Wisdom at the source of the Blue Nile

Ee-JRIF

Ethiopian e-Journal for Research and Innovation Foresight

Special Issue

Volume 11: Number 2
2019

Ethiopian Institute of Textile and Fashion Technology
Bahir Dar University, Ethiopia
http://eitex.bdu.edu.et/

ISSN: 2042-6356

Early Childhood Cognitive Science Development: Implication for Economic Development in Africa

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Abstract: Science and national development are quintessentially the two sides of the same coin and it goes without saying that the changing phases of education as a result of its paradigm shift of the 21st century necessitates a deeper consideration for laying a solid foundation for science education. It is globally accepted that science rules the world and a knowledge-driven economy demands a well-grounded knowledge in science and technology for scientific breakthroughs and technological advancement. Science, which has an ever present but subtle impact on virtually every aspect of modern life should be laid from the early childhood education level. This paper focused on the development of cognition and cognitive science as a problem solving skill which should be developed in every child albeit, in every human being. Some challenges in the process of developing cognitive science in the child include among others, the environment, inadequate facilities, the school curriculum, incompetent teachers etc. some suggestions were also made, among which are: provision of stimulating environment, mandatory school attendance by every individual child in the Nigerian nation in order to implement the equality of education policy, recruitment of qualified teachers, government placing more importance on the foundation laying education levels (Early Childhood and Primary) and vigorous funding of education at all levels in Nigeria.

Keywords: Science education, early childhood education, cognition and cognitive science, economic development.

1. INTRODUCTION

The changing phases of education as a result of its shift in paradigm in the 21st Century necessitate a deeper look into its achievements in the last half of the century in Nigeria, most especially in the areas of scientific breakthroughs and technological advancement. Science, as observed by McComas, Almazroa & Clough (1998) has an ever present but often subtle impact on virtually every aspect of modern life – both from the technology that flows from it and the profound philosophical implications arising from its ideals. Hence every learner, starting from the most basic level of education must be made to understand the tactics and strategies of science in an evolving society.

Generally, subjects are grouped in the school system according to the branches of knowledge they fall into in order to develop students in their specific areas of interest and intellectual capacity. However, it has been observed over the years from the results of general / public examinations in Nigeria (WASCE, GCE, NECO & NABTEB) that the performance of students has continuously

been below the expectation of stakeholders, especially in the sciences and science related subjects. Unfortunately, a country may not be able to progress or advance technologically if a large percentage of her young learners eschew the science based subjects in their choices of future careers which according to Murphy and Beggs (2003) may be due to their being turned- off science early in their academic journey.

Corroborating the statement above, Hadden and Johnstone (1983) reported that students' interest in science start to wane from the tender age of 9 up to 14 which is quite early in the child's journey of formal education. In the same vein, Schibeci (1984) found that the decline in the interest for the science - based subjects is an international phenomenon which he opined needs a serious attention. The general reasons put forward to explain the decline in science subjects from various research include: the natural tendency for science or love of the child's physical environment was never explored by the adults around, the transition from the primary to post primary schooling; the content-driven nature of the science curriculum (especially in Nigeria where rote learning and memorization still hold a centre-stage in the school); the perceived difficulty of science subjects; the ineffective science teaching methods; the absence of science teaching materials and inability of teachers to relate topics to real life situation; and home-related as well as social factors.

From the foregoing, it can be inferred that early solid foundation for the science- based subjects and scientific knowledge are the major tools needed by countries the world over to meet up with the challenges of technological advancement as an option in human endeavour. Therefore early childhood education and care should be attended to accordingly, thus in Nigeria and at the international level, early childhood development and education has become a theme for serious consideration in the recent years starting with the 1989 United Nation's (UN) adoption of the Convention on the Rights of the child and the 1990 world conference on Education for ALL (EFA) in Jomtien, Thailand, then the 2000 World Education forum in Dakar, Senegal up to the Millennium Development Goals (MDGs) in the United Nations, UN) as well as the most recent Sustainable Development Goals (SDGs), all of which have led to the heightened awareness of the importance of Early Childhood Education as a corrective measure for the decline in the standard of education globally. Research abound that the child's early years demand adequate protection, care and stimulation which according to UNESCO (2000) also act as the foundation for his or her well-being and development. Therefore, fulfilling the child's well-being and basic needs both in terms of nourishment and nurturing, particularly from pregnancy to about six years of age as opined by Paiva, Schneider, Machado and Perinazzo (2009) recurrently demands not only technical but, also more skillfully human knowledge of what a healthy and happy childhood actually means to everyone as both a right and absolute priority for the achievement of the goals of development.

Supporting the foregoing, Lake (2014) said "we now know that it takes more than education (reading and writing in the class) for

a young child's brain to develop". Instead, learning should ignite a kind of revolution for learning in the child and in how the adults think about and act on early childhood development. It is a known fact that the developing brain needs multiple inputs in the area of health, nurturing care, protection and enrichment. Therefore, incorporating these multiple inputs will foster the developmental potentials of the young children. There is no gain saying that early childhood education is one of the most cost-effective strategies for solving most, if not all social challenges in the society as it is believed that the brain has a maximum capacity for development in the fullness of its complexity thereby allowing children to learn the skills that will help them flourish in a 21st century economy.

It goes without saying that the main object of education is to prepare the young to educate themselves throughout their lives having acquired an effective life-long education while the best educated human being is the one who understands the physical environment in which he finds himself and can contribute positively to the growth and development of such an environment. Against this background, cultivating the scientific tendency in children becomes a task for every adult around the child i.e. the parents, the teacher and the government in order to meet the demands of the 21st century world. Thus, in the submission of (NRC, 2012), humans have a need to know and understand their physical world. They also have the need to change their environment using technology in order to accommodate what they understand or desire. It is therefore generally agreed that a solid foundation in the knowledge of science would enhance the pursuit of explanations to the natural world while technology and engineering become the means of accommodating human needs, intellectual curiosity and aspiration.

It is apt at this point to note that the fundamental purpose for developing science in all children is to produce scientifically literates who can understand how nature works in their environment and the nature of scientific knowledge, while growing up with the characteristics of scientific knowledge across all disciplines as well as the knowledge that scientific knowledge itself is opened to revision in the light of new evidence. Therefore helping learners or young children to understand their natural world amounts to helping them to realize their futures by providing avenue for them to nurture their natural tendency towards scientific knowledge by providing them with enabling environment, facilities and instructions that give direction and allow them to use cognitive and technological skills which invariably lay the needed foundation for quantitative literacy from the earliest contact with formal education, thus allowing young children to understand and cope with their ever changing environment.

2. EDUCATION AND NATIONAL DEVELOPMENT

DeFillipi and Arthur (1994) attested to the fact that in the post-modern world, various changes in the social context and global perspectives have changed the properties of careers tremendously such that school administrators are challenged to realign school programmes to equip learners adequately to cope with these changing phases of the

society. Supporting the above, the quality of education according to Sulaiman (2019) determines the pace of growth and development of a country while also the leadership of an organization affects its productivity. To this extent, importance should be placed on the relevance of school programmes while also thinking of the type of future being prepared for various levels of learner. The 21st century according to Daggett (2010) demands specific skills from learners at all levels of education apart from the basic learning which focused traditionally on reading, writing and mathematical skills. The new education goals expect products of schools to possess skills in creativity, critical and logical thinking, nature appreciation, value orientation and collaboration exhibited in team work and group dynamics. Products of schools are expected to be capable citizens who can access and process information efficiently and effectively, they are also expected to exhibit quality leadership traits in order to harness, manipulate and use resources at their disposal adequately in their various environment and in the long-run contribute their own quota to the growth and development of their nation.

2.1. Goals of Early Childhood Science Curriculum

At the early childhood education level, science is simply explained as a system of knowledge that covers the general truth and laws about the physical environment as well as being aware of the fact that scientific knowledge is an open ended phenomenon which is opened to revision whenever there is new evidence as a result of research. Therefore, the goals of science at the early childhood level include:

- Fostering children's appreciation of nature and themselves because science stems from social and cultural traditions;
- Nurturing curiosity and providing opportunities to explore the world as well as explain natural phenomenon;
- Encouraging children to investigate the world by using their senses;
- Providing children with hands-on experiences that develop basic science concepts;
- Increasing children's ability to observe; describe, classify, see relationships, be creative and solve problems. (Karen Stephens 1996).

2.2. Goals of Early Childhood Mathematics Curriculum include:

- Identifying and classifying shapes;
- Understanding concepts of size and space;
- Sorting objects based on specific characteristics;
- Using mathematical vocabulary that relates to number and establishing relationship between objectives;
- Mastering one-to-one correspondence, which will lead to the ability to count;
- Organizing mathematical information and relating it in an understandable way;
- Establishing relationships between objects through comparison;
- Using mathematics concepts and applying them to everyday life.

2.3. The Young Child and Science

Naturally every child is born with a spark of science. What the adults do is just to kindle such spark through encouragement, care,

patience, understanding and love. Nurturing each child holistically brings out the latent scientific knowledge in him or her as they grow up and become clear thinkers. The young child naturally observes, explores, imagines, discovers, investigates, gathers information and shares knowledge through interaction with his environment. The child listens to different sounds around him, observes every object, learns about his environment quietly and consistently and grows to develop various skills which include reasoning and inquiry.

Stephens (1996), noted that children are always curious about things in their environment especially nature. She says further that they are excited about exploring even though much information is beyond their understanding. She believes that it is always good to lay a solid foundation for curiosity and confidence in the child and that these would go a long way in developing the love of science in the young child. Nature, according to Kellert (2005) is important to children's development in every major way, be it intellectually, emotionally, socially, spiritually, and physically. He said further that "play in nature, particularly during the critical period of middle childhood (4-8) appears to be an especially important time for developing the capacities for creativity, problem solving, emotional and intellectual development. Supporting the view above, Cherry (2018) posits that early cognitive development involves processes based on various actions which later manifest into changes in mental operations resulting in the creative abilities.

In the same vein, Chawla (1999) posits that creativity, physical competence, social skills, environmental knowledge, confidence, and problem-solving ability are among those benefits to children's development. She also specified the experiences provided for children when adult mentors take them out-of-doors, such include, being given attention to their surrounding in four different ways i.e. care for the land as a limited resource essential for family identity and well-being; a disapproval of destructive practices; simple pleasure at being out in nature; and a fascination with the details of other living things and elements of the earth and sky. The above experience of the children according to her suggests not only care for the natural world, but also care for the child, which form part of the ingredients needed for laying solid foundation for learning science on the part of the child.

Children in recent times don't play in the woods, the natural water or in the sand as everything learnt now is carried out in the confinement of classroom blocks and narrow passages of the school buildings. In Nigeria, curriculum overload has taken away the natural means of learning from the school system and as observed by Maduewesi (2005) in her statement that children below the age of school already experience real or concrete academic rigours with homework and assignments, where the children do not even have contact with any natural learning facilities such as gardens, natural play grounds etc. This situation according to NLI (2007) is known as nature-deficit disorder where children spend more time viewing the television and playing video games in computers than they do being physically active outside the classroom or homes. This ugly situation has affected so many children

by turning them into obese and overweight children which also affects their brain. An in-active brain or an unchallenged brain cannot produce a creative thinker needed in the 21st Century/ technological age.

3. LEARNING SCIENCE AT HOME

Everything in the home of the child can be used to encourage scientific knowledge. Parents are to prepare their children for a world vastly different from the one in which they grew up. Every citizen needs to become scientifically literate in order to make informed decision about their health, safety and citizenship, therefore children need adults (guardians, parents and other relatives) to prepare them for the world that awaits them. Vigotsky (1997), in his socio-cultural theory explains the effects of the environment on the child by laying much emphasis on the roles played by parents, relatives and the entire society in assisting the child to develop higher level of functioning based on the quality of interactions they share with him. Wilder (2014) corroborates the earlier opinion by his submission that parental involvement is one of the integral parts of major educational reforms and initiatives recognized and embarked upon by school administrators and policy-makers.

When parents prepare meals at home, it should be an avenue for them to explain some facts about food to their children, such facts include nutrients required for good nutrition, role of nutrition in the development of humans, how to prepare a balanced diet for children, teach classes of food, explain how to prepare healthy food, teach about food poisoning and safety, teach eating habits and etiquette, teach chemical reactions in food. Over time, parents could teach children about over eating and indiscriminate eating. Children should be taught about fluid intake, especially water. The usefulness of water in the life of an individual, sources of water and how to purify and save water etc. So much scientific knowledge can be acquired from home by the young child if the adults around understand the role such scientific knowledge plays in the life of the young child.

Other items in the home e.g. clothes are also scientifically based as most clothes are made from raw materials harvested from trees e.g. cotton which is gotten from the cotton pods and processed into thread and later woven. Trees are planted, cultivated and harvested for further processing. Trees have other benefits in the life of human beings; all these could be explained to the young children. Other things about the trees include: being felled as timber, being used as furniture, being used as raft and roof and even houses. Everything in the home of a child could be used to develop scientific knowledge in him. The bulb which supplies electricity, the stove and fire have their own scientific components and children should be exposed to such knowledge early in life in order to develop the tendency for creating their own knowledge. The car or any other means of transportation in the house could be used to teach the young child about transportation. Better still, the adults around the child could ride in a taxi or train with the child so that he acquires a first - hand information about road transportation, while other means of transportation could be explained to the child. Every home uses soap and re-agents, the simple knowledge of how these products work will help the child to

learn about chemical reactions and different components of chemicals.

Parents can also take children out into the garden or a farm to explore nature-the plants, the flowers, different colours etc., Children could be made to pick different types of flowers to compare their sizes and colours, they could be asked to weed the garden or till the flower beds etc., children could be trained to use the watering can, whatever the child is made to do in the garden should be explained to him while this forms a basis for learning science.

Parents could also take a walk with children around their homestead and take a stock of the types of houses in the neighbourhood for comparison. Children could be told stories about some of the ancient buildings in the neighbourhood and also why those buildings are different from their own either from the materials used or the architectural designs or cultural values promotion. All these information should be given to the children while playing with them. They should also be allowed to see the scientific knowledge in all the things they have been shown. While taking such walks, parents could encourage children to note the different types of animals passing by and to count the frequency of the appearance of one or two of such animals. In this way, mathematics concepts could be taught as well as the information on the animals that have been sighted. There are a lot of scientific concepts that could be taught while taking a walk in the neighbourhood. There are may be rivers or a big farm or vegetation in the community of the child which may act as a source of teaching some scientific concepts. Spellings (2005) submits that the child should be encouraged to ask questions when the parents give them information during an outdoor exercise. However sometimes, when children ask questions adults around them may ask them about their own opinion on the issue raised and a collective answer may be arrived at.

4. ENHANCING CHILDREN'S POTENTIALS THROUGH THEIR MULTIPLE INTELLIGENCES

Children learn through all their sense organs i.e. sight, touch, sound, smell and taste. Everything learnt in all the domains of learning falls within one or more of the sense organs, below is a table of what can be achieved and method in the course of laying a solid foundation for science in the child.

Table 1. Enhancing Children's Potentials Through their Multiple Intelligences (*Adapted from NAEYC – Young children 2005, page 50)*

Skill to be developed	Means of reinforcement
Logical/Mathematical skills	Itemizing; numbering, counting anything and everything they come across e.g. stones, sticks, bottle-covers. Adding and subtracting numbers from objects collected previously, dividing and multiplying items etc.
Spatial	Describing the characteristics of their physical environment, describing the nature of animals sighted, drawing pictures of home pets or any object in their environment etc.

Naturalistic	Children could be asked to compose stories about their homes, they can be asked to describe their experience in the hot sun, in the rain, or when it is windy.
Bodily kinaesthetic	There are specific movements of the body that could be encouraged for developing the bones, muscles etc. using outdoor games for improving children's physical growth, interpersonal relationship, emotional balance etc. walking in the garden in groups, dancing to different beats and so on.
Sensory Awareness	Olfactory organs development – smelling flowers, comparing their scents etc. Visual – learn colour from various objects around, cars, flowers, buildings etc. Auditory – listen to the sound made by different animals e.g. birds, dogs, cats etc. Feeling/touch – heat from the sun, candle light, iced block etc., wetness from swimming or rain drenched clothes etc. Taste – sweet taste from cake, salt from food, bitter from herbs etc.

4.1. Objectives of Early Childhood Education in Nigeria

- Effecting smooth transition from home to school;
- Prepare the child for primary level of education;
- Provision of adequate care and supervision for children while their parents are at work;
- Inculcate social norms;
- Inculcate in the child the spirit of inquiry, critical thinking and creativity through the exploration of nature, environment, art, music and playing with toys;
- Developing sense of cooperation and team spirit;
- Learning good habit, especially good health habit;
- Teaching of rudiments of numbers, letters, colours, shapes, forms etc. though play. FRN (2013)

4.2. Objectives of the Primary level of Education in Nigeria

- Inculcating permanent literacy, numeracy and ability to communicate effectively;
- Laying a sound basis for scientific and reflective thinking;
- Giving citizenship education as a basis for effective participation in and contribution to the life of the society;
- Moulding character and developing sound attitude and morals in the child;
- Developing in the child the ability to adapt to his changing environment;
- Giving the child opportunities for developing manipulative skills that will enable him function effectively in the society within the limits of his capabilities;
- Providing the child with basic tools for further educational advancement including preparation for trades and crafts of the locality.

4.3. Interplay Between ECE, Primary Education Objectives and Science

The interplay between the objectives of science and mathematics curriculum and the objectives of early childhood and primary education can be easily observed in the presentation of the learning outcomes of the two crucial levels of education attended by children during their formative years.

From the objectives early childhood and primary education, the foundation for the acquisition of science and mathematics as learning constructs are clearly stated. Learners at both the pre-primary and primary education levels are still in their formative years when scientific knowledge can be encouraged easily. The early years are known to either bring about the educational success or failure of the child in later years, depending on how the adults around the child see and use the period with such child. Thus, in the views of Sulaiman (2012), building on the natural tendency of science in the child is very important as such will lead to the achievement of the identified objectives of Pre-Primary and Primary Science and Mathematics contained in the Nigerian Policy document on education.

4.4. Teaching Science in the Early Childhood and Primary Education Classrooms

Science concepts and contents could be taught or encouraged using various methods of teaching based on the fact that, dynamism and flexibility in teaching strategies' applications enhances goals achievement to a large extent. Activity based methods include project method, team, deductive, inductive, group field trips etc. which could be interchangeably used according to the objective of the lesson, while materials for teaching science and mathematics include all the sense organs and the environment of the learners which the teacher should be well informed about.

Teachers should provide contexts for developing learners' curiosity, creativity, discovery and delight. This can be done by using physical materials around the child's environment, such include, the sun, the moon, the sky, the rain, the human body, animals, food types or plants etc. Planning activities to cater for different levels of ability and development

- Every programmer in school is planned to meet the needs of individual learner
- Developmental stages of Piaget are reviewed with respect to the concepts to be taught at the early childhood and primary education levels.
- Activities should include all the domains of learning i.e. cognitive, affective and psychomotor. This is what is referred to as educating the whole child.
- Inclusive, exceptional, multicultural etc.

4.5. Science Concept development through questioning

A teacher could ask a learner to mention some of the things in his room at home. Another child could be asked to mention the items in the kitchen while another could mention some of the things in the living room. Here, the concept of family science could start developing where the teacher classifies the items mentioned by the learners and their uses.

Everything in the learners' homes as opined by Sulaiman (2012) could actually be used to teach science and mathematics concepts at the early childhood and primary levels of education based on the fact that knowledge should be built on familiar concepts, from known to unknown, from near to distance and from simple to complex. A bulb in the bathroom gives light – a lesson on how light is produced can be given. The gas cooker in the kitchen produces heat which is used to cook the family food as some certain foods cannot be eaten raw. The number of beds counted by the learners could start their numerical skills while teaching about relationships could start by comparing the small and big items in the house. The shapes of the beds, the tables, and mirror in the house can be used for teaching the concept of shapes while colours the rooms or the toilet and bathrooms are painted as well as the lawns or gardens can be used to teach colours. Young learners can be taught classification with their mothers' cutlery sets by being asked to sort the different sizes out.

Every concept can be taught by asking learners questions. Questions at this level should be leading in nature i.e. answer given should generate further inquiry whereby the learners supply the most important parts of the information needed in the concept development e.g. Jide, what did you eat this morning?

I ate yam and egg

The teacher asks again – what class of food is yam?

- What class of food is egg?
- What does yam do in the body?
- What does egg do in the body
- How is yam produced?
- How is egg produced?

The questions above can answer various areas of knowledge, they include:

- Food and Nutrition;
- Agricultural Science;
- Commerce i.e. buying and selling etc.

The teacher can turn the same answers given by Jide to numerical skill development by asking – Jide how many slices of yam did you eat?

I ate three slices.

If you and your and sister ate three slices each, how many slices would you eat? Or if mummy and daddy ate four slices each, how many slices would they eat? or remove the slices you and your sister ate from what mummy and daddy ate, how many slices will remains?

Critical Thinking Activities- curiosity in the child is a natural phenomenon that can be positively tapped by the teacher to help the learner become critical thinkers. Children are fond of asking questions of how, where and why, this indicate their examination of the cause and effect relationship in all life's situations.

- A question often asked by young children – where does a baby come from, here the teacher teaches human reproduction in the appropriate complexity. A chart can be brought as teaching material or if a pregnant woman is available, she can be used.
- Usually a hands-on approach is prescribed for teaching science concepts to the young learners. Teachers should make sure that the science concepts to be taught are understandable in accordance

with the developmental stages of the learners. Principles and concept should be related to everyday life experiences. E.g. breathing, eating, bathing, walking, and things around the child's environment.

- Concepts should be arranged about broad themes e.g. "the story of fish", "The green forest and its inhabitants" The sky and the rain etc.
- Teaching mathematics concepts should be done mostly practically. Fractions can be taught by cutting oranges e.g. 1 whole = the whole orange, ½ by cutting the orange into 2, ¼ by cutting the orange into four pieces etc. volume can be taught by using a cylinder filled with water and another empty cylinder.
- The young learners' class should have a corner for science and mathematics activities. This corner should have materials that can be used as teaching aids such as seeds, nuts, shells, rock types, sand types, leaves, plants, bird nests etc. Measuring devices for mathematics should include rulers; balance scales etc. play money, registers, shapes, puzzles and different items for counting.

4.6. Multimedia/Technology at the early childhood and primary levels

- Instructional materials in the teaching and learning process include video tapes, audio cassettes, music machines etc. the most widely used multimedia is the computer since it has the screen for showing any concept to be taught as well as the sound to explain what is being taught.
- Young children can be taught how to use computers at very early stages of their education.
- All subjects can be taught with the use of the computer. Graphs, charts, angles, parallel lines etc. can be taught using the computer.
- The teacher should know the types of computer that could be used for specific subjects at the early childhood and primary levels. The desk top will be most serviceable at these levels. The Laptops are for grown- ups.

4.7. Challenges of Teaching Science and Mathematics at Early Childhood & Primary Education Levels

The challenges of developing science in children shall be organized under three sub-headings as follow:

Home-related challenges

- The inability of adults around the child to understand signs or gestures made by children when they want to explore their environment. Children like to see things by themselves, touch, feel, smell objects since they learn a lot with their sense organs but most often the adults especially parents fail to recognize when the child is restless and wants to get some things done as learning, rather the adults prevent such actions in children.
- Most of the time adults ignore children when they ask questions and it is a known fact that curiousity is natural with children. In fact all scientists are first of all curious about an issue before developing hypotheses to form the framework for their investigation.
- Some homes are not stimulating enough to trigger inquisitiveness in children.

Plain homes or houses without gadgets or natural scenes may constitute hindrance to children's learning of science.

- Dull adults around the child will definitely affect all the natural tendencies in the child since there will be no one to interact with.
- Strict adults around the child will not give him enough freedom to explore his environment.

Social Factors

- **The Nature of the Curriculum**- Content-driven curriculum has always laid emphasis on facts already accomplished and supporting only cognitive growth. Children confronted with these types of situations have no option but accept whatever has been presented to them. In this case using all sense organs, exploring their environment, manipulating and inquiry become difficult to experience. It should be specifically noted that very young children according to Gelman and Brenneman (2004) are perception-bound and as such may not be able to form abstract concepts which usually accompanies school subjects.
- **Children's Curriculum Designers/Developers-** The designers and developers of children's books in Nigeria are most often not professionals in field of Childhood Education. Most of them do not have the understanding of the nature of children and how they learn; this will constitute a serious challenge for midwifing an age appropriate science learning materials for children.
- **The Nation's Education Policy**- This does not really capture the appropriate nature of the teacher training programmes purported for early childhood education teachers.
- **University Teacher Education Programme**- Teacher training in Nigeria focused more on basic and secondary education while the training of teachers for the formative years of children (0-4) is left majorly in the hands of a very few and expensive private organizations.

School-Related Factors

- **Teaching Materials**- The school environment is the major teaching aid needed for laying any concrete foundation for science teaching. The environment is conducive when it has a good landscaping, playground, gadgets and other age appropriate materials that will stimulate learning in children.
- **Employment Criteria**- Organizations employ staff based on relationships rather than on qualification. This is a case of square pegs in round holes. This definitely will not allow for the achievement of the goals of education.
- **Funding**– Schools are generally underfunded in Nigeria. Children's education in particular according to Sulaiman (2004) has not been adequately provided for.

Teacher Related Factors

- **Teaching Method-** Most of the time the teachers employ ineffective methods to teach science. Such methods include:

rote learning, cramming, and regurgitation of facts which would not allow for any form of expansion of the child's natural potentials for science learning.

- **Teachers' inability to relate topics to real life situations-** In most cases teachers teach science concepts as if such do not have any relationship with real life of humans and as such end up confusing learners.
- **Teacher's Attitude-** A lot of learning takes place when the teacher understands the nature of children. It is not a gain-saying that the attitude of the teacher greatly impacts upon his teaching.

5. CONCLUSION

This study has been able to establish the fact that children have potentials for learning science from the earliest period of their development. They are naturally born with a spark of science and all the adults around them need to do is to build on such spark by creating an enabling environment for such seed to grow adequately. The role of early childhood education, starting from the home cannot be over emphasized anytime matters relating to children are raised.

6. RECOMMENDATIONS

Building on the natural science tendencies in children demands that adults around the child have full understanding of the nature of children, their features and how they learn, therefore the following recommendations are made:

- The parents or caregivers should observe and identify the needs of the child especially when all the sense organs are involved;
- Children should be patiently addressed by the adults when they need clarification on their physical environment;
- The home of children must be conducive enough for science to become a part of their daily activities;
- Home should have stimulating gadgets for children to build on their inquisitive nature;
- Curriculum designers and developers, political leaders and citizens and in fact all stakeholders should make changes in the modern built environment to provide children with positive contact with nature where they can play, live and learn;
- Teachers should make learners understand the nature of science, a hybrid field blending of various social studies of science such as history, sociology and philosophy of science with research from the cognitive science into a rich and useful description of what science is and how it functions. This will facilitate direct experiences that will promote conceptual learning;
- Homes and schools should encourage the use of scientific inquiry and practices in the early childhood education classes;
- Schools should plan in-depth investigations involving children;
- Teachers training programmes should be reviewed to capture the ideal training for Early childhood education teachers;
- Admission requirements into teacher education programme should be based on merit, with English and mathematics

as well as a science subject as requirements.

- Developmentally appropriate programmes should be developed and used in pre-schools to foster science learning;
- Teachers should help learners to connect science learning in school with their real world outside the school environment;
- In-service training for teachers of children should be organized frequently in order to update their knowledge;
- Supervisory outfits of government should monitor the activities of schools both in the private and public schools;
- School and home environment should be created for science learning.

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Innovative Strategy for Measuring Skill Performance of Students of Vocational Agricultural Education for Sustainable Livelihood in Nigeria

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Abstract: Agricultural trades have been introduced for learning in Secondary Schools to complement Agricultural Science. Success or failure in Agricultural Science is being determined by West African Examination Council through essay test, multiple choice tests based on bloom taxonomy on knowledge, comprehension, application and alternative to practical. The observed effect is that most students who offered Agricultural Science, pass with Credit, but couldn't practice farming because of lack of skill, instead they prefer office jobs that are difficult to find. Even those from parents in Agrarian Communities migrate to cities with their West African School certificate to hunt for jobs. Based on this unsatisfactory effect or effort of the Government to diversify the economy through Agriculture, Agricultural trades are now being introduced for learning in Senior Secondary Schools across the country. Performance in these trades cannot be measured fairly through essay cognitive test and alternative to practice. Hence there is need for new assessment instrument. Psycho-productive multiple choice or criterion reference test has been developed and tried and found successful as contained in this paper. It is therefore recommended that WAEC, other examination boards and other stakeholders should adopt Psychomotor or criterion reference test for measuring students in trades in Agriculture in Senior Secondary Schools across the nation to ensure a sustainable livelihood.

Keywords: Psycho-productive, Psychometric properties and Rating Scale

1. INTRODUCTION

Students in secondary schools are usually assessed by National Examination Boards like West African Examination Council (WAEC) through standard Examination which are judged valid. Presently, the relevance of West African School Certificate Examinations (WASCE) for secondary school students in certain vocational and technical subjects are being challenged by individuals or groups who could have used WASC Examination result to recruit some of these secondary school graduates for intermediate jobs in vocational and technical areas like agriculture, home management, business among others. The relevance or suitability of these examinations are vividly attested to by most of these students with credits in WASC examinations in Agriculture, Home Management, Business, metal work, technical drawing among others but could not perform any skill in jobs in these areas when expected to do so with their

background credit as awarded by WAEC. West African Examination Council could have been exonerated from this hidden facts but a clear examination of WAEC strategies of measuring skill in her final examination revealed as follows:

a) Multiple choice test items administered on student in vocational and technical subjects are based on the cognitive domain of knowledge, comprehension and application which is regarded as cognitive reasoning instead of criterion reference test items that should be in Psycho-motor domain of perception, set, guided response, mechanism, complex overt response and adaptation.
b) Basing test of practice on the job on alternative to practical, a good understanding of grammar will make some individuals to understand that alternative to practical means opposite to practical or substitute which implies that practical is absent. As it is practiced in secondary school both by the teacher and WAEC. Alternative to practical appears to consolidate the cognitive domain especially in the area of application where students are asked certain questions about their knowledge in agriculture and certain areas where they can be applied instead of testing how they can do work practically.

This paper assumes that confidence should be built in WASC examination which is verifiable in other subjects like English, Physics, Chemistry, and Biology among others. What the paper is saying is that there is high reliability in WASC results in these areas because individuals with credit or above in these subjects could be ascertained as excelling in the subject.

The researcher observation has also been confirmed by other examining bodies like Joint Admission and Matriculation Board (JAMB) i.e. current research between performance in JAMB and WASC results with some of the subjects mention above in English, Physics among others show a high correlation (rho) of 0.81 i.e. This cannot be true if credit or above in Agricultural Science, Home Management, Business Management, Industrial Technical subjects when it comes to performance of the job. The correlation between performance on the job especially Agric Science and credit and above in Agric Science and practice on the job has a low correlation (rho) of 0.21 (Elom 2016). This shows that alternative to practical did not measure practical in Agric Science in West African School Certificate Examination, therefore, there is need to design other strategies that should be alternative to practical which means a strategy that will measure practical.

2. Rating Scale and its Limitations

Many scholars may wonder why the examining bodies have not been using other instrument like rating scale or observation to measure practical. Rating scale according to Ali (2016) is an instrument for measuring personality traits such as feelings, attitudes and preferences, among others. Okpala, Onocha and Oyedeji (1993) stated that rating scale is an instrument for measuring expressed behaviors in order to determine how good or bad such expressed behaviors are. It is a useful instrument for judging

attributes to be appraised in a person or group of persons.

The researcher like to support the non-use of rating scale by WAEC and other agencies for measuring practical in secondary school subjects like agricultural science and others because research efforts by most of the researchers and colleagues such as Elom (2016) and Okpala, Onocha and Oyedeji (1993) among others have revealed some limitations of rating scale that could render obtained result serviceably invalid as follows: (1) rating scale as reported by Iupui.ed (2017) has the following limitations ; (a) Limited reliability. (b)May be substantial variations among informants. (c) Do not assess sources of behaviour problems (d) Unqualified users may use and interpret these scales, and (f) Not suitable for sophisticated treatment planning.

Rating scale as observed by Okpara, Onocha and Onyedeji (1993) has the following limtations; (a) Hallow effects (b) Sympathetic rating and (c) Highly expensive for parents and examining bodies to conduct. Equally, Elom (2016) found out that rating scale has; (a) block loading effect. It exaggerates scores when a four point rating scale is based on 100%. Each block therefore has 25% for example, if a student nearly present himself/herself for practical with little or low performance that student obtains 25% which is an exaggeration based on the activity acerbated, the other student with slight performance will move to 50%. Such scores are very invalid.

The other faults associated with rating scale by the author especially in Agricultural Science is that the production process of crops like maize, rice or animals from breeding to maturity cannot be examine practically through rating scale with a time limit of three hours for practical examination, hence it has to adopt piece meal approach which may be time consuming, too expensive and boredom to the examiners and examinees. Probably these limitations scared away WAEC and other agencies from using rating scale for subject like agriculture, home management among others to examine student since WAEC and other agencies have been very proud of the validity and reliability of their measuring instrument such as norm reference test or cognitive driven objective test.

2.1. Introduction of New Trades in Secondary School

In 2014, the West African Examination Council introduced 39 additional subjects to the curriculum of secondary schools to prepare the students for challenges in order to meet up with the modern-day realities. Eguridu (2014) also stated that the introduction of additional 39 subjects will prepare the students for skill acquisition and entrepreneurial studies. The author further stated that the review was done by the Nigerian Educational Research and Development Council (NERDC) which is the body responsible for the review of primary and secondary school curriculum in the country. The NERDC introduced certain trades in these vocational areas into the school for students to learn for the following reasons.

- The nation is expanding in population while the needs of the youth are increasing in the area of occupation, work and maintenance, while adults in the field are growing old in meeting up with the needs, because of the use of primitive technology. The use of this technology could only produce little for the farmers family and very little for the teaming population. Youths seems not to be interested in imbibing of the primitive technology of their parents because of their education. The education acquired by them are knowledge based and theoretical in nature but could not meet their occupational and production needs, therefore, the NERDC has introduced change into learning in order to equip youths with productive skills for employment.
- Also, the nation has not been able to produce enough so as to export to other country that need them because of inadequate human power in the production cite, had it been that the majority of these youths who are in schools are empowered with technological skills and facilities to produce, the nation's needs from her soil and environment, therefore NERDC has started these revolution through the introduction of trades and teaching of these trades in the schools.
- Many other African countries are looking up to this nation to help meet some of their needs that can be produced within the tropics and for the people in the tropics. The nation must rise to these challenges and hence, the challenge should begin with the trades in secondary school, so that by the time these youths reached adulthood production technology could have been part of their way of life which they could easily transfer to those coming behind.

The revolution or the challenges so to say could not be accomplished by NERDC alone without active participation of other agency such as WAEC. West African Examination Council is now being challenged to look further in words for innovative strategies that could be utilized by teachers to measure performance skills through technology like computer based test examination (CBTE), this innovative strategy is invoke for measuring skills in many developed countries. The major problems we have in this country at the moment are;

a) How to develop these tests in various occupational areas?
b) How to make others learn how to develop it.

2.2. Psycho-Motor Multiple Choice Test

Development of CBTE in skill areas involved what is known as psycho productive multiple choice test which is known as criterion reference test. edglossary.org (2014) stated that criterion referenced test and assessments are designed to measure student performance against a fixed set of predetermined criteria or learning standards. In any skill – oriented occupation, learners are expected to acquire psycho productive skills during training for effective performance on the job. To ascertain the level of acquisition of skills,

learners can be accessed through certain recognized assessment procedures. One of such assessment procedures in skill acquisition is the psycho-productive multiple choice test.

Psycho-productive multiple choice test in the view of William, Ombugus, Umara (2016) is an instrument for determining the extent to which students can demonstrate their practical competence in Agriculture using production process skills of psycho-multiple choice test item. According to the authors, psycho-productive multiple choice test is a device with process skills to be responded to by the learners. Psycho-productive multiple choice test was introduced by Simpson in (1972). Simpson (1972) utilized psycho-productive multiple choice test to measure the performance of students in home economics based on the seven levels of psycho-motor taxonomy. These levels are perception, set, guided response, mechanism, complex overt response, adaptation and organization.

In the opinion of Olaitan, Nwachukwu, Igbo, Onyemachi and Ekong (1999), some vital steps that should be followed before writing psycho-motor multiple choice test items are: be followed before writing psycho-motor multiple choice test items are; the identification of occupational areas within a specific skill, establishment of a table of specification, construction of test items; about two or more items on each objective listed. assemble the test items, write clear and concise direction for each type of questions, construct key, validation of the test items (have another teachers to criticize the test), conduct a pilot study, and make versions based on result of pilot study, that is, carry out standardization.

The authors stated further that psycho production multiple choice test can be constructed in form of multiple choice test based on Simpson's (1972) taxonomy of the psychomotor domain, which includes physical movement, coordination and use of the motor –skill. Development of these skills requires practice and is measured in term of speed, precision, distance, procedure or technique in execution. This psychomotor skills range from manual tasks, such as digging a ditch or washing a car, to more complex task such as operating a complex piece of machinery or dancing (Clark 2015) This psycho motor domain according to Simpson are in seven levels as follows: perception, set, guided response mechanism, complex overt response, adaptation and origination.

Perception: This is the ability to use sensory cues to guide motor activity. This ranges from sensory stimulation through cue selection to translation. In test development, illustrative verbs in perception include choose, describe, detect, differentiate, distinguish, identify, isolate, relate, separate and recognize.

Example: One of the following facilities is not very important in sitting a poultry house.

- Electricity
- Access road
- Land
- River *

Set: This is the readiness to act; it includes mental, physical and emotional sets. These three sets are disposition that predetermine a

person's response to different situations sometimes called mindsets. It requires the learners to demonstrate awareness (mindset) or knowledge of the behaviour needed to carry out the skill. The illustrative verbs associated with set include: begins, display, explain, move, proceed, states react, respond, demonstrate, show and volunteer.

Example: The particular time a doe is ready to accept a buck for mating is called

- Ovulation period
- Parturition period
- Heat period *
- Lactation period

Guided response: This is the early stage of learning complex skills. It involves imitation, trial and error. At this level of psychomotor domain, adequacy of performance is achieved by constant practice. Common illustrative verbs used in developing a test in guided response include: copy, trace, follow, react, respond, assemble, build, calibrate, construct, dismantle, display, dissect, fasten, fix, grind, heat, manipulate, measure, mend, mix and organize.

Example: The incubator hatches better when the eggs are in one of the following positions.

- Large part facing operator
- Small part facing operator
- Large part standing downward
- Large part standing upward *

Mechanism: This is the intermediate stage in learning a complex skill. At this stage, learned responses have become habitual and the movements can be performed with some confidence and proficiency. In test development, the following illustrative verbs are used in mechanism: mixes, organize sketches, assemble, build, calibrate, construct, dismantle, display, dissect, fasten, grind, heat, manipulate, measure and mend.

Example: Preparation to receive day old chicks for rearing will include the following steps except

- Wash brooder house
- Provide heat source
- Prepare foot dip
- Formulate grower ration *

Complex overt response: This is the stage of skilled performance of motor acts that involves complex movement patterns. It expresses 'doing' in a continuous movement pattern of increasing complexity. Proficiency is indicated by a quick, accurate and highly coordinated performance without hesitation. Illustrative verbs used in developing tests at this stage include: assemble, build, calibrate, construct, display, dismantle; dissect, fasten, fix, grind, heat, manipulate, measure, mend, mix, organize and sketch.

Example: The production of a calf follows one of the following orders below

- Mating – fertilizing – gestating – calving *
- Fertilizing – mating – calving – gestating
- Mating – gestating – fertilizing – calving
- Calving – gestating – fertilizer – mating

Adaption: This is the ability of the individual to modify movement patterns to fit special requirement or a new situation. At

this level, skills are well developed for action.

- Common illustrative verbs for developing tests at this level include adapt, alter change, rearrange, revise, organized and vary.

Example: A battery cage can be made of one of the following instead of metals

- Iron sheets
- Plastic and wire
- Wood
- Wood and wire*

Organization: This is the ability to develop original skills that replaces the skill as initially learned. It involved creating new movement patterns to fit in particular situations for specific problems. Learning outcomes emphasize creativity based on highly developed skills. Illustrative verbs used in developing tests at this level include: arrange, combine, compose, construct, create, design and originate.

In the view of Fatusin (1996), the psycho-productive multiple choice test (usually called criterion reference assessment) has the following merits:

- It can examine all activities carried out in an occupation from growing to processing.
- It measures those activities that cannot be rated by rating scale in one shut examination such as land clearing to harvesting in a single practical examination of about 3 hours without interruptions due to seasons during the growth cycle of the crop.
- It follows finite taxonomy like perception, set, guided response, mechanism, complex overt response, adaptation and origination.
- The items can be stored and re-used for subsequent examinations.
- It can measure students' acquisition of process skills in large classes in agricultural occupations conveniently without stress.

3. Psychometric properties for developing Psycho-Motor Multiple Choice Test Items

A good psycho-motor multiple choice test items have to be guided by the psychometric properties: such as: Table of Specification, Item difficulty Index, Item discrimination Index and Item distracter Index.

3.1. Table of Specification

Table of specification, sometimes referred to as test blue print, is a table that helps teachers align objectives, instruction and assessment .Table of specifications as stated by Kansas University (2017) is a two-way chart which describes the topics to be covered by a test and the number of items or points which will be associated with each topic. Akem and Agbe in Alade and Omoruyi(2014) viewed table of specification as a guide to assist a teacher or examiner in the evaluation system. The table shows the total number of items to be allocated to each instructional objectives, it also suggest what might be covered under each item, take decision on what types of items to be used. In fact the blue-print stage" is the last and crucial stage in an evaluation plan since it enables the teacher to combine properly the objective and the content areas, bearing in mind the importance and the

weight attached to each areas. Okpala, Onocha and Oyedeji in Alade and Omoruji (2014) noted that table of specification enables the test developers to complete the cells in the table and decide the percentage of the total number of items that will go to each of the cells. According to Quijano (2014) steps in preparing table of specification are as follows;

a) List down the topics covered for inclusion in the test
b) Determine the objectives to be assessed by the test
c) Specify the number of days/hours spent for teaching a particular topic
d) Determine percentage allocation of the test items for each of the topics covered
e) Determine the number of the items for each topic
f) Distribute the numbers to the objectives

Equally Gareis and Grant in Okeme (2011) stated the steps that will guide the teacher in developing a table of specification to include;

- Develop learning objectives based on the taxonomy of educational objectives.
- Identify instructional activities that target the learning objectives
- Implement the instructional activities
- Reflect on instructional activities and identify relevant learning objectives that will be assessed based on the instructional experience.
- Determine relative importance and weightings of each objective.
- Generate test items based on the designed learning objectives and weightings.

Simpson (1972) indicated relative weight to be attached to the test items so as to guide the test developer;

- Perception (5-10%)
- Set (5-10%)
- Guided response (20-30%)
- Mechanism (20-30%)
- Complex overt response (20-25%)
- Adaptation (5-10%)
- Originality (5-10%)

The study therefore adopted the above weightings of Simpson's taxonomy to develop 46 test items on animal husbandry for Senior Secondary School Students, to be considered by West African Examination Council in administrating their multiple-choice test questions in Animal Husbandry. Based on the weighting indicated above, the researcher came up with the following distribution of the items according to the table of specification as follow:

- Perception 4 items
- Set 4 items
- Guided response 12 items
- Mechanism 12 items
- Complex overt response 10 items
- Adaptation 4 item, making a total of 46 items (Appendix A)

3.2. Item Analysis

The item analysis is an important phase in the development of an exam program. In this phase statistical methods are used to identify any test items that are not working well. If an item is too easy, too difficult, failing to show a difference between skilled and unskilled examinees, or even scored incorrectly, an item analysis will reveal it. The two most common statistics reported in

an item analysis are the item difficulty, which is a measure of the proportion of examinees who responded to an item correctly, and the item discrimination, which is a measure of how well the item discriminates between examinees who are knowledgeable in the content area and those who are not. An additional analysis that is often reported is the distracter analysis. The distracter analysis provides a measure of how well each of the incorrect options contributes to the quality of a multiple choice item. Once the item analysis information is available, an item review is often conducted. (Professional Testing Inc. 2015)

Item Difficulty

The item difficulty index is one of the most useful, and most frequently reported, item analysis statistics. It is a measure of the proportion of examinees who answered the item correctly; for this reason it is frequently called the p-value. As the proportion of examinees who got the item right, the p-value might more properly be called the item easiness index, rather than the item difficulty. It can range between 0.0 and 1.0, with a higher value indicating that a greater proportion of examinees responded to the item correctly, and it was thus an easier item.(Professional Testing Inc. 2015) According to wood in Matlock-Hetzel (1997), Item difficulty is simply the percentage of students taking the test who answered the item correctly. The larger the percentage getting an item right, the easier the item. The higher the difficulty index, the easier the item is understood to be To compute the item difficulty, divide the number of people answering the item correctly by the total number of people answering item. The proportion for the item is usually denoted as p and is called item difficulty (Crocker & Algina, in Matlock-Hetzel 1997). An item answered correctly by 85% of the examinees would have an item difficulty, or p value, of .85, whereas an item answered correctly by 50% of the examinees would have a lower item difficulty, or p value, of .50.. The authors concluded that criterion group usually consists of the upper and lower achievers in the test.

It was recommended by experts that the average level of the difficulty of a test for a four options multiple choice test should be between 60% and 80%. An average difficulty within this range can be obtained when the difficulty individual items fall outside of this range.

3.3. Item Discrimination

Item discrimination is an index that states how well the item serves to discriminate between students with higher and lower level of knowledge. The item discrimination index is a measure of how well an item is able to distinguish between examinees who are knowledgeable and those who are not, or between masters and non-masters. There are actually several ways to compute an item discrimination, but one of the most common is the point-biserial correlation. This statistic looks at the relationship between an examinee's performance on the given item (correct or incorrect) and the examinee's score on the overall test. For an item that is highly discriminating, in general the

examinees who responded to the item correctly also did well on the test, while in general the examinees who responded to the item incorrectly also tended to do poorly on the overall test.(Professional Testing Inc. 2015).

The possible range of the discrimination index is -1.0 to 1.0; however, if an item has a discrimination below 0.0, it suggests a problem. When an item is discriminating negatively, overall the most knowledgeable examinees are getting the item wrong and the least knowledgeable examinees are getting the item right. A negative discrimination index may indicate that the item is measuring something other than what the rest of the test is measuring. More often, it is a sign that the item has been mis-keyed. (Professional Testing Inc. 2015)

Items discrimination is greatly influenced by item difficulty. In order to determine the discrimination index, you must use guideline. Shadish and William (2002) said the guideline include;

- 0.30 to 0.45 – Moderate positive discrimination
- 0.20 to 0.29 – Borderline positive discrimination
- To 0.19 – Low to zero positive discrimination and below – Zero to negative discrimination.

The literature reviewed above on Simpson's (1972) taxonomy of psychomotor domain enable the researcher to develop psycho-productive multiple choice test items in animal husbandry using similar illustrative verbs for the assessment of students' performance in the occupation. It is of the opinion of the researcher to advocate that to WAEC, of which if adopted will help to give an adequate assessment to student, and to determine who has actually acquired the skills required in the occupation, hence this study.

4. CONCLUSION AND RECOMMENDATION

New trades have been introduced for learning in secondary schools, to equip students with skills for work, but there is paucity of skill measuring instrument for determining skill performance of students instead of using alternative to practices.

This paper has reported the suitability of , or adequacy of psychomotor productive multiple choice test or criterion reference test for measuring skill performance in Agriculture, to ascertain the quality of skills possessed by students for work after graduation, if this Psycho-productive tests are developed for various trades or occupation in Agriculture, such as Fishery, Animal husbandry, Crop Production,, Processing among others, it will help teachers to teach the students towards mastering of skills for success in West African School Certificate Examination, thereby indirectly preparing students for work i.e not to look for success in examination, It is therefore recommended that West African Examination Council should:

- Use Psycho productive or psychomotor test items to assess students' performance in Agricultural trades, such as Fishing and Animal husbandry in Senior Secondary Schools.

- Organize training workshops for teachers in the development and validation of Psycho-productive test for assessing students' skill performance in the different trades they teach in Senior Secondary School.
- Help to mobilize stakeholders in Senior Secondary education for students such as Federal and State Government, Religious organizations, Proprietors of Private Schools, Community Leaders, Parents Teachers Association, among others, to accept this new initiative and commit themselves maturely into the success of adoption of Psychomotor production or criterion reference measurements for measuring skill performance of students in Agricultural trades for success in WAEC and for work after graduation.

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Comparative Evaluation Of Dry Brewer Grain, Palm Kernel Cake, And Wheat Offal With Conventional Additives, Sucrose And Maize, In The Ensiling Process Using Water Hyacinth As Forage

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Abstract: Silage additives are natural or industrial products that are often added to forages to improve or alter fermentation, reduce fermentation losses, promote the growth of lactic acid bacteria and improve the stability of the silage. Concern in added cost as a result of conventional additives in the ensiling process has necessitated a need for alternative cheap sources. .Hence, three relatively cheap and readily available agro-industrial additives, wheat offal (WO), brewer dry grain (BDG) and palm kernel cake (PKC) were tested with two conventional additives, sucrose (S) and cracked maize grains (CM), for their ability to properly ferment and impart high nutritional qualities to ensiled water hyacinth (WH). Thus WH, a prolific plant with a high biomass yield was ensiled with each of the named additive in turn. From these, the following treatment silages were prepared: WHS, WHCM, WHWO, WHBDG and WHPKC. After 42 days ensiling period, quality and chemical composition were assessed. Results indicated positive physical attributes in colour, texture and odour in all experimental silages. Crude protein for WHBDG (23.25 %) and WHPKC (20.10 %) were higher ($p < 0.05$) than those of WHS, WHCM and WHWO. For the fibre detergent fractions, the NDF, ADF and ADL followed similar trend. The dry matter (%) of the silages ranged from 11.34 (WHS) to 22.39 (WHBDG). The pH and temperature (˚C) were not significantly different ($p > 0.05$) ranging respectively from 2.8 to 3.45 and 27.5 to 28.5. Findings indicated that all tested additives compared favourably with the controls; WO performed best; BDG and PKC performed no less than the conventional S and CM additives. This observation is suggestive that WO, BDG and PKC can replace the conventional additives, sucrose and cracked maize in an ensiling process.

Keywords: Non-conventional agro-industrial additives, possible usage, for silage fermentation.

1. INTRODUCTION

In the tropics and developing countries, a major problem of the livestock industry is the dry season feeding of livestock because of scarce forage resources which are often highly lignified with attendant low digestibility. It is quite necessary to devise means by which livestock will be adequately fed all year round. Recent efforts have been towards supplementation of available grasses and other forages especially in the dry season with crop residues, agro-industrial by-products, legumes and

multipurpose browse plants (Jamala et al., 2013; Abegunde et al., 2017).

In the wet season within the agro-climatic region, there exists relative abundance in forage resources even to the extent of having a surplus. It comes to reason therefore to adopt a feed conservation method against the off-season period (dry season), one of which is silage making. As rightly stated, silage making is a tool for farmers for the preservation of surplus forage in the wet season to ensure all year-round availability (Ibhaze et al, 2015).

Many types of silage will ferment better and attain better silage stability when certain additions/additives are added to the silage mass. Such additives have been documented to function in the following ways: add dry matter to reduce moisture, alter the rate, amount and kind of acid production, acidify the silage, inhibit bacteria and mould growth, culture silage to stimulate acid production and increase nutrient content of the silage (Wasaya, 2008). Conventional silage additives include, molasses, cracked maize grains, honey, sugar beet, bagasse, etc. of which each is added at 1-10 % inclusion level. However, in recent time, other researchers have experimented with novel additives like wheat offals, brewer dry grain, poultry litters, citrus pulp, cassava peels, and breadfruit among others (Akinwande, 2011; Falola et al., 2013; Abegunde et al., 2017). The first author had noted the suitability of WO, BDG and PKC as replacement additives. However, there is need for further validation by comparing with conventional additives. The choice of an additive is dependent on availability, cost and suitability.

On this premise, this study was conceived to carry out a comparative evaluation between two conventional additives, sucrose or cracked maize and three unconventional or novel additives, WO, BDG and PKC in the fermentation of water hyacinth (Eichhornia crassipes, Mart. Solms-Laubach) itself being a recently much researched plant for its invasiveness, prolificacy and high biomass yield. The proposed additives (WO, BDG, PKC) are agro-industrial additives, they are available throughout the year, relatively cheap and powdery at mixing time, making them suitable for effluent reduction and nutrient losses. Specifically, the study sought to characterized each silage produced from the combination of WH with an additive in its: proximate composition, fibre detergent fractions, dry matter composition, fermentation pH and temperature attained by the silage mass towards assessing the nutritional implications.

2. MATERIALS AND METHODS

2.1. Experimental site

This experiment was conducted in the sheep and goat house of the Teaching and Research Farm of the Department of Agricultural Science, Tai Solarin University of Education, Ijagun, Ijebu-Ode located at 6˚47 N and 3˚ 58 E, elevation 200-400 m above sea level and 1200 mm annual rainfall (Department of Geography, Ogun State College of Education, 1990).

2.2. Water hyacinth sourcing and silage production

Water hyacinth procurement took place at an inland fresh-water river at Itoikin, along Ijebu-Ode-Ikorodu road, Lagos State, Nigeria. Samples were collected in batches and brought down to Ijebu-Ode into a shady location. Fresh plant shoots were separated from the roots. The shoots were lacerated and chopped into 3-5 cm pieces by kitchen knives and then wilted on polythene sheets under shade for 24 h. Following the procedure of Akinwande (2011), the WH pieces were then weighed on a kitchen scale and mixed in turn with each of the additives at the following inclusion levels (W/W) to obtain the silage types:

WHS = 95 % WH + 5 % S

WHCM = 95 % WH + 5 % CM

WHWO = 80 % WH + 20 % WO

WHBDG = 80 % WH + 20 % BDG

WHPKC = 80 % WH + 20 % PKC.

Each of the silage mixture was now packed into a large polythene bag, thoroughly compacted while filling in so as to displace pockets of air. After filling, each bag was tied with twine before placing inside a 65 litre capacity basin for reinforcement and stabilization. About 25 kg sandbag was placed on top of each container to weigh down the content to promote anaerobic conditions. Each silage type was replicated thrice and fermentation was for 42 days (Babayemi, 2009).

2.3. Physical and chemical evaluation of silage

After 42 days, the fermentation of each of the silages was terminated and silo opened for quality assessment using the procedure of Babayemi (2009). Quality characteristics looked at were colour, texture, odour, temperature and pH. For colour assessment, a rotary colour chart was used for cross-matching; texture was by gripping a small sample in hand between the fingers to determine whether firm or watery. The odour test was as to whether silage was pleasant / fruity or odoriferous /unpleasant. For temperature of silage, a thermometer was dipped into the midst of silage immediately after opening and left in place for about 5 min before taking a reading. The pH of silage was taken using a glass electrode pH meter.

2.4. Chemical Analysis

Samples were taken from different depths in a silo, mixed and dried in an oven, first at 65˚C to inactivate the enzymes and later at 80˚C to constant weight for dry matter determination. The samples were later milled and stored in sample bottles. Later, crude protein, crude fibre, ether extract and ash were determined in the laboratory by the standard procedure of AOAC (2005). Also, another set of samples were analysed for their fibre detergent fractions according to the methods of Van Soest et al. (1991). Every analysis was done in triplicate.

Other nutritive value parameters were done by calculations following the procedure of Horrocks and Vallentine, 1999, cited by Baba et al. (2018).

DDM = 88.9 – (0.779 x ADF % dry matter basis)

DMI = (120/NDF % dry matter basis)

RFV = (DDM% x DMI% x 0.775)

Where, DDM = digestible dry matter, DMI = dry matter intake and RFV = relative feed value.

2.5. Statistical analysis

All generated data were analysed using analysis of variance procedure of SAS (2003). Significant treatment means were compared and separated by the Duncan multiple range F-test (1955). Experimental model for the analysis was:

$½j = \mu + \alpha i + \varepsilon ij$

Where, ½j = the studied parameters or individual observations, μ = general mean of the population, αi = effect of additive type on silage and εij = residual error.

3. RESULTS AND DISCUSSIONS

The colour, texture and odour characteristics of water hyacinth silages using different additives are presented in Table 1. The colour varied from brownish or dark green to yellowish green suggesting good fermentation of silage.

Table 1: Colour, texture and odour characteristics of water hyacinth silages treated with different additives

Treatment	Colour	Texture	Odour
WHS	Brown Green	Firm	Pleasant
WHCM	Dark Green	Firm	Pleasant
WHWO	Yellow Green	Firm	Pleasant
WHBDG	Dark Green	Firm	Pleasant
WHPKC	Dark Green	Firm	Pleasant

(WHS= Water hyacinth sucrose treated silage; WHCM= Water hyacinth cracked maize treated silage; WHWO= Water hyacinth wheat offal treated silage; WHBDG= Water hyacinth brewer dry grain treated silage; WHPKC = Water hyacinth palm kernel cake treated silage).

A well fermented silage is expected to exhibit a colour similarity to the actual forage ensiled (t'Mannetje, 1999, cited by Babayemi 2009). The water hyacinth in its natural state is known to have a very intense green colouration which usually turns yellowish-green following a 24 h wilting exercise. The texture for the silages was firm, also expected of a good silage (Kung and Shaver, 2002, cited by Babayemi 2009). Odour-wise, all the silages came out with pleasant odour buttressing the fact that all additives might have contributed positively to making good silages. This agrees with the findings of Abegunde et al. (2017) who fermented water hyacinth with bread fruit.

Figure 1 depicts the temperature developed in the silage mass. Temperature ranged from 27.5 to 28.0˚C. This was consistent with value (26.0-27.5˚C) obtained by Babayemi (2009) in a Guinea grass silage study. According to the author, this indicated a well preserved silage as temperature is one of the factors that could affect silage colour. The less the temperature, the less the likelihood of colour change in a silage. It is

posited further that a higher temperature than 30˚C could result in caramelisation of sugars in a forage. In overheated silage, the colour change could give a black brown if the temperature exceeds 55˚C, Protein digestibility may be reduced out rightly (McDonald et al., 1981).

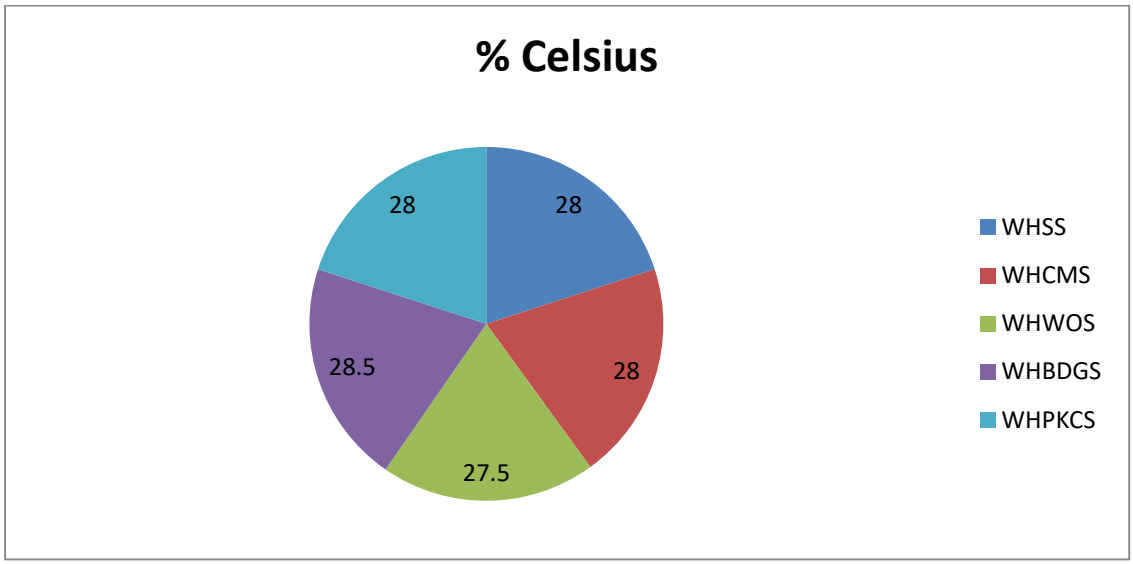

Figure 1: The temperature of ensiled water hyacinth

(WHSS= Water hyacinth sucrose silage; WHCMS= Water hyacinth cracked maize silage; WHWOS= Water hyacinth wheat offal silage; WHBDGS= Water hyacinth brewer dry grain silage; WHPKCS; Water hyacinth palm kernel cake silage).

The pH values of the silages are shown in figure 2. These ranged from 2.8 to 3.45 which may be regarded as good silages as Meneses (2007) had classified a good silage to be below 5.5 pH and McDonald et al. (1981) had classified silage categories as lactate silages (pH 3.7 to 4.2), acetate silages (pH 4.2 to 5.0) and butyrate silages (pH 5.0 to 6.0) in a descending order of quality. By this categorisation, all five silages in this study fell within the best (i.e. lactate silages). The silage stability obtained in this study was better than that obtained by Abegunde et al. (2017) who recorded a pH range of 4.45 to 5.40. Difference in the two observations could be explained to be the result of using different additives and to a lesser extent, management procedure.

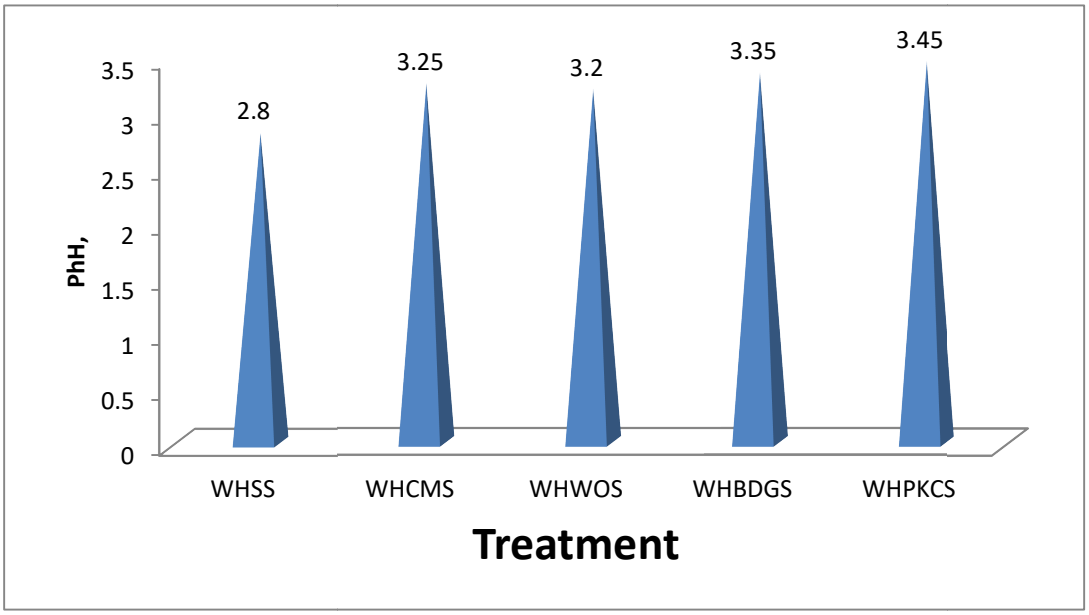

Figure 2: pH of water hyacinth silages treated with different additives

(WHS = Water hyacinth sucrose treated silage; WHCM = Water hyacinth cracked maize treated silage; WHWO= Water hyacinth wheat offal treated silage; WHBDG = Water hyacinth brewer dry grain treated silage; WHPKC = Water hyacinth palm kernel cake treated silage).

The dry matter (DM) levels of the silages are presented in Figure 3. The DM (%) ranged significantly ($p<0.05$), from 11.34 (WHS, sucrose treated silage) to 22.39 (WHBDGS silage). The observed difference in DM was expected indicating properties of each individual additive. For example, WHS silage having the lowest dry matter, behaved to type as the additive sucrose could not have made any appreciable contribution to DM. In agreement, Akinwande (2011) had obtained an equivalent DM of 9.84 % for a fresh unfermented sample of water hyacinth. The DM values of WHCM, WHWO, WHBDG and WHPKC silages obtained in the present study were within the range (14.21 to 28.44 %) obtained by Abegunde (2017). In light of the above, the WHS silage would appear inferior to others for nutritional sustenance. Caution should therefore be observed when using sucrose treatment in silage because of low dry matter.

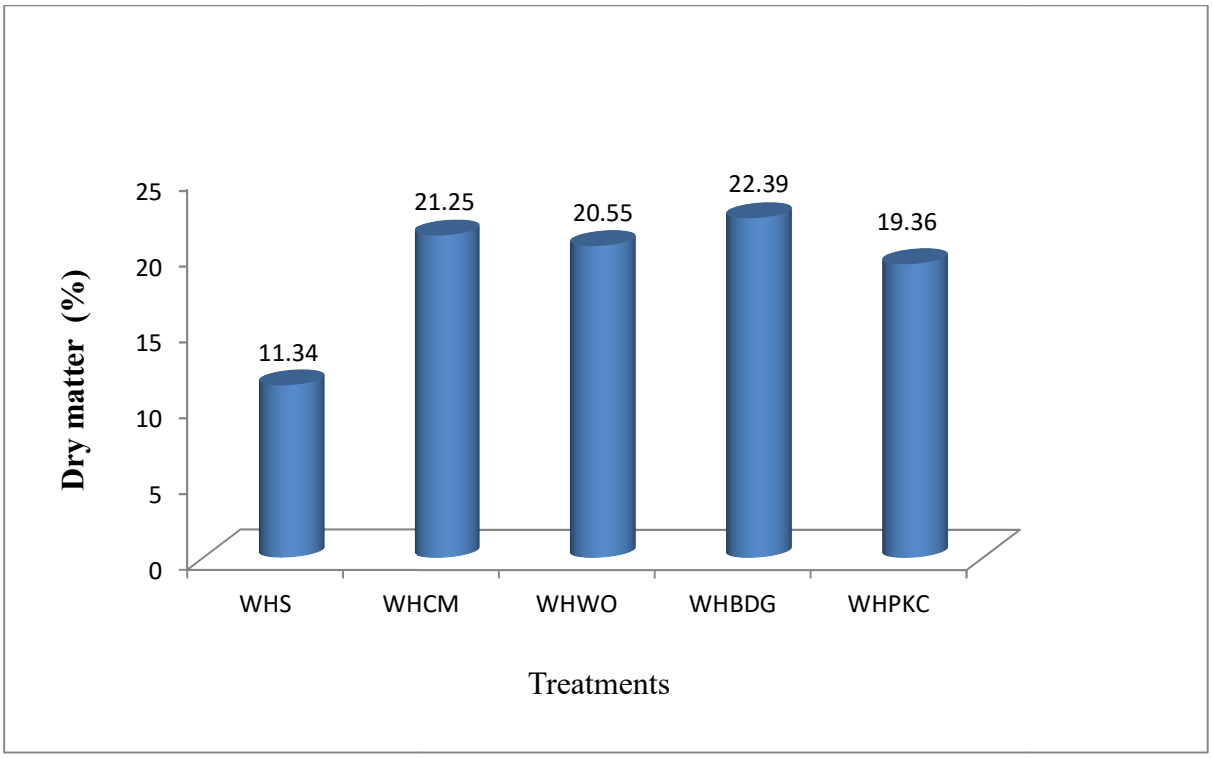

Figure 3: Dry matter (%) of water hyacinth silages treated with different additives

(WHS = Water hyacinth sucrose treated silage; WHCM = Water hyacinth cracked maize treated silage; WHWO= Water hyacinth wheat offal treated silage; WHBDG = Water hyacinth brewer dry grain treated silage; WHPKC = Water hyacinth palm kernel cake treated silage).

The table given in Table 2 depicts the proximate fractions of ensiled water hyacinth treated differently with additives sucrose, cracked maize, wheat offal, brewer dry grain and palm kernel cake.

Table 2: The proximate composition of water hyacinth silages treated with different additives (%)

Treat	CP	CF	EE	Ash
WHS	18.55c	10.52e	6.15a	10.12c
WHCM	13.27e	15.01a	2.11d	10.10c
WHWO	15.01d	13.40d	2.01e	12.27b
WHBDG	23.25a	14.01c	5.01b	14.01a
WHPKC	20.10b	23.34a	2.86c	10.14c
SEM	0.31	0.30	0.05	0.01

(WHS = Water hyacinth sucrose treated silage; WHCM = Water hyacinth cracked maize treated silage; WHWO = Water hyacinth wheat offal treated silage; WHBDG = Water hyacinth brewer dry grain treated silage; WHPKC = Water hyacinth palm kernel cake treated silage).

There were significant differences ($p < 0.05$) in crude protein, crude fibre, ether extract and ash. Crude protein level ranged from 13.27 (WHCM silage) to 23.25% (WHBDG silage) higher than values previously obtained by Akinwande (2011) and Abegunde (2017). The variation could be explained on the basis of additive types used. The range of protein reported in this study was above the 7.7% recommended for small ruminants by NRC (1981) and 10-12% recommended by ARC (1985). It thus appears that the silages were good enough for small ruminants without the problem of protein supplementation. Crude protein ranking would be:

WHBDG > WHPKC > WHS > WHWO > WHCM

The crude fibre range obtained (10.5 to 23.3 %) was also in agreement with both Akinwande (2011), (12.4 to 21.4 %) and Abegunde (2017).

The fibre detergent fractions of the silages using different additives are presented in Table 3. The neutral detergent fibre (NDF), acid detergent fibre (ADF) and acid detergent lignin (ADL) were significant and different ($p < 0.05$). The NDF and ADF ranged from 58.77 to 68.01 % and 20.31 to 40.82 % respectively. Forages display wide differences in their fibre content which is a good estimate of how digestible the forage is and how much of it an animal will eat.

Table 3: The fibre detergent composition of water hyacinth silages treated with different additives (%)

Treatment	NDF	ADF	ADL
WHS	63.24b	20.31e	9.84b
WHCM	60.36e	21.41c	7.15d
WHWO	58.77d	20.80d	5.00e
WHBDG	69.31a	24.00b	10.81c
WHPKC	68.01a	40.82a	18.20a
SEM	0.61	0.32	0.25

(WHS = Water hyacinth sucrose treated silage; WHCM = Water hyacinth cracked maize treated silage; WHWO = Water hyacinth wheat offal treated silage; WHBDG = Water hyacinth brewer dry grain treated silage; WHPKC = Water hyacinth palm kernel cake treated silage).

While NDF controls voluntary feed intake (VFI) of animals, the ADF controls digestibility. Both NDF and ADF maintain an inverse relationship with VFI and digestibility respectively. Judging by the high levels of NDF and ADF in all the silages in this study, it is obvious that they are best suited for ruminants. From the ADF values, digestibility in PKC and BDG treated silages would be compromised whereas WO treated silage was better than the conventional additive, cracked maize. Similar trend was presented in the case of NDF values with regards to VFI. With regards to intake and digestibility, superiority order could be ranked thus:

WHS > WHWOS > WHCMS > WHBDG > WHPKC

Table 4 presents additive type effect on dry matter intake, digestible dry matter and relative feed value of the silages. All the three parameters were significantly different ($p < 0.05$). The RFV of both wheat offal treated and cracked maize treated silages were greater than others. The DMI followed same trend.

Table 4: DMI, DDM and RFV characteristics of water hyacinth silages treated with different additives

Treat	DMI	DDM	RFV
WHS	1.90c	73.08a	107.61c
WHCM	1.99b	72.22b	111.38b
WHWO	2.04a	72.70b	114.94a
WHBDG	1.73d	70.20c	94.12d
WHPKC	1.76d	57.10d	77.88e
SEM			

(WHS = Water hyacinth sucrose treated silage; WHCM = Water hyacinth cracked maize treated silage; WHWO = Water hyacinth wheat offal treated silage; WHBDG = Water hyacinth brewer dry grain treated silage; WHPKC = Water hyacinth palm kernel cake treated silage; DMI = dry matter intake; DDM = digestible dry matter; RFV = relative feed value.

On the basis of this, ranking of the silages would go thus:

WHWOS > WHCM > WHS > WHBDGS >WHPKCS

Similarly observed by Baba et al, (2018), it should be noted that the wheat offal treated silage had the highest values of DDM, DMI and RFV. This could be explained that the silage had the lowest value of the fibre components, NDF, ADF and CF which are all involved in digestibility. The DDM did not follow similar trend. The sucrose treated silage gave the highest value while the others were without a trend. This observed effect can plausibly explain to be due to the differential digestibility levels of the various additives used. Sucrose on its own merit is expected to be more digestible than maize, wheat offal, brewer dry grain or palm kernel cake. While sucrose is a disaccharide, the other additives are impregnated with mainly hemicelluloses and polysaccharide starch or cellulose which are not as digestible as sucrose.

4. CONCLUSION

This study indicated highest values in DMI, RFV, second to highest in DDM but lowest in NDF, ADF, ADL and second to lowest in CF (all fibre fractions) for the wheat offal treated silage compared to other silages suggesting the best qualities, better than sucrose and cracked maize treated silages. Although the crude protein (15.0 %) of the wheat offal treated silage ranked second lowest than others, it was far higher than the critical 7-7 % NRC (1981) stipulated for ruminants. Because silage WHWO was found to be superior in quality than WHS and WHCMS, it can therefore be recommended that wheat offal can be used as a replacement additive for either sucrose or maize which is costlier.

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The Satirical Social-Media Skits As Template For New Education: Understanding The Amateurish Auteurism In Nation Building

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Abstract: The ICT age has midwifed into existence, all manners of multifaceted creativities both in written forms and in cinematheques. For theatre practitioners, for instance, these creativities have manifested in different genres, one of which the present paper has labelled "satiric social-media skit" which is defined as a short theatrical sketch or act characterized by comical embellishments often designed for spontaneous viral spread via the social media. This research proceeds out of the need to examine selected social-media skits as didactic satires intended to educate their audience on certain endemic social dysfunctions. Thus, the study considers the social media skits, as typified by some selected pieces, as veritable windows to use the cyber space as educative forum which dwells on the popular binarity involved in the coinage – edutainment – in which such skits have the tendency to educate and entertain their audience within the parenthesis of the global classroom and cinema world at the same time. Relying on the theoretical praxis of Paul Simpson in his model of 'Satire as Humorous Discourse', a theory which recognizes the presence of the indexical trio of the satirist, the satiree and the satirized, the study attempts an analysis of Mock News, and Adeola Fayehun's comical news packages that permeate the social network. The theory offers sufficient support to this research since the selected skits are considered amateurish in the sense that they have been scripted and produced by auteurs who are often driven by the need to satirize in order to educate than the need to produce professionally ethical pieces that merely fulfill architectonic mandate of news peddling. Hence, there is the assumption that the underlining structures of the cinematographic pieces called satirical social-media skits are traceable to the auteur's sub-conscious frenzy to teach a global class within a framework where he (auteur or the skit producer) is the jocular teacher, the cyber space the classroom, the cinematics the teaching aids and the audience the students. In the final analysis, the study opines that the satirists are nation builders in their own way since they attempt to curb or reduce decadence in the society in one way or the other.

Keywords: satirical, cinematics, social-media skit, auteurism

1. INTRODUCTION

The introduction and development of different communication programmes of ICT have done a lot in the revolutionalization of the world of literaro-theatrical creativity. This is indicated in the various literary and dramatic pieces that have relied mostly on the wide coverage of such ICT media to circulate limitless drama/cinematic skits that appeal to the sensibility of the postmodern man. The internet is the most outstanding and communicatively influential discovery of the ICT era. In his popular book, A Brief History of the Future: The Origins of the Internet, John Naughton writes:

> The Internet is one of the most remarkable things human beings have ever made. In terms of its impact on society, it ranks with print, the railways, the telegraph, the automobile, electric power and television. Some would equate it with print and television, the two earlier technologies which most transformed the communications environment in which people live. Yet it is potentially more powerful than both because it harnesses the intellectual leverage which print gave to mankind without being hobbled by the one-to-many nature of broadcast television.

To say the internet has transcended its predecessors like the radio and television in mass media genre is stating the obvious. Little wonder that such internet social media programs like the Whatshapp, Facebook, Telegram, Instagram, etc. have turned the cyber space into the tableau of interaction where people's creative savvy can be adequately showcased. For instance, several narratives and dramatic pieces with audio-visual imports have often been circulated in soft-copies via the social media to provide gadget-based followership. This is why Thabo Mbeki, a one-time President of South Africa, accurately notes that the internet has come to make the people of the world

> Seize the new technology to empower themselves; to keep themselves informed about the truth of their own economic, political and cultural circumstances; and to give themselves a voice that all the world could hear (in Berners Lee, 110).

In addition to this, cinematized creativities have also utilized the cyber space in this regard and rather than get circumscribed to the televisionist mode, audience are entertained and educated by the various cinematized dramaturgical inputs that permeate the creative world through the internet.

In order not to be left out of the race, Nigerian creative writers/auteurs have joined others to short-circuit their productions through amateurizing the productions and distribution of their filmic media; they successfully accomplish this by operating through minimized cast and mono-modal projections that result into mass communication which invades the internet network. To explain the internet and its workings, David Crystal avers that:

> The Internet is an association of computer networks with common standards which enable messages to

> be sent from any central computer (or host) on one network to any host on any other. It developed in the 1960s in the USA as an experimental network which quickly grew to include military, federal, regional, university, business, and personal users. It is now the world's largest computer network, with over 100 million hosts connected by the year 2000, providing an increasing range of services and enabling unprecedented numbers of people to be in touch with each other through electronic mail (e-mail), discussion groups, and the provision of digital 'pages' on any topic. Functional information, such as electronic shopping, business data, advertisements, and bulletins, can be found alongside creative works, such as poems and scripts, with the availability of movies, TV programmes, and other kinds of entertainment steadily growing. Some commentators have likened the Internet to an amalgam of television, telephone, and conventional publishing, and the term cyberspace has been coined to capture the notion of a world of information present or possible in digital form.

Crystal above captures the various trajectories of the internet's operations and it is not out of place to state that the most prominent, and perhaps the most widely followed of all the internet creative features is the comical and satirical skits. Such skits are the deliberate creations of their auteur/producers who intend to achieve the tripartite aims of amusing the audience, informing them of some current affairs and teaching them something new. In Nigeria, comical and satirical pieces include several episodes from Mark Angel's Comedy skit in which the child prodigy, often casted as Emmanuela, features prominently to educate the populace through the display of ingenuity. There are also notable skits from Femi Ajewole (Woli Agba) whose resolve it is to often satirize the fake prophets who dupe people with the name of God. This study attempts a study of selected skits from the video series labeled Mock News, and Adeola Fayehun's satirical pieces that build comical templates from extant news items to provide the façade of news burlesque in which audience are thrilled, amused, educated and informed. Mock News is a one-man cast drama skit which adopts the news casting mode to re-broadcast an extant news item with comico-satirical tonality.

2. THEORETICAL CONCEPTUALIZATION: SATIRE AS HUMOROUS DISCOURSE

This study has adopted the Simpsonian mode popularly labeled Satire as Humorous Discourse in which within the satiric discourse, there is the vertical relationship between three indices – satirist, satiree and satirized. Simpson's model operates from the premise that satire is a discursive practice. In other words, satire performs the function of a higher-order discourse. By 'higher order', Simpson refers to the fact that satire:

> Requires a *genus,* which is a derivation in a particular culture in a system of institutions and in the frameworks of belief and knowledge which envelop and embrace these institutions. It also requires an *impetus*, which emanates from a perceived disapprobation, by the satirist, of some aspect of a potential satirical target.

Thus for Simpson, a satirist operates from certain framework of belief and knowledge which inherently substantiate the argument that he has messages to pass across in a didactic manner, albeit in a not too fashionable way. The satirist is thus an educator. Satire as a discursive practice is configured as a triad embodying three discursive subject positions which are subsumed within the constant operational mode. Thus, as Simpson notes, there are, within his mode, "the *satirist* (the producer of the satiric text), the *satiree* (an addressee, whether reader, viewer or listener) and the *satirized* (the target attacked or critiqued in the satirical discourse)". Simpson sees, from the elemental triad of satiric discourse, the entities of satirist and satiree as *ratified* within the discursive event. By this, Simpson has implied that both the satirist and the satiree operate within the same logico-semantic background where the discoursal indices are given as common to both entities. Simpson labels the third entity of the triad as *ex-colluded* because it "is not normally an 'invited participant' in the discourse exchange even though it is the initial impetus for the satire". We, therefore, can conclude that this model recognizes the *ratified* discourse participants (the satirist and the satiree) on one side and *non-ratified discourse participant* (*the* satirized) on the other. Simpson concludes that:

> The non-ratified, ex-colluded discourse participant that constitutes a satirical target may be an individual person, an episode involving human agents, an aspect of more fixed or stable experience or existence, or even, crucially, another discursive practice (8).

The choice of this model lies in the fact of its elucidation of the working dynamics of satire in a novel way that can vividly account for *Mock New* and Adeola Fayehun which ares news caricaturized to educate the audience.

3. THE SATIRICAL SOCIAL MEDIA SKIT: A MODERN TEMPLATE FOR EDUCATION

Satirical social media skits are cartoons, drama skits and comic news designed primarily to entertain and make viewers relax and ease their stress. It is usually well-crafted, targeted at a particular age group; fun-poking, concise and quick. Education, on the other hand, is a key ingredient in the actualization of individual and country's ideals. Modern innovations in education consider the satirical skits as programmatically educative since it is the desire of the satirist to teach the people something allegedly new about the society. Hence, in a world inclined towards

immorality and crookedness, satirical social media skits could be employed to inculcate morals and best ways of living, thereby discouraging vices and eulogizing virtues. This paper explores the positive side of satirical social comedy skits as a means of education designed for the purpose of nation building. The paper thus concludes that since all satirists are educators in their own way, all social media satires are created to educate via entertainment mode.

Therefore to appropriate Simpson's idea within the present discourse, both Ken Nwadiogbu, aka Pararan (*Mock News*), and Adeola Fayehun are the satirists who *defamiliarize* existing news items with comical styles for the purpose of attracting in its totality the attention of their audience. The significance of attracting the attention of the audience is stressed by George when he opines that:

> [t]here is a science to joke telling. You have to have the attention of the audience, you have to have the intellectual as well physical participation of the audience, and you must have an audible indication of their acceptance of you, and if you don't hear that every ten seconds, you are dying (in Danelo, 20).

George goes further to say that comedians are like other performers in that they need affirmation and to them laughter is like applause for an actor or an ovation for a singer. This goes to show that a satirist/comedian needs to understand the gradual build-up of the ingredients required to cause laughter in his script. The foregoing also likens the satirist to a classroom teacher who must teach with style that enchants his students to rapt attention. It is also important to note that the satiree needs to understand the story line and nuances. This is especially so because "comedy is culture-bound and perhaps psychologically determined" (Bamidele, 2). What may elicit laughter from a Nigerian may make no meaning to an American and vice versa. Therefore, the satirist must ensure that he handles the culture coloration well to elicit laughter which is his lifeline. This is essential because satire's affinity with culture is germane to the commonsensical nature of any successful joke. This again provides the link with the classroom notion of *previous knowledge* designed to contextualize the subject matter

This takes us to the script of the comedy/satire. As established hitherto, comedy/satire has close affinity with culture. The script may be structured in cause/effect formation or the other way round. The choice depends on the type of audience. Creating and presenting a joke is an academic exercise as it requires a good script (either written or improvised). Therefore, the script must take cognizance of the audience and the satirist must be able to read the audience if they flow with the stream of the joke or not. This is where dynamism comes in as he may have to alter the joke to elicit the expected laughter. Any rigid satirist will not be successful in joke business.

Satirical comedy is primarily for entertainment purpose but by extension it provides information about socio-political

issues as well as providing the needed education for the audience. Importantly, the education deducible from this through moral suasions is unquantifiable and it is hopeful that in future engagements, satirical comedy could be used when teaching boring subjects or courses to lighten up the mood of students.

Satire has many genres but this paper focuses on social satire. Social satire focuses on society and its cultural interactions, such as daily life idiosyncrasies while political satire consists of jokes told to deride those in authority, the rulers and can sometimes be directed towards those who are ruled (Hodgart in Danelo, 21). Satirists construct their jokes by creating a caricature of someone, and over-emphasizing certain traits to the point that the representation was almost grotesque and the isolation of these specifics elated the audiences (Petro in Danelo, 22). The butt of jokes may be directed at an individual, the government, government's policies or at people's attitude.

The summary of a book, *Satire and Humour in Education,* is emphatic on the relationship among satire, humour and education by stating that "perhaps educators, and others, have taken the issues and problems of education too seriously and a satirical and humorous perspective might lighten their task". The authors added that the essays in the book aim to "deflate pompousness, among authority, shake the status quo, empower the little people, bring reality into the Ivory Tower, spur change and primarily, allow us to take ourselves less seriously".

4. MOCK NEWS WITH PARARAN AND ADEOLA FAYEHUN ON SAHARA TV AS EDUCATIVE SATIRES

Mock News with Pararan is, as the name implies, a news programme on the You Tube, an internet video sharing website, which appeals to the humorous sensibility of the audience by burlesquing via humorous imitation of the real news. The main character is the caricature news caster, Ken Nwadiogbu, who simply tags himself Pararan the bringer of *ogbonge* news.

Similarly, *Adeola Fayehun on Sahara Tv* is a programme anchored by Adeola Fayehun who is by all rating a political satirist, a Nigerian journalist who specializes in discussing current geopolitical, social and economic issues that affect the lives of Africans living on the continent with satiric tone. The adopted theoretical programme perfectly fits into this study in that it is possible to view the selected skits via the satirist-satiree-satirized model suggested by Simpson (2003). Consequently, the comical news presenters – Pararan in *Mock News* and Fayehun in *Fayehun on Sahara TV* are the *satirists*, hence, the teacher. The particular news item they develop more often presents a topical character. Such a character becomes the *satirized.*

Simson's Satire as
Humorous Discourse Model

Satirist

Pararan/Fayehun

↓↓

satirized

↓↓↓↓

Satiree satire satire satire

- The above reflects the flow of communication/education between the satirist and the satiree.

As the model reveals, the main thrust of the satire is the satirized which turns out, in the cases of the selected skits, as personalities who have deviated from certain societal norms and their acts have manifested as news items with which the selected satirists have decided to poke fun. Although, both skits selected for study are aligned with particular television stations, they are more available as social media pieces to audience. The various audiences across the globe are the *satirees.*

Mock News with Pararan

The following are some of the various episodes of Mock News as presented by Pararan.

- Snake swallow 36 million naira at Jamb office.
- Nigerian Pastor Ayo Oritsejafor asks members to pay N1.8m for a mantle.
- Cow kill people in Benue State.
- Rat pursue President from his office.
- Blaming (Queen Elizabeth for colonizing Nigeria).
- 2010 – 2016 Jamb made about 15 billion Naira.
- 2 fake soldiers robbed 2 real soldiers in Abuja, Nigeria.

For the Mock news, the medium of presentation is the Pidgin English. As far as the Nigerian Stand-Up comedy is concerned, the language of expression often adopted is the Pidgin English which is believed to house several slangy expressions that allow the comedians to emphasize their satirical elements to create fun and educate the audience simultaneously. Consider the following excerpt from "Nigerian Pastor Ayo Oritsejafor asks members to pay N1.8m for a mantle".

> *Our pastor wey dem de call Pastor Ayo, for Warri…hmm… the guy don choptalize people. The guy go obodo oyibo a.k.a USA go preach. As he dey preach the Lord touch am (Pastor Ayo's photo displays on the top left of the screen). …God touch am and he say he need to bless people, ninety people with hankie, handkerchief, una know their normal thing eh? He say him need to bless people wey want to see God, people wey want make God see them. He say him need ninety people to step out. Him want give them the mantle….he say because im no want make the ninety people miss God. And the ninety people weydey come out everybody dey pay 5000 dollars. Hmm. Five five thousand dollars times ninety people is about four hundred and fifty something dollars…I calculate.. almost half a million dollars… this New Year, them done resume work…he dey like say God broke and He go need our money to build house for heaven….*
>
> [One of our pastors who is called Pastor Ayo in Warri. The pastor has swindled

people. He went to the USA to preach. As he preached, it appears that the Lord touched him (Pastor Ayo's photo displays on the top left of the screen). God touched him and he said he needed to bless people with handkerchief. Of course you know that's their usual practice. Eh? He said he needed to bless people who wanted God to see them. Ninety of them. And the ninety must be ready to step out to receive a mantle and be ready to give 5000 dollars each. Hmm if you multiply 5000 dollars by ninety, that's about four hundred and fifty something dollars and by my calculation that's almost half a million… this New Year, it seems these pastors have started their usual gimmick of extortion…it is just as if God has been broke and He needed our money to build more houses in heaven].

Pararan concludes this particular piece by berating pastors who perpetrate such ungodly money-raising attributes. But before he draws his conclusion, he corrects this religious ill by first educating the populace on what is bad. He follows the normal order of education which must first inform, teach and correct.

Adeola Fayehun Sahara Tv. (Adeola Fayehun is a political satirist, a Nigerian journalist who specializes in discussing current geo-political, social and economic issues that affect the lives of Africans living on the continent). Next is the news of Pastor Tim Omotoso accused of sex charges.

A Nigerian Pastor in South Africa, Pastor Tim Omotoso accused of sex with 30 women, faces charges. The 58 years old pastor has many branches in South Africa. He has a record company and foundation known as "Help the helpless foundation". Omotoso had allegedly been abusing minors of his congregation as far back as 2002. Not just one or two but as many as 30 girls. Some of these girls are as young as 14 years old. Can you imagine ladies and gentlemen? A 58 year old Omotoso founder of the Jesus Dominion International Church. We learn through the church website that he has 12 churches around South Africa with branches also in Britain, France and Israel. Apparently, this man has been a pastor in South Africa for almost 16 years. Omotoso is well known for his designer suits. When you see his pictures, you can tell everything bling, bling, expensive sunglass and luxurious cars. Apparently, he has a Lexus, he also has Porch cars. His wife drives a Jaguar. One of the women working with him said that everything from his clothing all come from a designer in England. So basically, they import everything he wears. He also has a recording company and a foundation known as "Help the Helpless Foundation". He used to be the music director for Ebenezer Obey way back in the 80s. Music is a huge part of his ministry. Sometimes during his ministering he will sing and play instrument. Apparently, the man of God has at least 3 opulent apartments. One of his houses is valued at 2 million dollars. He also has female recruiters who look out for beautiful young girls that live with their single mom. Apparently the man is intimidated by girls who have fathers in their lives. So he targets girls who have single parent. It has to be a single mom. So these recruiters will tell the young girls that

if they come to live with the pastor that he will sponsor their education and give them a better life that there are so many girls that live with him that he is taking care of. So a lot of girls are attracted to this but upon arrival in the house where he keeps them, they will see other girls and relax and then one night the man of God will call the girls to massage his leg in his room and then he will tell them to perform oral sex with him. If they refuse he will say it is God's will for them to do it, you know some people cannot just say no when they hear the man of God says it is God's will and then in their attempt to sleep with him he tells them God wants them to sleep with him so that they can be closer to God because he is very close to God. God is merciful. There are so many people that have messed up and then they claim they are men of God. One of the victims said that what if she gets pregnant. The man of God laid his hand on her stomach and prayed to prevent her from getting pregnant. There are so many wolves in sheep clothing. So many people called men of God that are just manipulators and mind controllers and for so many years none of these girls could talk to anybody about this. I mean they all knew among themselves that they are being molested by this man. Apparently, this has been going on since 2002 but many of them believed that because he is a respected man that no one will believe them. I saw a video where some of the male workers were complaining that how come that only the female workers were getting the preferential treatment. There was a huge bus that will take these girls to church and take them back, he was giving them preferential treatment and it looks like the guys were just invisible and when one of the male workers complained to Papa, how come you are only focusing on the female workers?… Some of the girls said that the man of God will convince them to drop out of school and he will say that they are not destined for school but that God has a plan for them to open a business and become rich. In doing this, he is trying to isolate them. Now when the story broke out, they tried to arrest this man during Easter celebration but he apparently knew about it so he escaped. Why would the man of God be running? Why would he be hiding during Easter, if he is innocent? Guess where they finally arrested him. They arrested him in the airport in South Africa. Imagine, he was hiding in a female restroom. If really he was innocent, why was he hiding in a female toilet? It took them days before they could arrest him and of course they found him in another town far from Turban to Port Elizabeth that was where they caught him and they were talking to him on phone that he needs to come in for interrogation and they knew he was going to Port Elizabeth and he told them that his flight was delayed so that they won't come to look for him when he is still there. He thought they will come some hours later but the police officer got there at the exact time he was suppose to take off because they knew he was lying. Please be careful who is called your spiritual father.

Adeola Fayehun is unequivocal in using this episode to inform and educate the populace about religion. She used the above news item to satirize the malicious, vulgar, reckless and ungodly misdemeanor of some who called themselves men and women of

God. What she did in this episode brings to mind Wole Soyinka's famous play *The Trials of Brother Jero* and another work (poem) titled "Do-godders" by Olu Obafemi. Both works centre on hypocrisy of some so-called ministers of God. Fayehun concludes that people should be careful of those they refer to as spiritual fathers. She follows the order of education which must inform, teach and correct. Kirma, in his Article titled "Using Satire to Study Current Events" sheds light on the importance of jester/comedian by writing that:

> The satirist is the modern version of the court jester who made the monarch laugh. With humor, the jester had license to bring to the monarch's attention his foibles and shortcomings. In a social democracy, the people are like a monarch, and satire can bring to them, in a high-heated manner, those items that may need their attention, concern, and action. Satire is also a tool for giving people power.

In essence, Adeola Fayehun and Pararan are the Satirists in our study and by extension in the contemporary Nigerian society who uses the satirical mode to perform the essential societal functions – inform, educate and entertain.

5. CONCLUSION

Nation building requires that all stake holders, governments, government policy formulators, academics, entrepreneurs, philanthropists, business tycoons, politicians, civil servants, educators, theatre artists, satirists, writers, parents, students, children, and all and sundry should assume the responsibility to contribute their quotas in nation building. This research focuses on comedy satirists as one of such nation builders who have employed satirical media skits to inform, educate, instruct and correct. The spot light in this research is on Pararan and Adeola Fayehun; the duo use their skits which are in form of news items to educate their audience on the social media. Two of their numerous media skits are brought to the fore to underscore their importance as template for new education. It is obvious from the research that comedians play active roles, though through making fun, in nation building through their jokes by deriding society's misdemeanor not minding whose ox is gored thereby doing more for their nations, continent and the world. In fact, their services to nation building is altruistic, hence, it is commendable and appreciated. The researcher hopes that soon, comedy skits will be extensively used to discourage African leaders from their sit-tight mentality when elected as presidents of their countries and also use it to educate them on the meaninglessness of amassing wealth dubiously while the people they govern could barely survive.

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Socio-Economic Contributions Of Wood-Based Cottage Industries To Livelihoods And Industrial Development In Ogun State, Nigeria

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Abstract: In view of the Sustainable Development Goals (SDGs) or Global Goals numbers 1, 2, 3 and 15 aiming at ending poverty in all its forms everywhere; end hunger; achieve food security and improved nutrition and promote well-being for all at all ages and protect; restore and promote sustainable use of terrestrial ecosystems; sustainably manage forests; combat desertification and halt biodiversity loss; a survey was carried out to assess the roles of wood-based cottage industries in attaining the Sustainable Development Goals (SDGs) in Nigeria with the aid of a questionnaire administered on two hundred (200) purposively selected respondents in Odogbolu Local Government Area of Ogun State. Data generated were analysed and presented using descriptive statistics, budgetary technique and Chi Square Analysis. I found out that majority (88%) are within the active age (25-50 years), even-gendered (50% each) of which 92% are married with 60% having 1-5 persons in their household. All had one form of education or the other and a greater part (68%) are operating and depending on wood-based cottage industry as sole source of livelihood. The principal source of wood sold among the respondents is forest reserves (98%) and each of them engage 10 to 24 workers earning between N2000 ($6.56) and N 5000 ($16.39) on a daily basis. Proprietors make a Gross Margin of N 28,334 ($ 78.71) per day. Funds are sourced through cooperatives (56%), personal savings (16%) and friends and relations (14%). Government assistance is sought in the areas of infrastructures, access to land and more forest reserves. Chi Square results reveals that there is a significant difference between output per day and the marital status (0.037, > P0.05) and years of experience (0.005, > P0.05) at 5% probability level. The study concludes that, at the current scale of operation, wood-based cottage industries in the study area are generally profitable and has the potential to contribute significantly to the economic wellbeing of the entrepreneurs engaged in it, provide employment for the teeming population as well as boost infrastructural development of the Ogun State, Nigeria given enabling environment. The study recommends government intervention in the areas of provision of basic amenities, public enlightenments and establishment of more forest reserves to ensure sustainable supply of raw materials for the sustainable development of wood-based cottage industries, supportive policies, better access to finance, tailored service and markets, and secure forest access and tenure for sustainable forest enterprise development

Keywords: Cottage Industry, Development, Livelihood, Gross Margin, Forest

1. INTRODUCTION

The loss forest ecosystem and by implication, its services have been due to climate change, pollution, overexploitation, land use change and urbanization (Millennium Ecosystem Assessment (MEA), 2005). A cottage industry is a small-scale industry carried out at home by family members using their own resources including equipment for a sustainable living.

It is an aspect of traditional small-scale forest-based processing enterprises which depend on wood and non-wood products as a main raw material (Soaga, Oluwalana and Adekunle, 2010). Kingston (2005) described a forest ecosystem as an environment comprising of species (such as smaller plants, fungi, bacteria and animals) as well as physical and chemical processes such as energy flow and nutrient cycling. Forests are central to all human life because they provide a diverse range of resources, they store carbon, aid in regulating the planet climate, purify water and mitigate natural hazards such as floods.

Forests are vital for life on the earth as they are not just the green cover, we need to make earth beautiful but they perform many functions essential for our survival and sustenance (Paul, 2005). Kalu (2005) reveals that Nigeria benefited immensely from forest especially timber products before the advent of commercial exploration of petroleum. The Gross Domestic Product (GDP) of forestry compares favourably with other aspects of agriculture like fisheries. Forestry sector provides employment opportunities for thousands of Nigerians (Okeje, 2008) as about 80% of rural populations are engaged in agroforestry and other related industries (Osanyinmere, 2008).

Global demand for many forest products has grown with rising income, urbanization and industrialization (Igbal, 2005). Poulton and Pole (2001) stated that there are developed markets and global international trade valued at 7.5-9 billion US Dollars per annum with another 100billions in processed medicine and medicinal plants (Simula, 1990). The annual value of fuel wood and wood-based forest products to the global economy is estimated to be more than US$400 000 million, or about 2 percent of gross domestic product (Schmincke, 1995).

Wood processing is an engineering field comprising of the production of forest products such as pulp and paper, construction materials. Small Scale Forest Based Industries process a large part of their raw materials from forest and supply some to the main markets for use in the rural areas of developing countries (Fisseha, 1987, FAO, 2005). They are enterprises that utilize any material or product that is derived from the forest and woodlands for income and employment generation (Olatunji, 2004).

The main thrust of this research is to examine the practices and economic contributions of wood-based cottage industries to the livelihoods of the residents of Odogbolu Local Government area of Ogun State, Nigeria with a view to unravelling the socio-demographic characteristics of the stakeholders, describe the various forest-based cottage industries, estimate costs and return structure in the

business as well as reveal its contributions towards economic development of the study area.

2. RESEARCH METHODOLOGY

2.1. The Study area

Odogbolu Local Government Area of Ogun is one of the 20 Local Government areas of Ogun State located on latitude 60 50'N and longitude 30 46'E with a population of over 100,000 (NPC, 2006). It is about 61Km South-west of Ibadan and 100Km North of Lagos. It has a humid weather with an average temperature of about 27.40 C and annual rainfall of 128 cm in the Southern part and 105 cm in the Northern part. The LGA is the nerve Centre for cloth weaving and dyeing, trading and carving. Some of its important agricultural products are maize, cassava, yam and livestock. It has the highest forest-based industries (about 300) and there are many local forests and carpenters in the town. It is also an educational Center with several educational institutions including Tai Solarin University of Education and Ogun State College of Health Technology among others.

2.2. Sampling and Data Collection Procedure

Both primary and secondary data were used for this study. Primary data were obtained through purposive sampling of two hundred (200) respondents in Odogbolu Local Government Area of Ogun State with the aid of a well-structured questionnaire. Data generated were analysed and presented using descriptive statistics, budgetary technique and Chi Square Analysis. Secondary data were sourced from published journals, textbooks, previous research works, internet and other publications relevant to the research focus.

3. RESULTS

Table 1: Socio-demographic Characteristics of Respondents (N= 200

Variable	Frequency	Percentage
Age		
21-30	25	12.5
31-40	60	30
41-50	91	45.5
51and Above	44	22
Sex		
Male	100	50
Female	100	50
Marital Status		
Single	8	4
Married	184	92
Widow	8	4
Household Size		
1-5	120	60
6-10	80	40
Literacy Level		
Adult Education	12	6
Primary Education	16	8
Secondary Education	76	38
Tertiary Education	96	48
Subsidiary Occupation		
Civil Servant	32	16
Pensioner	16	8
Farming	16	8
No other Occupation	136	68

Table 2: Major Types and Sources of Wood Sold by Respondents

Local Name	English Name	Botanical Name	Major	Minor
Kokoigbo	Poplar Wood	*Liriodendron tulipifera*	Yes	-
Eru	Oak Wood	*Pachyelasma tessmanii*	Yes	-
Omo	Birch Wood	*Cordial millenii*	Yes	-
Ekki	Hemlock Wood	*Lophira lanceolata*	Yes	-
Okilolo Wood	Cedar Wood	*Cedrela odorata*	-	Yes
Mansonia Wood	Mansonia Wood	*Mansonia altissima*	-	Yes
Mahogany Wood	Mahogany Wood	*Swietenia macrophyla*	-	Yes
Obi Wood	Fir Wood	*Pseudosuga*	-	Yes
Sanmi Wood	Pine Wood	*Pinus achinata*	-	Yes
Gmelina	Gmelina Wood	*Gmelina arborea*	Yes	-

Table 3: Sources of Wood Sold

Source	Frequency	Percentage
Forest Reserve	196	98
Local/Community Forest	4	2

Table 4: Employment and Income Generation

Employment/Average No of Workers	Frequency	Percentage
1-3	64	32
4-5	40	20
Above 5	96	48
Average Wage of workers per day (N)		
400-2000	60	30
2100-3000	44	22
3100-10000	4	2
11000-50000	8	4
Above 50000	88	44

Table 5: Budgetary Analysis of Cost and Return Structure of Wood-Based Cottage Industry

Items	Amount (~~₦~~)
Fixed Costs	
Sheds/Overheads	5,000
Fixed Cost Depreciated (Machine) @ 10%	5,000
Total Fixed Cost	**10,000**
Variable Costs	
Labor wage	3,522
Wood purchase	2,324
Machine Hire	1000
Shop rent	1200
Total Variable Cost	8,046
Total Cost	18, 046
Total Revenue	36,380
Net Income	18,334(**$ 50.93)**
Total Gross Margin/Day	28,334 (**$ 78.71)**
Gross Margin/Month (Assuming 25 working days/Month)	708,350 (**$ 1,967.64)**
Gross Margin/Year	2, 896, 560 (**$ 23,611.67)**

Table 6: Business Information of Respondents

Item	Frequency	Percentage
Scarcity of Materials/Wood		
Yes	76	38
No	124	62
Major Problem Encountered		
Inadequate Finance	52	26
Economic Instability/Inadequate supply of wood	140	70
Rainfall	8	4
Sources of Funds		
Personal Savings	52	26
Friends and Family Relations	36	18
Co-operatives	112	56

Table 7: Chi Square Analysis of the Relationship between Socio-demographic Characteristics and Output per Day

Variable	F-value (p< 0.05)	Result	Decision
Marital Status	37.750	0.169	NS
Household Size	10.691	0.710	NS
Religion	20.071	0.862	NS
Literacy Level	47.705	0.252	NS
Occupation	59.979	0.037	S
Year of Experience	48.359	0.005	S
Nature of Practice	18.092	0.154	NS

4. DISCUSSIONS

Table 1 shows the socio-demographic characteristics of respondents. Majority (88%) of the stakeholders/operators of the wood-based cottage industries in the study area are within the economically active age of between 21 and 50 years with those within 41-50 years predominating and constituting 45.5%. This is in line with the findings of Soaga, et al (2010) in a survey of traditional forest industries in Ogun State of Nigeria.

Evenness (50% each) in gender was observed in the business with 92% married respondent implying they are men and women with responsibilities. This is in line with the findings of Adekunle, et al. (2014) in which they reported that the level of participation of in wood marketing defies gender bias as both sexes are found at every stage of the process which also signifies the lucrativeness of the business.

In another vein, the respondents maintain a household size of 1-5 persons (60%) and 6-10 persons (40%) which may be due to high labour requirements in the enterprise. Local wood plays a key role in the livelihoods of the residents. Timber products constituted the base for small scale industries in many communities. For example, a study conducted in Mozambique in 2001 found that there were 147 wood-based industries employing an average of 60 workers each (Eureka, 2001).

In terms of literacy level, all the respondents possess one form of formal education or the other though those with tertiary (48%) and secondary education (38%) are in the majority. This high level of literacy is expected to enhance their business managerial abilities.

A higher part (68%) of the respondents have made wood-based cottage industries their permanent and sole source of livelihoods. The small-scale enterprises have certain micro-economic characteristics that are known to generate 'multiplier effect' of increased economic benefits in rural economies resulting in higher incomes, higher consumption and improved terms of trade (Elson, 2010).

The respondents principally (98%) sourced wood for the business from Government forest reserves; only 2% are sourced from private/community forests as indicated in Table 3.

Okunomo and Achoja (2010) examined the impact of African Timber and Plywood industry on Sapele community, Nigeria. They concluded that sawmill industry created significant impact on Sapele community through the provision of social amenities and wood supply. Abdullahi (1999) indicated that furniture industry alone represented 80% of the wood-based industries in Nigeria implying that wood-based cottage industries are main source of employment in Nigeria.

In terms of employment generation, 48% of the wood-based cottage industries gainfully employs above 5, 32% engages 1-3 workers while 20% employs an average of 5 individuals. This shows that most of the wood-based cottage industries are operating as micro enterprises in line with the grouping by Small Medium Enterprises Development Agency of Nigeria (SMEDAN, 2012). Olawuni and Okunola (2014) reported that the presence of sawmills in Ife area provided employment to the people of the area as well as contributed to infrastructural developments such as well, access roads, electricity among others. In another vein, Adeniyi (1999) stated that the economic importance of sawn timber marketing includes meeting the needs of the people for construction, fuel wood and provision of employment as well as revenue for the stakeholders.

Table 6 reveals the business information of the stakeholders in wood-based cottage industries in the study area, 62% indicated that wood resources are currently not scarce in the study area though 38% confirmed otherwise. The principal constraints facing the respondents in the business are economic instability or inadequate supply of raw material/wood (70%), inadequate finance (26%) and excessive rainfall (4%).

In terms of sources of funding for business, the respondents got funds from Cooperatives (56%), personal savings (26%) and friends and relatives (18%). This implies that the potential for expansion and use of modern facilities for efficiency and profitability is there for the stakeholders given access to cooperative funding although sourcing funds from banks will impact more positively on their scale of operations as reported by Adekunle, et al. (2014). It is generally difficult to raise capital for the forest

industries due to their small size and difficulty in assessing risks by would-be investors (Canby, 2001) and this limits technology adoption, deter efficiency of operation, economy of scale and, hence, profitability of the business. The small size of the forest industries restricts the development of suppliers, subcontractors, service providers and other efficiency gains (FAO, 2011). FAO (2011) indicated that the competing demands for land are now sometimes referred to as the '5-Fs'- food, (animal) feeds, forest (for conservation), fibre and fuel – and there is growing interest in how these demands will be met in future.

The results of the budgetary analysis reveals that an average wood-based industry practitioner earns a total revenue of N18,334 ($ 50.93) per day, a gross margin of N 28,334 ($ 78.71) per day, a gross margin of N 708,350 ($ 1,967.64) per month and a gross margin of N 2, 896, 560 ($ 23,611.67) per annum. This implies that the business is a viable venture that can readily be scaled up to boost the livelihood of the residents of the study area and the economy of the Nigerian nation in general which is in line with Alamgirrr, Mezbahuddin and Jashimuddin (2007) projection of a total expected annual income from making bamboo articles to a family in their study area to be USD 1,078.

To strengthen small and medium forest enterprises; Governments can play a critical role in strengthening SMFEs to reduce poverty. They can grant and enforce legal access to forest resources. They can simplify bureaucratic procedures for obtaining natural resource quotas and SMFEs registration. Financial incentives, including tax breaks for start-up SMFEs and local or green purchasing policies are additional positive steps (Donavan, et al; 2000).

5. CONCLUSION

The study concludes that, with the current scale of operation, wood-based cottage industries in the study area are generally profitable and has the potential to contribute significantly to the economic wellbeing of the entrepreneurs engaged in it, provides employment for the teeming population as well as boost infrastructural development of the Ogun State, Nigeria as well as West African sub-region given necessary and essential enabling environment. The study recommends provision of enabling environment in terms of supportive policies, better access to finance, tailored service and markets, and secure forest access and tenure-all crucial for the initial steps in forest enterprise development.

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