLYCINE MAX*), CASTOR OIL SEED (*RICINUSCOMMUNIS*) AND FROM MELON SEED(*COLOCYNTHIS VULGARIS*)

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ABSTRACT

Ogiri soya (OS), OgiriUgba (OU) and OgiriEgwusi (OE) fermented condiments were produced from Glycine max Riscinuscomminus and Citrullus vulgaris respectively and their proximate as well as their amino acid properties were analysed and compared. Quantitatively, crude protein and ash contents were highest in Ogiri soya had the highest with such values as 39.58±0.10% and 6.40±0.00% while OgiriUgba had the highest quantities of crude fat, 43.16±0.13%and 12.52±0.16% crude fibre. OgiriEgwusi had 10.55±0.93% carbohydrate. The three samples had high quantities of energy ranging from 2362.32KJ/100g in Ogiri soya to 2435.38 KJ/100g in Ogiriegwusi. Among the eighteen amino acids assayed, the highest concentrations obtained in g/100g unit, Aspartic acid 17.49±0.04, 11.53±0.00. 6.82±0.02 for OU, OS and OE respectively while their respective values for Glutamic acid were 16.05±0.05, 15.89±0.02 and 11.28±0.08 for OU, OS, and OE. Ogiri soya had higher values in terms of the essential amino acids while OE had higher values for arginine 6.80±0.38, Glycine 3.61 and Threonine. The use of Ogiri condiments from these substrates is recommended for consumers.

Keywords: *Soya Beans, Castor oil seed, Melon seed, Ogiri soya, Ogiriugba, Ogiriegwusi, Proximatecomposition, Amino acid profile*

INTRODUCTION

Ogiricondiment is of great importance to the "Igbos" (the South Eastern occupants of Nigeria). "Ogiri" also called "Ogiriisi" is a product of fermentation of such oil seeds as castor oil seed (*Ricinuscommunis*), melon seeds (*Citrullus vulgaris , Colocynthis vulgaris or other varieties*), fluted pumpkin seed (*Telferiaoccidentalis*), soy beans *(Glycine max)*, Ojinnaka and Ojimelukwe, (2012); Nzelu and Onyekwere (2017); Jideani and Okeke, 1991; Odibo and Ume (1989); Barber and Achinewhu, (1992)Akhuemonkhan and Badaru (2000) ; (Nzelu 2006 and 2007), Nwosu, and Ojimelukwe (2000); Omafuvbe*et al* (2004) and Dimejesi and Odibo(2017) among other raw materials. Castor oil bean,*Ricinuscommunis*, is a major oil seed belongs to Leguminousae family and has been known since ancient time. In the subtropical zones, its plant attains 11-13meters height even in the wild, Ojinnaka and Ojimelukwe (2013). It requires a temperature range of between 20°C and 26°C with low humidity throughout the

growing season so as to obtain, maximum yields for which reason its cultivation is limited to the tropical areas of the developing world.Soya bean originated in eastern Asia and is still widely cultivated in China, Japan, Korea, and other countries but USA is the current largest producer of Soya beans, (Unilever 1975) Beddows (1988). Soya bean is able to thrive inextreme temperatures, from tropical Brazil and Nigeria, to the snows of Japan. In addition to its potential as a prime cash crop, it has attractive features nutritionally due to its high content of protein, fat, with poly unsaturation, minerals and low starch content.Soya beans (*Glycinemax* (L) Merrill) belonging to the plantate kingdom and processed into numerous products, (Chukeatirote 2015). Such products include kinema, thuanato, soy-daddawa and Ogiri, (Chukeatirote 2015, Omafuvbe*et al* 2002).“Ogiri” is prepared by traditional methods of uncontrolled solid substrate fermentation resulting in extensive hydrolysis of the protein and carbohydrate component,Achi (2005). At the same time, its quality is unpredictable as the varying environment and techniques used Ogueke*et al* (2013). However, the processor may modify some of the traditional steps. The production typically involve five steps namely (1) the boiling of the dehulled seeds, (2) cooling, (3) mashing of the softened seeds, (4) wrapping the substrates mash in natural leaves and (5) fermenting the mash at the prevailing temperature and humidity. Through the fermentation process, the anti-nutritional factors in the oil seeds are reduced or eliminated in the product, flavourous compounds are developed (Mensah, *et al.,* 1990; Manandhar (1995) and their characteristics ammonical taste enhances the tastes of foods, beverages and drugs containing them. The fermentation also improves digestibility and nutritive value of the raw samples, (Achi, 2005). It has been reported that Bacteria in genus Bacillus were responsible for the fermentation of these fermented food products, (Ojinnaka and Ojimelukwe, 2013). Through proteolytic activities the quality of the fermented product is enhanced with such attributes as improved protein quality, texture as well as characteristics aroma and taste. According to Alais and Linden (2009), flavour enhancing substances confer as a rule a new aroma while the development of strong odours seems to be the rule in foods where *Bacillus subtilis* dominates, (Dirar 1993).The micro-organisms predominant in the fermentation to produce “Ogiri” include *Bacillus* species, especially *B. subtilis, B.pumilus,B. brevis, B. macerana, B. polymyxa*and*B.licheniformis* (Omafuvbe, *et al* 2000 and 2004; Maureen Theodore *et al* (2013). Sarkar*et al*, (1997) indicted *Bacillus subtilis* as the most dominant naturally fermenting agents in Soybeans. Soya bean, *Glycine max,* has a prominent role in the world food and agriculture, mainly because of its ability to be used in many forms, (Ashok *et al*, 2010).Against the background of the significance and nutritional benefits of Ogiri, a traditional fermented condiment, the object of this study was to evaluate the proximate and amino acid profiles of “Ogiri soya”, “Ogiriugba” and “OgiriEgwusi” from fermented soya beans, castor oil seeds and melon seeds.

MATERIALS AND METHODS

Sources of Materials

The raw materials soya bean (*Glycine max*), castor oil seed (*Ricinuscommunis*) and from melon seed (*Citrullus vulgaris*) were bought from Eke Oko market, Orumba North, Anambra State of Nigeria.

Production of Ogiri Soya bean

Soya bean seeds were cleaned by winnowing, sorting, and removal of pieces of string, stones and other extraneous materials as shown in Figure 1. The cleaned golden coloured seeds were soaked for 9h in excess potable water. The soaked beans were then removed into a stainless steel pot to which potable water had been added and the beans were boiled for 60mins. The boiled beans were then removed from the pot and cooled to about 30^0C, a manageable temperature for the manual removal of the beans' hulls. The dehulledbeans were wrapped with aluminum foil paper and boiled for 3h after which the wraps were pierced using tooth picks and, incubated by the fire side for the next 4 days. The wraps were turned from one side to the other thrice daily. On the fourth day, stainless steel hand grinder (Corona brand) was sterilized in boiling water and used to grind the fermented beans while the used aluminium foil paper was discarded. The ground soya beans, mash wrapped with aluminum foil paper for secondary fermentation. The proximate and amino acid profiles of the Ogiri Soya wereanalyzed on the fourth day of secondary fermentation. The results were recorded on Table 2.

Production of OgiriUgba(OU) from Castor Oil Beans, and OgiriEgwusi(OE) from Melon Seeds:

The traditional method of processing "ogiri" was used. Two kilograms each of dehulled seeds were washed and boiled using stainless steel pots and with about 4 liters of potable water per sample. Cooking continued until the seeds were very tender as judged by the processor. Technically, effort was made to allow the water dry off avoiding the sticking of the seeds to the pot or the charring of the seeds. The cooked seeds were transferred to different sieves to aid cooling and the draining off of remaining water (if any). With clean and sterilized grinding machine, the very soft seeds were ground separately and the mash of each sample was wrapped separately. However about one teaspoon of heaped ash from burnt palm bunch was added and ground into the melon seed mash/paste so as to impart the gray colour to the OE. These wraps were kept by the fire side at night but taken out on stainless steel trays and allowed for incubation at the prevailing ambient temperatures in the environment. At this time of global warming, minimum average temperatures are usually around 30°C to 40°C in many parts of Nigeria. By the fourth day, the "ogiri" samples OU and OS were analysed for their proximate and amino acid compositions using the Benitez (1989) method.

OS	OU	OE
Soyabeans Seeds	**Castor Oil Seed**	**Melon**
Cleaning	Cleaning	Cleaning
↓	↓	↓
9h Soaking (1 bean: 5water)	Dehulling	Dehulling
↓	↓	↓
Manual dehulling	Washing	Washing
↓	↓	↓
3h Boiling	3h Boiling	3h Boiling

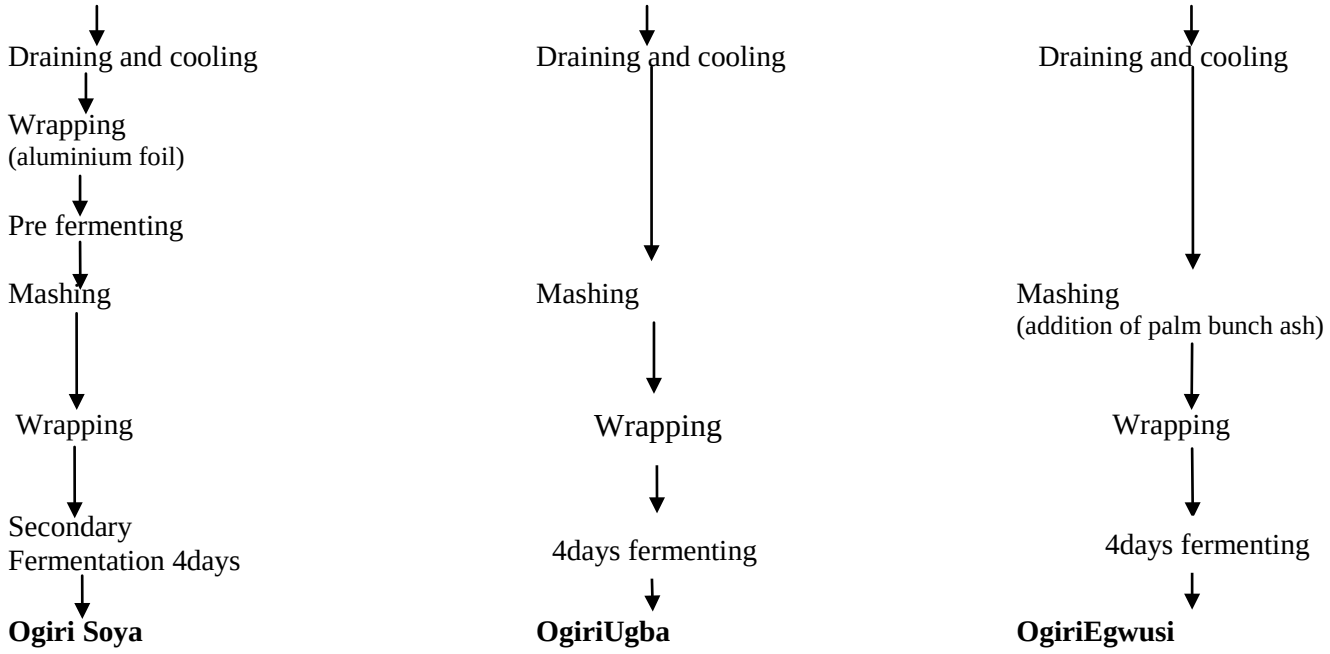

Fig. 1: Flow charts for production of Ogiri Soya, OgiriUgba and OgiriEgwusi

Proximate composition of the Ogiri Samples

The Proximate composition of the Ogiri Samples was determined using the standard methods of AOAC (2010). The energy values were calculated using the factors: 4.1 (for carbohydrates and protein); 9.4 for the fat (Fox and Cameron 1989) and the results were recorded on Table 1.

Amino Acid analysis:

The Amino Acid profile was determined by Benitez (1989) method. The Technicon Sequential Multiple (TSM) Amino Acid Analyzer (Technicon Instrument Corporation, New York) was used to determine the different amino acid composition of the three Ogiri samples. The amino acid values reported were the averages of three determinations.

Amino Acid profile

Two point zero grams of each "Ogiri" sample was weighed into the extraction thimble and the fat was extracted with chloroform/methanol (2:1 v/v) mixture, using soxhlet apparatus [AOAC 2005]. The extraction lasted for between 5-6 hrs. Thirty milligrams each of the defatted "Ogiri" samples was weighed into three separate glass ampoules. Seven millitres of 6M HCL was added to each ampoule and oxygen expelled by passing nitrogen gas into the samples. The glass ampoules were sealed with Bunsen flames and were placed into an oven at 105°C for 22hrs. The ampoules were allowed to cool, and filtered to remove the humins. The filtrates were then evaporated to dryness at 40°C, using a rotary drier under vacuum. Each residue was dissolved with 5ml acetate buffer (pH 2.0) and stored in a plastic specimen bottle, and lastly analysed for their amino acid contents. Tryptophan was determined by Maria et al (2004) method. The "ogiri" samples were individually hydrolysed with 4.2m sodium hydroxide. The known samples were each dried to constant weight, defatted, hydrolyzed,

evaporated in a rotary drier evaporator and loaded into the Applied BiosystemsPhenylthiohydration (PTH) Amino acid Analyser. Results were recorded on Table 2

Statistical Analysis

Data were collected on triplicate determinations and means ± standard deviations (SD) were computed. Data obtained were analyzed by one way analysis of variance (ANOVA) using the SPSS .version 17 (2014) statistical procedure and significance was accepted at 0.05 level of probability.

RESULT AND DISCUSSION

The result obtained from the analysis are recorded on Tables 1 and 2

Table 1: Proximate Composition of the OS,OU and OE Ogiri samples (Dry Matter)

Parameters	Ogiri Soya (OS)	OgiriUgba (OU)	OgiriEgwusi (OE)
Crude protein	39.58^{a} ± 0.10	32.71^{c}± 0.10	37.29^{b}±0.48
Fat	39.65^{c}± 0.36	43.16^{a}± 0.13	40.82^{b}± 0.22
Ash	6.40^{a}± 0.02	3.06^{c}± 0.04	4.20^{b}± 0.20
Crude fibre	4.36^{b}± 0.07	12.52^{a}± 0.36	4.44^{b}± 0.24
Carbohydrate	7.10^{b}± 0.21	7.24^{b}± 0.15	10.55^{a}± 0.93
Energy KJ/100g	2362.32KJ/100g	2391.90KJ/100g	2435.38KJ/100g

Values are means ± Standard deviation of triplicate determinations. Means with the different letter along a row showed significant difference (p <0.05).

The result on Table 1, reveals that the crude protein content of the“Ogiri” samples ranged from 32.71±0.10% for OU through 37.29±0.48% for OE to 39.58±0.10% for OS. These crude protein concentrations agree with the results of Davis and aderibigbe (2010) where 24.60% to 32.00% protein was reported for fermented melon seeds, and with Nzelu, and Onyekwelu (2017) who reported a range of 24.78% to 35.08% for fermented castor oil seed. Legumes and oil seeds used for production of these condiments are usually high in proteins and fats. Besides, the microbial enzymes which catalyze the fermentation process, and consequently affect colour, flavour as well as texture are proteins, and also enhance the quality of these foods (Onwuka 2014). Fermented protein foods are used mainly for flavour enhancing condiments and gourmet food ingredients due to the meaty and appetite-stimulating flavour of protein hydrolysate which were formed during the fermentation, (Campbell-Platt 2009). The lipid content of the “Ogiri” condiments was also high and ranged between 39.65±0.36% and 43.16±0.13%. OU had the highest lipid content while the OS had the least content quantitatively. However these lipid contents agree with the fat contents reported by Nzelu and Onyekwelu (2014) for fermented castor oil seed product, and the 35.28% reported by Akinyele and Oloruntoba (2013), as well as with the range of 38.40% to 43.20% fat from fermented melon seeds reported by, David and Aderibgbe (2010). The fats supply energy for metabolic activities as well as the essential fatty acids for maintaining proper health.

The fat content of OE and oil in the study varied with the values (36.30% and 37.50% respectively) reported by Omafuvbe*et al* (2004). Some of these changes can be attributed to the soil, age, and the variety of the seeds. About 50%, 45% and a range of 44.80% to 53.40% oil have been reported as the oil content of the raw soya beans, castor oil seed and melon

seed by Beddows, (1988), Unilever (1975) and David and Aderigbe 2010. From records, the fat content of the fermented products are usually lower than that of the substrate. The ash content obtained on this study (2.8% to 4.44%) agreed with those reported by other researchers for similar products Nzelu and Onyekwelu (2017)

The crude fibre contents in the "Ogiri" samples ranged between 4.36±0.07% and 12.52±0.36% and 24.08% with the OU value being the highest. The crude fibre4.44±0.24% obtained in this study is lower than 15.6% and 11.59% reported by Omafuvbe et al (2004) and Akinyele and Oloruntoba (2013) respectively, for OE samples. Fibre is the non-starch polysaccharide carbohydrate portion of plants (i.e., celluose) that helps to maintain structural rigidity, Murano (2003). The three "Ogiri" samples have the potential to release a range of 2362.32KJ/100g to 2435.38KJ/100g to the diet when used.

Amino Acid profile of the Ogiri Samples

The amino acid profile of the soyabean "Ogiri soya", (OS), Castor oil seed "ogiri" (OU) and Melon seed "Ogiri" (OE) samples are shown in Table 2. Significant differences existed in the amino acid compositions of the samples except in isoleucine, methionine, proline and threonine contents of the "Ogiri" samples. The results reveal an increase in the concentrations of the essential amino acids in the "Ogiri" products which is in agreement with the reports of some other researchers regarding condiments from oil seeds (Ojinnaka and Ojimelukwe, 2012). Eighteen amino acids were detected. Nine essential amino acids (EAA) including Histidine and, nine other non-essentials (NEAA) were detected. Both essential (EAA) and non-essentials (NEAA) amino acids were present in various concentrations. Generally the EAAs, (designated (E) from the OS were quantitatively higher than the EAAs from OU and OE. For the neutral amino acids, Leucine had highest concentration, yielding 5.95% for OU, 7.00% for OE and 8.20% for OS, followed by Lysine where OE, OU and OS had 5.04%%, 6.04% and 6.36% respectively.For Histidine, the respective concentrations for the "Ogiri" samples were 2.04% OU, 3.13% for OE and 3.19% for OS. In this study, Tryptophan, cystine and methionine were the major limiting amino acids in the samples, a condition which is similar to "kinema", a fermented product form soyabeans, Sarkar*et al.* (1997). Besides, proteins from nut and seeds are rather low in tryptophan, Lee (1975)

Glutamic and Aspartic acids had the highest concentrations among all the amino acids. Glutamic acid is recognized as a flavor agent (Okeke and Elochukwu (2013). Its sodium salt, monosodium L-glutamate (MSG) has a sweet taste and has thus found application as a flavour enhancing salt in the food industry. Sweetness is a property, not only of sugars but also of lead acetate, saccharin, aspartame, sugar alcohols and other substances (Murano 2003). According to Ward (2010), the flavour enhancing properties of Sodium glutamate were discovered in Japan in the twentieth century. Production of glutamic acid and several other amino acids such as Lysine is carried out through a fermentation process using mutants of*Corynebacteriumglutamicum, (*Willey *et al* 2009*).* According to Jeleń (2012), both Glutamic acid and Aspartic acid contribute to the Umami, (neither sweet, nor bitter, nor salty nor sour) tastes but described as savory and delicious sensation (Murano 2003; Onwuka 2014). Umami flavour enhancers are largely based on amino acids and nucleotides.

According to Yasuda *et al* (1994), it is well known that glutamic acid and aspartic

acid contribute to the pleasant Umami taste or savoury enhancement of foods.

Higher quantities of the rest of the EAAs were obtained from OS,Interestingly, OS had higherconcentrations in seven out of the EAAs and this was significant ($p < 0.05$). Methionine and Cystine (both sulphur containing amino acids)are limiting amino acids in plants and animal foods (Fox and Cameron 1989). All the "Ogiri" samples are from leguminous seeds and this could explain the lower concentrations of these amino acids. Methionine takes part in the synthesis of choline, component bile salts. Cysteine, Cystine and Methionine are all sulphur containing amino acids, and constitute the main source of sulphur in the diet. The body can make cysteine from methionine. Cystine is one of the main amino acids of insulin and is formed from cysteine in the body.

Table 1 also reveals that the "Ogiri" samples had energy values of between 2362.32KJ/100g and 2435.38KJ/100g.

Table 2.0: Amino Acid Profile of the Ogiri Samples (g/100g)

Amino Acid	Ogiri Soya (OS)	OgiriUgba (OU)	OgiriEgwusi (OE)
Leucine (LEU)	$8.20^{a} \pm 0.20$	$5.95^{c} \pm 0.05$	$7.00^{b} \pm 0.01$
Lysine (LYS)	$6.36^{a} \pm 0.14$	$6.04^{b} \pm 0.03$	$5.04^{c} \pm 0.04$
Isoleucine (ILEU)	$3.60^{a} \pm 0.70$	$3.50^{a} \pm 0.50$	$3.80^{a} \pm 0.20$
Phenylalanine (PHE)	$4.61^{a} \pm 0.30$	$3.72^{b} \pm 0.30$	$4.26^{ab} \pm 0.26$
Tryptophan (TRP)	$0.92^{a} \pm 0.02$	$0.84^{a} \pm 0.04$	$0.74^{ab} \pm 0.06$
Valine (VAL)	$4.74^{a} \pm 0.04$	$4.59^{a} \pm 0.50$	$3.33^{b} \pm 0.03$
Methionine (MET)	$1.07^{a} \pm 0.10$	$1.07^{a} \pm 0.07$	$1.34^{a} \pm 0.30$
Proline (PRO)	$3.45^{a} \pm 0.05$	$3.86^{a} \pm 0.46$	$3.96^{a} \pm 0.04$
Arginine (ARG)	$6.71^{a} \pm 0.40$	$5.16^{b} \pm 0.16$	$6.80^{a} \pm 0.38$
Tyrosine (TYR)	$3.27^{ab} \pm 0.50$	$2.49^{b} \pm 0.40$	$3.44^{a} \pm 0.30$
Histidine (HIST)	$3.19^{a} \pm 0.19$	$2.04^{b} \pm 0.04$	$3.13^{a} \pm 0.10$
Cystine (CYS)	$1.63^{b} \pm 0.03$	$2.06^{a} \pm 0.10$	$0.85^{c} \pm 0.05$
Alanine (ALA)	$4.44^{b} \pm 0.22$	$5.19^{a} \pm 0.19$	$3.72^{c} \pm 0.04$
Glutamic ACID (GLU)	$15.89^{b} \pm 0.02$	$16.05^{a} \pm 0.05$	$11.28^{c} \pm 0.08$
Glycine (GLY)	$3.37^{b} \pm 0.05$	$1.99^{c} \pm 0.11$	$3.61^{a} \pm 0.00$
Threonine (THRE)	$3.44^{a} \pm 0.40$	$3.45^{a} \pm 0.40$	$3.00^{a} \pm 0.06$
Serine (SER)	$5.54^{a} \pm 0.04$	$4.48^{b} \pm 0.08$	$3.40^{c} \pm 0.08$
Aspartic Acid	$11.53^{b} \pm 0.00$	$17.49^{a} \pm 0.40$	$6.82^{c} \pm 0.02$
Total Amino Acid (TAA)	91.96	89.97	75.52

Values are means ± Standard deviation of triplicate determinations. Means with the same letter along a row showed no significant difference ($p > 0.05$).

Table 2 summarizes the total (protein: bound plus free) amino acid profile of the soyabean Ogiri soya, (OS), Castor oil seed Ogiri (OU) and Melon seed Ogiri (OE).

The proximate composition of the Ogiri sample (see Table1) reveal that the increase in the concentrations of the essential amino acids in the Ogiri products is in agreement with the reports of some other researchers regarding condiments from oil seeds Ojinnaka and Ojimelukwe (2012). Eighteen amino acids were detected by the Benitez (1989) method. Nine essential amino acids (EAA) including Histidine and, nine other non-essentials (NEAA) were detected. Both essential (EAA) and non-essentials (NEAA) amino acids were present in various concentrations. Generally the EAAs, (designated (E) from the OS were

quantitatively higher than the EAAs from OU and OE (see Table 1). For the neutral amino acids, Leu had highest concentration, yielding 5.95% for OU, 7.00% for OE and 8.20% for OS, followed by Lysine where OE, OU and OS had 5.04%%, 6.04% and 6.36% respectively.ForHistidine, the respective concentrations for the Ogiri samples were 2.04% OU, 3.13% for OE and 3.19% for OS. Going by Lee's classification, adopted by Sarkar*et al* (1997), where the amino acids obtained were grouped into acidic, basic and the amino acids in this study resulted to 29.81%, 37.28%, 23.97% of acidic; 17.68%, 14.72%, 19.82% of basic; and 8.55%, 6.40%, 10.20% of aromatics OS, OU and OE Ogiri samples respectively. Sarkar*et al* (1997) reported the acidic, basic and aromatic acid from their kinema, a product from fermented soya beans, as 20.8%, 15.1% and 13.0%. In this study, tryptophan, cystine and methionine were the major limiting amino acids in the samples, a condition which is similar to "kinema", a fermented product form soyabeans, Sarkar*et al* (1997), and general for legumes.

Glutamic and Aspartic acids had the highest concentrations among all the amino acids. Glutamic acid is recognized as a flavor agent (Okeke and Elochukwu (2013). Its sodium salt, monosodium glutamate (MSG) has a sweet taste and has thus found application as a flavourenhancing salt in the food industry. According toCampbell-Platt (2009) and Ward (2010), the flavour enhancing properties of Sodium glutamate was discovered in Japan in the twentieth century (in the 1950's) and a fermentation process for its production by *Corynebacteriumglutamicum* currently supplies large quantities of the salt in the world market annually through morden biotechnology. According to Jeleń (2012), both Glutamic acid and Aspartic acid contribute to the Umami, (neither sweet, nor bitter, nor salty nor sour) tastes.

Higher quantities of the rest of the EAAs were obtained from OS,Interestingly, OS had higherconcentrations in seven out of the EAAs and this is significant (P>0.05). Methionine and Cystine(both sulphur containing amino acids)are limiting amino acids in plants and animal foods (Fox and Cameron 1989). All the Ogiri samples are from leguminous seeds and this could explain the lower concentrations of these amino acids. These are sulphur containing amino acids and sulphur is a component of nails and hairs. Methionine takes part in the synthesis of choline, component bile salts. Cysteine, Cystine and Methionine are all sulphur containing amino acids, and constitute the main source of sulphur in the diet. The body can make cysteine from methionine. Cystine is one of the main amino acids of insulin and is formed from cysteine in the body.

CONCLUSION

The results from the study have shown that "Ogiri" from the three raw materials (substrates) have high contents of protein, fats and energy values. "Ogiri" soya yeilds results in additionally better amino acids profile especially when the essential amino acids are considered. The higher contents of Glutamic and Aspartic acids in the amino acids' composition of "OgiriUgba" (OU), "Ogiri"egwusi (OE) and "Ogiri"soya(OS) explain the flavourous nature of "Ogiri" samples, especially now that Umami tastes have been linked to "Ogiri" condiments. Furthermore the "Ogiri" condiments would contribute to energy and protein intake as well as nutrition of the consumers. By this, they would and the thus contribute to the food security in developing countries.

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