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## SECTION A: SCIENCE, TECHNOLOGY AND ENVIRONMENT

### **Research, Indigenous Technology And Rural Development In Nigeria**

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#### ***Abstract***

*The study investigated the contributions of indigenous technology to rural development in Nigeria. In Nigeria, the rural areas are characterized by huge unemployment and massive poverty due largely to low productivity and near absence of alternative job opportunities outside agriculture, which is the mainstay of the rural economy. This situation is occasioned by the use of outdated and rudimentary indigenous technologies. Thus, the main objective of this study is to show that the available indigenous technologies in Nigeria can help to contribute to rural development and competitiveness, if improved upon and standardized through investment in research and development (R and D). The study analyzed mainly secondary data by using content analysis. The study revealed that Nigeria is endowed with several indigenous technologies that have sustained the people over the years. However, these technologies are quite rudimentary and therefore deprive the people of global competitiveness. It is the conclusion of this paper that indigenous technologies have contributed greatly to the development of the rural areas, irrespective of the challenges noted. However, to make these technologies more useful to the people, sustained research is required to bring about advancements so as to increase the productivity and competitiveness of the rural populace and ensure the development of the rural areas.*

**Keywords:** *Poverty, indigenous technology, rural development, alternative jobs, global competitiveness, rudimentary*

## **Introduction**

In modern times, science and technology are regarded as necessary tools for the development of any society. It is as a result of the benefits of science and technology that most rural areas in Nigeria are now being urbanized thereby decongesting the old urban areas. Rural development depends on how the inhabitants are able to utilize technology in the development of their areas. In this regard, indigenous technology becomes very vital in the context of rural development. Isioto, Philip-kpae and Dickson (2017) assert that the traditional skills and techniques used in the production of arts and crafts, blacksmithing, and iron smelting, carding and weaving, brewery, among others, can be summed up as indigenous technology in Nigeria. There are evidences that indigenous skills and techniques have made positive contributions to the development and growth of various Nigerian communities before colonialism (Isioto, et. al. 2017). For example, the Iron technology of the Nok culture around Jos, Bauchi, Daima, Kano and Zaria is dates back to about 500 B. C. Archeologists have excavated iron spears and axes at Nok. Iron smelting furnaces had been discovered in Taruga, and they are believed to have contributed to the development of agriculture in the region. There had been ample evidence regarding the use of iron around the Kanji Dam in the present day Niger State of Nigeria, around Second Century B. C. which also had contributed to the building of canoes and other agricultural implements around that region (Dekoya, 2012).

It is worthy of note that the present day Nigeria's indigenous technologies which produced pots from clay and aluminium metal scraps, textile-making, cloth-weaving, bronze-casting, leather-tanning, and the likes, in various parts of the country, present significant opportunities for rural economic transformation, and to some extent, for global competitiveness. When these technologies (and others not mentioned here) are improved and standardized through investment in research in science and technology, with a focus on cottage, small and medium-sized enterprises, businesses can be developed around these technologies which will foster national innovativeness, create employment and generate wealth that will enhanced rural development (Willie, Abiodun, Isola, Olumuyiwa, Helen and Mohammed, 2012). While indigenous technologies are very pivotal to rural development, one important aspect to harness indigenous technology is through the effort of research. According to Harry (2013) technologies are not acquired by accident, rather they are acquired through concerted efforts at research by tertiary institutions and research institutes. The discovery of new technologies, improving on existing ones, and perfecting acquired technologies require concerted efforts and commitment in research at tertiary institutions, research institutes and production factories. Research is directed towards the accumulation of knowledge. It is this knowledge that is transformed into concrete reality for the achievement of indigenous technology. Therefore, research is meant to provide information for the individuals that will create the indigenous technology needed for the production of goods and services that will in turn impact on the overall development of the rural areas. In view of the above background, this paper seeks to examine the extent to which research and indigenous technology have impacted on rural development in Nigeria. In this paper, we also examined one major indigenous industry/technology (palm oil processing industry) in Nigeria and its contribution to rural development (the red ink words are not in the hard copy).

## **Concept of research**

Research implies careful examination of an object or situation for the purpose of effecting development and improvement. It is a way of acquiring dependable and useful information and data about the particular object of research, as well as, the analysis of the data collected in order to arrive at a valid conclusion. The prime function of research, therefore, is to discover answers to meaningful questions aimed at remedying societal challenges. Oyesola (2010) viewed research as the application of the scientific method to attain or prove new and exciting theories.

It is the search for, invention, discovery and establishment of new knowledge, facts, principles, theories and methods. It is also acknowledged as a systematic and objective search for knowledge, to establish theories and prove the truth of ideas, hypotheses and assumptions. It is a search which requires care and diligence for new facts. It is experimentation to find knowledge, to take existing knowledge and explore ways of applying it to the many problems of life (Oyesola 2010). Further, research as asserted by Obasi (2007) is a systematic enquiry to discover phenomena, the laws governing them and the diverse means of the application of the knowledge to practical situations. He also stated that the essence of research is to proffer solutions to problems which justify the need for a systematic enquiry that offers details of research situations before intervention is made. It obvious that research is a problem-solving venture as well an informative instrument that instigates varying developments at different levels. According to Redman and Morry, research can be defined as a systematized effort to gain new knowledge. People considered research as movement; a movement from the known to the unknown (Kothari, 2013). Research is thus, an original contribution to the existing stock of knowledge making for its advancement (Kothari, 2013).

### **Nature of indigenous technology**

Like several concepts, there seems to be no single universally acceptable definition of indigenous technology, through the fundamentals are clear. Eionet (2012) defined it as the technology employed by native inhabitants of a country and which constitutes an important part of their cultural heritage and should therefore be protected against exploitation by industrialized countries. World Bank (2013) acknowledged that indigenous knowledge is the basis for local-level decision-making in agriculture, health care, food preparation, education, natural-resource management and a host of other activities in rural communities. It is part of the lives of the rural poor; their livelihood depends almost entirely on specific skills and knowledge essential for survival (Okoroafor, 2014). Eukora (1990) defined indigenous technology as a set of processes, methods, techniques, skills and the characteristic products existing and developed around specific condition of populations. These form the basis for local – level decision-making in agriculture, health care, food preparation, education, natural resource management and a host of other activities in rural communities. Warren, Slikkerveer and Brokenshal (1995) noted that it is the local knowledge that is unique to a given culture or society. Focusing on the sources of indigenous technology, Grenier, (1998) asserted that indigenous technology is the unique, traditional, local knowledge existing within and developed around specific conditions of women and men indigenous to a particular geographic area.

A particular commonality to be noted is that indigenous technology generally refers to the matured long-standing traditions and practices of certain regional, indigenous, or local communities as well as the wisdom, knowledge, and teachings of these communities (Willie, et. al. 2012). Indigenous technology arises when a new idea or improvement of the resources is accomplished through traditional methods or knowledge systems (Ukwuoma, Adelowo, Adebowale and Akinwale, 2018). Ukwuoma, et. al. 2018) asserted that indigenous technology has come to be associated with the terms like ‘rural’ and ‘grassroots’ innovation. These indigenous innovations, according to them, can help find the best solutions to local problems by utilizing the indigenous knowledge and existing resources available, and in turn generating new employment opportunities. The outcomes of these indigenous innovations help foster self-confidence and self-respect amongst the community which finally leads to economic growth and social change in the community. Indigenous innovations encourage local self-reliance, decentralization of decision-making and fair access to natural resources (Akinwale, 2018).

According to Labe (2008), indigenous technology is an important resource not only for the communities who developed it, but also for the scientist and technologist, who have the potential to promote social and economic development by improving the understanding of the local conditions. Labe (2008) further stressed that indigenous technology provides alternative to western know-how, thereby giving more for solving problems. Indigenous technology has been shown to harbour many benefits for the communities, which have developed aspects of you. For examples, indigenous technology gives rise to local industrial investments that are less capital intensive, thereby yielding the much-desired multiplier effects such as employment generation, rural economic empowerment and lessened dependence on imports.

Furthermore, indigenous technologies are part of the lives of the rural poor; their livelihood depends almost entirely on specific skills and knowledge essential for their survival. Besides, it needs to be remembered that the modern technologies that now pervade every facet of human activity in the world started as indigenous technologies in the country of their origin. For these reasons and more, indigenous technologies need to be preserved, protected, researched and promoted (Stephen, 2011). Dayanatha (2006) identified five major characteristics of indigenous technology as follows: (i) they are generally low capital-intensive and are usually environment and ecology-friendly, (ii) they are also sustainable, (iii) they are generally location and site-specific and have limited adaptability, (iv) they also diffuse over small homogenous zones mainly by farmers to farmers interaction, and (v) they generate only small increments in output. Indigenous technologies have historically made and will continue to make a valuable contribution to the world of science, technology and cultural heritage. Therefore, investments in research and development on indigenous technologies are imperative for rural, as well as, national development.

### **Rural development**

Like most concept in social science, rural development has been subjected to multifarious meaning. However, any definition of rural development must have some ingredients that qualify it to be rural development. In their attempt to offer a definition for rural development, Ubani, Alum, Eke, Isigwe and Obasi (2013) opined that to understand rural development, it is imperative to first explain the various concepts associated with rural development. These concepts, as Ubani, et. al. (2013) put, it include rural sector, rural areas and rural dwellers. Rural sector, in this regard, refers to the occupational activities of the rural population characterized by agricultural occupation, closeness of the people to the natural environment as contrasted with a human environment smallest of its communal aggregate; by less internal differentiation and stratification and less territorial occupational and vertical social mobility of the population. Individuals in a rural society have fewer contacts with others outside their setting due to communication problems. As a result, they are limited within their geographical and social area. On the other hand, a rural area refers to the geographical size and the numbers of individuals that dwell in the area. It is generally accepted that any community with a population less than 20,000 inhabitants is a rural community (Ubani, et. al., 2013). Rural dwellers here refer to the individuals residing in a remote area with agriculture as their predominant source of livelihood. Having explained these important concepts associated with rural development, it becomes necessary to asserts that any efforts made to improve the rural sector, rural area and rural dwellers are efforts to ensure rural development.

According to Aziz, (2009), the concept of rural development should be viewed as a holistic concept, which recognizes the complexity and inter-relatedness of the many variables which influence the quality of life in rural areas. It is a complex process, which involves the interaction of economic, social, political, cultural, technological and other situational factors.

For the actualization of the concept of rural development, these factors have to be integrated to local government policies and plans with the aim of improving the quality of life of the people in the rural sector. Mabogunje, (2010), believed that rural development is concerned with the self-sustaining improvement of rural areas, and implies a broad-based re-organization and mobilization of the rural masses so as to enhance their capacity to cope effectively with the daily tasks of their lives and the attendant consequent. In the opinion of Gana, (2006), rural development is important, not only for its impact on rural places and people, but also for its contribution to the overall development of the nation. The Nigerian experience, where the bulk of the people and land are rural, and where the level of rural output is very low, rural mobilization provides the quickest and most direct route to national development. This require the adoption of appropriate technology for raising rural productivity and efficient utilization of resources, creation of efficient transport network between rural and urban areas to ensure easy movement of agricultural produce for massive food production and supply of industrial raw materials. It is to be observed that the scope of rural development is very wide, and it requires a comprehensive approach. It includes generation of new employment, more equitable access to arable land, equitable distribution of income, widespread improvement in health, nutrition and housing, creation of incentives and opportunities, etc. It also involves the ability of the local government to create wider opportunities for individuals to realize their full potentials through education, and sharing in the decisions and actions which affect their lives. To achieve the aforementioned goals of rural development, the nature and state of indigenous technology are central and critical to the processes.

### **Research, indigenous technology and rural development**

Technology is the product of creativity and innovation. Man in his ingenuity is in constant research to proffer solution to developmental challenges so as to lead a better life. This results of to technology through minor or incremental technical changes. It is believed that agricultural tools developed from stone, to the automated tractors, equipment and agricultural airplanes, and each forward step in the development was associated with some definite technological innovation, resulting to better ways of carrying out farming operations. These development and growth achieved overtime in the agricultural sector are indeed a consequences of efforts in research, and the outcome is a high level technology. In Europe, there have been massive development and improvement in the production of textiles. Successfully, research efforts have made it possible for the manufacturing of machines that facilitate textile production such as knitting machines, which create knitted fabrics in large swaths of materials, instead of long strips, that are looped and sewn together. Furthermore, with regard to increased production, research and indigenous technology have effectively contributed in many countries across the world. For example, the introduction of high yield varieties of crops under the Green Revolution agricultural programme adopted by many economies, enhanced their productivity. According to Sachs (2005), the fear of the possibility of widespread hunger because of the rapid increase in global population, the Rockefeller Foundation took the initiative in developing and promoting high-yield varieties (HYVs) of staple crops in Mexico, Asia and different parts of the world. The HYVs of wheat developed by the Foundation's Institute were used in Mexico immediately after World War II. Mexico went from a large net importer of grain to a major net exporter between 1944 and 1960 (Harry, 2013).

In some parts of Nigeria (Oyo and Osun States) aluminum casting is a well-established trade; the major raw material for indigenous aluminum casting is processed aluminum metal obtained in the form of scraps from household utensils and other disused aluminum products. These scraps are melted in earthen furnaces and locally fabricated crucibles using firewood or palm kernel shells for fuel. The molten aluminum is poured into mud or clay moulds to form desired products. These products comprise cooking pots of various sizes.

Over the years, the casting practice has developed to the point of customized products for groups and individuals emanating from the clusters (Willie, et. al. 2012). In India, indigenous technology has been championed by Grassroots Innovation Augmentation Network (GIAN). Ahmedabad successfully supported Amritbhai Agrawat, an artisan-innovator from a small village in Gujarat, to further improve on his innovation of a four-wheeled bullock-cart integrated with tilting mechanism. This new innovative cart eliminates the drudgery for the farmers and labourers manually involved in carrying and spreading the farm manure in the field (Ukwuoma, et. al. 2018). The tilting cart can be used single-handedly by the farmer to distribute manure over the entire field. Another success story in India is that of the 'rain gun', introduced by Anna Saheb, a local innovator in Kerala, who made use of indigenous knowledge available in the community. Anna Saheb was successfully supported by Rural Innovation Network (RIN) to boost its market potential, further improvements and final technological transfer to another company (Ukwuoma, et. al. 2018). These indigenous technological innovations are as a result of research efforts carried out by individuals which have produced positive results for the overall development of their various rural areas. Nonetheless, more researches are needed in the area of indigenous technologies and innovations in Nigeria to help bring development to the rural areas.

### **Methodology**

The focus of the study is on research, indigenous technology and rural development in Nigeria. The study employed a qualitative design, that is, the library/documentary research design. The design enabled the collection of data from mainly secondary sources. The processing and analysis of collected data from books, newspapers, magazines, and online journals were based on the content analysis method.

### **Nature of research in Nigeria**

Research and development impacts transcend all spheres of human endeavour - social, economic, political, educational, science and technology - clearly serving as determinants to the pace of growth and development of the entire society (Lucky and Samson, 2013). Advancement in research gave rise to the growth in science and technology, which in turn led to industrialization, – creation of job opportunities, increased income, increased production of goods and services, creation of wealth, improved quality of life, improved transportation/communication system, networking regions of the world, clustering of people and integrating of nations socially, economically and politically (Lucky and Samson, 2013). Nations in the world that have attained a reasonable degree of development, and those who aspiring to attain similar heights are nations that have identified and embraced qualitative education, research and development, as well as made their services accessible to their peoples. Brademas (1989) in his recommendations for the future of liberal arts education observed that education has new mission which includes: preserving peace and security, revitalizing the economy, expanding individual opportunity, enhancing the quality of life, and restoring respect for ethical behaviour. Orbach (2001) observed that, university serves as a broker between government and private interests. The university has the opportunity to serve the public by provoking public debates with unbiased research. Most technologies are developed in the universities and research institutions in the industrialized economies. Developing and transferring technology from universities and research institutions have lately been a strategic issue for the governments in the Sub-Saharan Africa, and specifically Nigeria. It is true that, successes in research vary from country to country. The success recorded or achieved in Nigeria may vary from that of Britain or America because of the funds allocated for research and development in their budgets.

According to Lucky and Samson (2013), proper environment for research is not yet available in Nigeria. This is actually as a result of deplorable or sorry state of infrastructure, lack of trained manpower, deficiencies in institutional capacity and poor financial support. Stakeholders are of the view that one of the major problems militating against scientific research in general, and educational research in particular, is the complete absence of a clear-cut philosophy of national development. A philosophy which should spell out the direction Nigeria wants to channel its development efforts, a philosophy that should not change, no matter how frequently political power changes hands. With the frequent changes of political power in Nigeria and the attendant instability, inconsistency and incoherence in governmental policies and programmes, the practitioner in the education industry, including the researcher, is left confused (Lucky and Samson, 2013). Therefore, a conducive environment is needed for growth and utilization of research in Nigeria. For this to happen, many things have to be considered. These include adequate infrastructure, trained manpower, institutional capacity, and adequate financial support. It also involves motivating the entire population to adopt a science culture as a pattern of life.

### **State of indigenous technology in Nigeria**

Nigeria is greatly blessed with gifted hands that are laboriously engaged in the use of various types of indigenous technologies. These are in the areas of smiting, pottery, weaving, carving and tanning. The indigenous industries among others include the production of pots from clay and aluminum metal scraps, textile making, cloth weaving, bronze casting, leather tanning. The indigenous technologies supporting production in these industries are generally passed on from one generation to another as a tradition in specific locations. The method of indigenous technology-transmission and skills acquisition is largely through observation and apprenticeship (National Centre for Technology Management, 2008). Most indigenous technologies in Nigeria are tacit in nature and are transferred in unwritten manners. To exploit them formally for innovation presents challenges. For instance, there is the problem of standardization with local technologies and practices such as blacksmithing and traditional medicine (National Centre for Technology Management, 2008). These indigenous technologies are largely at their rudimentary forms requiring sustained research to bring about innovations and advancement. No doubt, technological advancements will enhance the productivity and competitiveness of the rural populace and consequently, generate the much needed development in the rural areas of the country.

### **Impact of indigenous technology on rural development**

The technological capability of a nation, determines the efficiency at which the nation harnesses her natural resources or utilizes resources acquired from other nations. Abundance of natural resources means nothing, if not transformed to generate wealth. Transforming them to optimum economic wealth, requires knowledge and skills. Thus, man, from the earliest time, has interacted with his physical environment and made use of what he finds in the environment to tackle the problems of development. Most rural areas, if not all, in Nigeria are endowed with natural resources, which are harnessed by the people for the production of traditional industrial and household products. The numerous traditional industries in these rural areas range from smithing, wood-carving, cashew nuts-processing, palm wine-tapping, garri-processing, palm oil-processing, canoe carving, fishing, etc. (Ibeanu and Okonkwo, 2015). Indigenous technologies boost the economy of the people and also empower the local communities. According to Ibeanu and Okonkwo, (2015), indigenous technologies constitute an important source of revenue-generation. It creates employment directly and indirectly within the community and stimulates regional interactions and economic development. The improvement in the industries enhance not only the people's social life, but also act as a catalyst to other investments, which contribute to sustainable development and inter group relations within the region and beyond.

Indigenous technologies encourage the sustainable use of natural resources and the preservation of cultural values. For instance, the ashes produced from cashew processing in Umundu are used as manure in the farms; while the burnt shells serve as fire-wood. The industry serves as a source of income and the nut itself is a source of food. The products of black smiths, when sold, give sustenance to the smiths and their families (Ibeanu and Okonkwo, 2015). To spice up our discussion, one indigenous industries/technologies will be discuss here-under

### **Oil palm processing industry in Nigeria**

The southern region of Nigeria is endowed with palm trees as a major economic resource. A study by Osei-Amponsah, Agbotse, Swanzy and Stomph, (2018), find out that oil palm fruit processing involves harvesting, threshing or bunch quartering, fruit loosening, boiling, and digestion, pressing/oil extraction, clarification and packaging/storage. All these stages are done manually except the digestion or pounding of cooked fruits which is done by a diesel engine powered digester equipment (Osei-Amponsah, et. al. 2018). In Nigeria, oil palm-processors are classified into mechanized, semi-mechanized and smallholder categories based on the level of processing (Alabi, Famakinwa and Akinnawonu, 2020). Basically, the sector is dominated by smallholder-processors accounting for over 80% of Nigeria oil palm industry and using rudimentary equipment for processing (Ohimain, Emeti and Izah, 2014). Similarly, the semi-mechanized palm oil processors account for about 16% while the rest 4% are mechanized processors (Ohimain and Izah, 2013). The industry is a source of livelihood to a large proportion of households in the rural areas of southern Nigeria. The employment opportunities in oil palm-processing are numerous, ranging from the nursery of the oil palm seedling, plantation farming, and palm oil mills and marketing of the final product, palm oil. Ohimain, Oyedeji, and Izah, (2012) reported that smallholder palm oil processing employs 3 – 12 workers (mean = 8) depending on the quantity of fresh fruit bunch available for processing. Similarly, Ohimain, Oyedeji, and Izah, (2012) also reported that semi mechanized processing has employment capacity of about 11 persons. No doubt, the sector needs advancement in research and improvement in technologies to exploit its full potentials for the maximum benefit of the rural people in Nigeria.

### **Conclusion**

The contributions of indigenous industries/technologies to the development of rural areas have been quite remarkable. It is, therefore, true to say that if not for the efforts made by inhabitants of most rural dwellers in Nigeria to improve economic activities in their localities, present day development achievement, though very poor, would not have been realized. What most rural areas enjoy today as development is largely due to their indigenous industries/technologies that have made it possible for them to connect to the urban areas through transacting businesses and moving their products to market places. What has been very challenging overtime is the environment in which these indigenous industries/technologies operate. The challenges emanate from the fact that the country's political leadership has not keyed into tapping and harnessing the potentials of indigenous technology; thereby forcing most of the industries to rely on archaic mode of production which is relatively frustrating with negative effects on production quality and quantity. The paper concludes that indigenous technologies have contributed immensely to the development of the rural areas, notwithstanding, the obvious drawbacks identified in the study. Therefore, it is imperative for government to fund research efforts toward improving indigenous technological innovations, which will go a long way to enhance indigenous technology, as well as, boost rural development efforts.

**References**

- Akinwale, Y. (2018). Descriptive analysis of building indigenous low-carbon innovation capability in Nigeria. *African Journal of Science, Technology Innovation and Development*, 10, (5), 601-614.
- Aziz, S. (2009). *Rural development: Learning from China*, London, Macmillan Press.
- Alabi, D.L., Famakinwa, M. & Akinnawonu, O. E., (2018). Oil palm fruits, Postharvest activities, Involvement, Rural households: *Journal of Agricultural Extension*, 24 (1).
- Brademas, J. Curriculum in the year 2000 (1989). *Liberal Education*, 75(No.1), 26-27.
- Dayanatha, J., (2006). *Indigenous technology and agricultural research system*. *Agric. Econ. Res. Rev.*, 21: 1-4.
- Dekoya, A. E. (2012). *Technological and social change in agriculture*, Published by National Open University of Nigeria.
- Eionet, (2012). *Indigenous technology. Eionet Gemet Thesaurus-concept version 3.1*, 2012-07-20 <http://www.eionet.eu/gemet/concept?ns=1&cp=4205> accessed 14/02/2013.
- Enukora, L. O. (1990). Towards the development of indigenous technology in Nigeria. The informal sector model. *Nig. J. Tech. Edu.*, 7: 32-41.
- Grenier, L. (1998). *Working with indigenous knowledge. A guide for researchers*, IDRC, Ottawa, 1998.
- Gana, J. (2006). A strategy for integrated rural development in Nigeria. A paper presented to the Directorate of Foods, Roads and Rural Infrastructures (DFRRI), Presidency, Lagos.
- Harry, D. M. (2013). Research, technology transfer and socio-economic development in Nigeria: Some lessons from the Asian economies. *Mediterranean Journal of Social Sciences MCSE Publishing, Rome-Italy*, 4 (8).
- Ibeanu, A. M. & Emeka E.O. (2015). *Indigenous technology and cultural practices in Umundu, Nigeria*: <http://www.researchgate.net/publication/280603460>.
- Isioto, N. N., Philip-kpae F. O. & Dickson, R. (2017). Factors affecting technological growth in Nigeria and the way forward. *International Journal of Mechanical Engineering and Applications* 5(5), 269-274.
- Kothari, C. R. (2013). *Research methodology methods and techniques*, New Delhi: News Age International Limited Publishers.
- Labe, B. I. (2008). Exploring local indigenous techniques as a context for basic technology education in Nigeria. *J. Natl. Assoc. Sci., Humanities and Edu. Res.*, 6, 224-232.
- Lucky, O. O. & Samson, I. O. (2013). Research and Development Initiatives in Nigeria: Challenges and Prospects. *Mediterranean Journal of Social Sciences*, 4 (2).
- Mabogunje, A.L. (2010). *The development process; A spatial perspective*, London, Hutchinson Publishers.
- National Centre for Technology Management (NACETEM), (2008). *Indigenous technology mapping and analysis of skills acquisition methodologies in the aluminium and bronze casting industry in Nigeria*, Policy Research Project Funded by the Federal Government of Nigeria.
- Ohimain, E. I. & Izah, S. C. (2013). Gaseous emissions from a semi-mechanized oil palm processing mill in Bayelsa state, Nigeria. *Continental Journal of Water, Air and Soil Pollution*, 4, 171-181.
- Obasi, I. (2007). *Politics and globe dictionary*. Enugu: Keny & Brothers Enterprises.
- Ohimain, E. I., Daokoru-Olukole, C., Izah, S. C., & Alaka, E. E. (2012). Assessment of the quality of crude palm oil produced by smallholder processors in Rivers State, Nigeria. *Nigerian Journal of Agriculture, Food and Environment*, 8, 28-34.

- Ohimain, E. I., Emeti, C. I., Sylvester, C., Izah, S. C., & Eretinghe, D. A. (2014). Small- scale palm oil processing business in Nigeria; A feasibility study. *Greener Journal of Business and Management Studies*, 4(3), 70-82.
- Okorafor, A. O. (2014). Developing indigenous technology for harnessing local natural resources in Nigeria: The Place of Technical Vocational Education and Training: *International Journal of Science and Technology* Volume 3 No. 8, August, 2014.
- Orbach, R. L. (2001) Universities should be honest brokers between business and the public sector. *The Chronicle of Higher Education*, 47 (30), 13-20.
- Osei-Amponsah, C., Agbotse, P., Swanzy, F. & Stomph, T. J. (2018). Role of smallscale enterprises in Agricultural Development Agendas: Insights from oil palm processing enterprises in the Kwaebibirem district of Ghana. *Ghana Journal of Agric. Sci.*,52, 131-144.
- Oyesola, G. O. (2010). *The contribution of research to the development of the national. Education system* <http://unilorin.edu.ng/journals/education/ije/sept1988/the%20contribution%20of%20research%20to%20the%20development%20of%20the%2>.
- Redman, L.V. & Morry A.V. (1973). *The romance of research*, New York; Halt, Rinhehart and Winston inc.
- Sachs, J. D. (2005). *The end of poverty: How we can make it happen in our lifetime*, England: Penguin Book Ltd.
- Stephen J.I., (2011). Indigenous technology and agricultural production: The case of poultry incubator. *International Journal of Poultry Science* 10 (6), 493-495.
- Ukwuoma, O., Adelowo, C.M., Adebowale, B.A. & Akinwale, Y.O. (2018). Harnessing indigenous innovations for economic development in Nigeria. *Sokoto Journal of the Social Sciences* 8, (3).
- Ubani, E., Alum, C., Eke, U., Isigwe, P & Obasi, P. (2013). *Issues in rural development*, Aba: Ker Expert book.
- Warren, D.M., Slikkerveer, L. J. & Brokensha, D. (1995). “*The cultural dimensions of development: indigenous knowledge systems*,” Intermediate Technology Publications, London.
- Willie, O. S, Abiodun, A. E., Isola, O., Olumuyiwa, O. O., Helen, O. A & Mohammed, S. (2012). Indigenous technologies and innovation in Nigeria: Opportunities for SMEs: *American Journal of Industrial and Business Management* 2, 64-75.
- World Bank Group (2013). *What is indigenous knowledge?* <http://www.worldbank.org/afr/ik/basic.htm> [accessed 14/02/2013].