

## **DIVERSIFICATION OF NIGERIA ECONOMY THROUGH SCIENCE EDUCATION: THE PROSPECT AND CHALLENGES**

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### **Abstract**

Nigeria is endowed with vast arable land intertwined with abundant human resources, mineral deposits and cash crops. Although the country is blessed with these abundant natural resources, sufficient efforts have not been made to exploit these abundant resources because of overdependence on mono –economy. Among the objectives of secondary, technical and tertiary education as stated in the National policy in education in Nigeria is to provide entrepreneurial, technical and vocational job-specific skill for self-reliance and for agriculture, industrial, commercial and economic diversification. Nigeria has high population of scientists and technicians who can exploit these abundant resources, thereby diversifying the economy, yet they are not employed. In fact, since the discovery of crude oil in commercial qualities in otuabagi at oloibiri in Bayelsa Nigeria in 1956, she has abandon other sectors of her economy such as agriculture and solid minerals virtually found in every state of the country in pursuance of revenue from crude oil. However, since the fall in crude oil price in 2016, it became imperative that Nigeria economy should be diversified because her economy is deeply rooted in crude oil. In recent time, diversification of economy has become a national issue because of downward trend in crude oil prices. This paper, therefore examined critically the impact of science education and scientific knowledge in economic diversification in Nigeria. The economic recession in some cases based on mono -economy demands that we resuscitate and use the natural resources such as palm and coconut fronds for weaving local mats and fans, clay for molding pots, bricks and ceramic materials, potassium nitrate, ash and urine for the production of gunpowder, recycling of waste materials and massive investment and exploitation of agricultural products. This paper equally examined the challenges of achieving

the economic diversification policies. Some recommendations were made to speed up the rate of the economic diversification in Nigeria and indeed the entire Africa.

**Keywords:** Diversification, Economy, Science education.

Economic diversification has been identified as veritable tool for the enhancement of standard of living and government sustainable income for nation's growth and development. It is a process of broadening the economic base, activities and status of government in both production and distribution of goods and services (Anyaehe & Areji, 2015). Nigeria is the most populated black race, having an estimated population of 192 million people with abundant natural resources distributed in all parts of the nation.

This amazing population consists of great scientists, people of divergent culture, occupations and religion capable of transforming the economy of the nation. Some of them have acquired adequate scientific knowledge and entrepreneurial skills through science education which have equipped them to boost the diversification of the nation's economy. Science education is viewed as the area of study which produces scientifically literate citizens (Lawal, 2015). The level of science education determine the status of health services, agricultural production, entrepreneurial advancement, technological development and economic growth.

Economy is viewed as the social interaction that emphasizes the practices, discourse and material expression

associated with the production, use and management of available resources (Wikipedia, the free Encyclopedia). Although the nation has high population of scientists, technicians and artisans, she still relies on mono- economy because of poor visual literacy and high rate of unemployment. In fact, since the discovery of oil in commercial quantity in Bayelsa in 1956, Nigeria had abandoned other sectors of her economy such as agriculture, solid minerals and recycling of wastes materials in pursuance of proceeds from the crude oil. Crude oil presently accounts for about 90% of the nation's revenue which signifies over independence on the sector.

However, since the fall in crude oil price in 2016, it became imperative for Nigeria to diversity her economy to embrace non-oil sectors such as recycling of waste materials, weaving of baskets, mats and fan, agro-based products and solid minerals.

### **Diversification of Economy through Recycling of Waste Materials**

The vexing issue in developing countries like Nigeria is the rate at which wastes are constantly dumped at strategic places in our environment. Nigeria with an estimated population of about 192 million people (United Nation Estimate, 17<sup>th</sup> July 2017) discharge several metric tons of solid, liquid and gaseous wastes emerging

from industries, offices and residential homes into the environment daily. These materials considered as wastes by some people can be reclaimed and re-used by another group of people in the process properly tagged recycling.

Recycling is the process of putting back into use those waste materials that pollute the environment (Ozioko 2015). In many developing and developed countries of the world, the problems of waste materials have been effectively tackled through efficient and effective recycling of various categories of waste materials. One of the positive impacts of recycling waste materials is the production of new products and creation of healthier environment.

#### **The Rationale for Recycling of Waste Materials in Nigeria**

The benefits of recycling the waste materials abound. These include the following:

- Recycling protect the environment. Recycling of waste papers help to prevent cutting down of more trees (deforestation) meant for production of new products such as toilet tissues, exercise books and envelopes.
- The energy consumed in producing new products is conserved through recycling. About 70% of energy is wasted in processing and production of new products.
- Another rationale for recycling of waste materials is to prevent various types of pollution. Recycling of waste materials such as papers, various sizes of cans,

chemicals such as oil and plastic materials help to reduce pollution.

- It also contributes to the reduction of global warming. Burning waste materials such as papers and chemicals help to produce large amount of green house gas emission such as carbonic oxide and chlorofluorocarbons (CFCs) which contributes in the destruction of ozone layer.
- Recycling of waste help to conserve natural resources such as trees, iron ores and natural habitats such as trees
- Create jobs to unemployed youths and equally scavengers
- It equally reduces the amount of waste materials carried to landfills.
- Finally, recycling reduces the importation of raw materials thereby conserving the revenue of the country.

#### **Methods of Recycling Waste Materials**

Recycling of waste takes place in different ways which include mechanical recycling, thermal recycling and chemical recycling. Mechanical recycling is the process of recycling the waste materials without changing the chemical structure of the materials. Too much heating is not required. Chemical recycling requires purification of chemical substance. In this case, the molecular structure of the substance is altered. Thermal recycling of waste materials requires great heat to melt the substance for the aim of producing new products.

Local recycling is done in rural areas where there is no source of power supply like electricity and it require heating of

substance like abandoned scraps of irons. It involves the combination of thermal and chemical recycling of waste materials. In thermal recycling, the blacksmith and goldsmith subjects the metals to great heat and reshape the wastes materials into new products.

The chemical recycling involves extracting and purifying liquids from plantain and Banana into pure water for processing palm nuts and cooking food. This type is practice where the source of water is very far from residential areas. The villagers normally prepare strata of palm kernel, fiber from palm nuts and sand in which they allow the liquid substance to drain through them. The water extracted is sold locally for domestic use such as boiling and processing of palm nuts.

S/N	Types of Recycling	Waste Materials Recycled	New Products
i	Chemical Recycling	(i)Ammonium sulphate. (ii)Iron chloride (iii)Abandon palm oil/crude oil.	Sulphuric acid Hydrochloric acid Vegetable oil and grease.
ii	Mechanical Recycling	(i)Waste papers (ii)Waste cotton (iii)Clay (iv)Waste glasses	Toilet tissue, exercise books, envelopes, wall paper and paper bags. Yarn, sewing threads Ceramic plates, bricks, cups, pots and tiles. Window blades, glass cups and mirror.
iii	Thermal Recycling	(i)Iron scraps	Iron rod, Nails, Plates and Knives.
iv	Local Recycling	Abandoned iron	Hoe, Knives, Diggers, Sickle, Cutlass.

Source: Ozioko (2015) recycling of waste materials for poverty eradication and National development

### **Factors that Hinder the Effective Recycling of Materials in Nigeria**

#### **i. Availability of Scavengers.**

Scavenging is a hazardous work which is dangerous to the health of scavengers. Scavenging is regarded as poor people's work and is limited to few individuals.

**ii. Lack of power supply.** The greatest problem in economic advancement in the country is lack of power supply in Nigeria. Poor power supply retards the rate of production in industries.

**iii. Insufficient funds.** Enough fund and capital are the vital tools for establishment of recycling business. Fund is needed to pay salaries and buy spare parts of equipment.

**iv. Lack of sufficient and efficient equipment.**

### **Weaving as a Way of Economic Diversification and Revenue Generation in Nigeria**

Weaving is culturally affiliated profession found in some tribes in Nigeria. It is another strategy of diversifying the economy of the Nation. The attractive products of weaving include baskets, mats, fans and Akwete clothes. In south East part of the country weaving is male dominated profession except weaving of Akwete clothes. The process of making basket is hazardous and requires climbing palm trees to cut down palm fronds. It is

male dominated profession because it is taboo for females to climb palm trees.

Baskets are woven into different sizes and shapes with palm frond ropes to serve different purposes. Big basket of semi-circle shape sales for about eight to one thousand Naira (#800- #1000) depending on the strength of the basket (Interview conducted with Ugwu Micheal, 2017). Baskets serve many purposes such as transportation of agricultural products such as tomatoes, cashew nuts and mango. It is also used to transport domestic animals like fowls, local dogs and snails. Baskets are important export products of Nigeria as they are exported to African countries and other parts of the World. The painted baskets for interior decoration are exported to almost all parts of the world. Weaving basket is not only common to Nigerians but also done in Botswana. The basket woven from Mokola palm has become souvenirs of great importance to Botswanas (Demotts, 2017).

Fans and mats are also important products of weaving mangrove leaves in Nigeria. Mats and fans are regarded as mobile sleeping materials and the woven products are exported to all parts of Africa. They are mostly used during the dry season when the weather is hot. The mats and fans are sold for one thousand Naira (#1000) and one hundred (#100) Naira respectively.

### **Diagram of Locally Woven Baskets**



The “Akwete” clothes are also woven using yarns from cotton. The woven akwete materials are sewn for different traditional outfits in all parts of Africa especially for cultural celebrations.

### **Diversification of Economy through Effective Revival of Agricultural Sector in Nigeria**

Before the discovery of crude oil in commercial quantity in Oloibiri in Bayelsa, Nigeria in 1956, agricultural products had been the mainstay of the country’s economy. It provided food, raw material for industries, revenue and

employment for youths. Agricultural products exported to other countries accounted to about 60 percent of Nigeria's Gross Domestic product (GDP) in 1960 Adah and Adejeh (2005). Before the oil boom in 1970's and 80's the dominant agricultural products that sustained Nigeria were produced in the four regions, East, North, West, and Mid- western regions.

The Eastern region was predominantly producers of palm products such as palm oil, palm kernel, palm wines and baskets. The western region was famous because they produce cocoa in large quantities. The northern region was known for production of groundnut, root-tubers, cereals and cotton. The Latex from rubber was massively extracted by the mid-western region. These products constitute the major export products and revenue to the country then.

However due to oil boom, Nigeria was forced to abandon the agricultural sector which surprisingly forced the country into mono-economy. Consequently, the economic recession of 2016 which emanated from downward trend in oil prices, compelled Nigeria to start diversification of her economy. Nigeria is endowed with vast arable land and high population of human resources to aggressively embark on production of various types of agricultural products.

The current trend of annual food production in Nigeria is 1.35%. The Central Bank of Nigeria Annual food production Report (2010) listed the following products as the major export products of Nigeria. The foodstuffs were

grouped into five categories of Root tubers, cereals, fruits, vegetables.

**Table Below Shows the List of Exportable Commodities from Nigeria.**

	Root-tubers/stem.	Cereals	Fruits/seeds	vegetables
ii	Yam flour.	Maize.	Plantain,	Lettuce.
iii	Cassava flour.	Rice.	Banana.	Fluted pumpkin leaves
liii	Sweet potato.	Millet.	Cocoa.	Amaranthus/Green.
iv	Cocoyam.	Sorghum.	Palm oil from palm nuts	Bitter leaves.
vV	Carrot.	Wheat.	Orange, grape, pear, date palm, cashew, ogbono, melon, groundnut, cowpea.	Oha.
VI	Ginger.	Beans.	tomato	Water leaves.
VII	Garlic.	Soya bean.	Cola nuts, Nsukka pepper, bitter kola.	Coffee.

Source: CBN Annual Report and Federal Office of Statistics (2010).

In addition, Nigeria is also endowed with a lot of solid minerals found in almost all the 36 states Nigeria. These solid minerals are another major source of diversification of Nigeria's economy. The exportable solid minerals are as shown below.

	Types of solid minerals	States where they are found.
ii	Bitumen	Edo Lagos
iii	Coal	Enugu, Benue, Ebonyi, Edo, Gombe, Imo and Plateau.
iii	Salt	Ebonyi.
iv	Limestone	Kogi, Sokoto, Edo, Ebonyi and Benue.
v	Iron ore	Kogi, Enugu, Abuja
vi	Tin ore	Plateau.
vii	Lead, zinc	Ebonyi, Abuja, Ebonyi, Cross-River.
viii	Gold	Sokoto, Niger, Osun, Kwara, Kebbi, Kaduna.
ix	Columbit	Plateau, Bauchi, Kwara, Kaduna, Cross-River.

Source: Interview conducted at Alvan Ikoku Federal College of Education Owerri, Imo State, Nigeria.

These solid minerals are found in large quantity but are not fully extracted for export. Coal is known to empower industries that require heating process such as thermal engines as witnessed in Orji River Electricity Power Station. Coal is ranked as one of the highest export commodity before the oil boom. Limestone and iron ore are being exploited vigorously for both local consumption and export too in Ebonyi and Kogi state.

#### **Production of Black Powder (Gun Powder) for Export in Nigeria**

The black powder popularly known as gunpowder is locally made in Nigeria. The raw materials for the production of gunpowder are potassium nitrate, charcoal (specifically burnt cassava stem) and sulfur. Sulfur and charcoal provides fuel for the reaction

while the oxygen required for the burning comes from the potassium nitrate (Onyelowe, 2012). It is produced massively at Agbamere, Eha-Alumona in Nsukka Local Government Area of Enugu State, Nigeria.

It is produced for both local consumption and export. It is occasionally used during festivals, burial ceremony and for hunting. In the past, when it is fed into the Den guns with pebbles, it serves as weapons for war and hunting. It is used as explosive materials for rock blasting and pre- splitting of rock. It is highly flameable and serious precautions should be taken in handling the product.

#### **Challenges of Economic Diversification in Nigeria**

Since the downward trends in the oil price and economic crisis in Nigeria, government had been making serious effort to diversify her economy in various sectors. However, there are serious challenges of diversifying the economy. Such challenges include: Brain-drain, inadequate power supply, Poor infrastructure, High rate of corruption, Lack of funds, Poor and unstable educational system, Poor visual literacy.

#### **Brain-Drain**

Brain-drain is the mass movement of the engineers, geologist and technicians out of the country in search of improved standard of living. To achieve reasonable standard of economic diversification, the nation needs high population of experts such as geologist, Engineers and technicians in

various sectors of the economy such as agriculture, mining, trade and services. The employment of these experts helps to boost the diversification of economy, but they move out to other countries.

#### **Inadequate Power Supply**

The epileptic power supply in form of electricity and gas prevents large scale production of commodities for export. The electricity and gas supply to industrial cluster had been judged to be poor and not satisfactory. The poor power supply coupled with high electric bill had incapacitated the industries and factory production of about 10 tons of commodities will be forced to produce half of the capacity.

#### **High Rate of Corruption**

High rate of corruption is becoming a global challenge. It is predominantly found in governance, management and trade. Corruption has forced industries to fold-up and sack their employers. Big factories like cement manufacturing factory, vegetable oil processing industries and canned food processing industries built with billions of Naira had been abandoned because of corruption and stealing of important equipment. The politicians and managers of industries divert the allocation meant for repairs, purchase of spare parts and payment of salaries into personal accounts.

#### **Lack of Funds**

Adequate fund is required for building industries and payment of salaries so as to

enhance diversification of economy. The importation of spare parts, chemicals and purchase of equipment require large sums of money. The conditions for borrowing from banks had become unbearable for the private proprietors and that hinders the establishment of new industries and sustenance of the old industries. Diversification can only be achieved by erecting new industries that deals with agricultural and extracted raw materials from mine such as coal mines, limestone and tin ores.

#### **Poor Infrastructure**

Diversification of economy requires tremendous improvement in the area of infrastructure such as roads, laboratory, dams, electricity, storage facilities, water supply and gas supply. Infrastructure such as roads should be constructed to link the rural area so as to transport the raw materials to industrial areas. Developed countries are held in higher esteem because of availability of infrastructures in the country. Nigeria is seriously backward in terms of infrastructure compared to the land mass and population. Laboratories for testing and standardization of export commodities are grossly inadequate.

#### **Poor Visual literacy**

Visual literacy is the ability of leaders, managers and traders to forecast and plan ahead to avoid retrogressive events such as economic recession. Poor visual literacy has been and is still the set back of economic diversification in Nigeria. Our leaders did not predict very well when they organized event such as FESTAC

during the oil boom. The resources used for the occasion should have been used to build many industries for the production of different products such as canned food, gunpowder, vegetable oil and to build strong and reliable transport outfit in Nigeria

#### **Poor Transport and Communication**

**Outfit:** Many agricultural commodities such as cereals, tubers and seeds are usually extracted in rural areas for processing because of access roads. The processed products also suffer the same problem of being transported to export zones or sea ports. In rural areas too, some people still communicate with gunges and flutes due to absence communication mask to cover the area. The perishable commodities occasionally get spoilt or damage due to poor transportation outfits such as railways, roads and seaports. Trains and big trucks are insufficient to convey these commodities to places where they are needed.

#### **Poor and Unstable Educational System**

Well planned and executed education is the pivot for sustainable economic diversification in Nigeria. There are acute shortage of technicians and engineers who are well trained to speed-up the economic diversification of the country. Socio-economic status of parents and strikes also retard the pace of educational progress in Nigeria. Government at all levels should train sufficient professional to boost economic diversification in Nigeria.

#### **Conclusion**

The economy of Nigeria has been bastardized by over-dependence on mono-economy (crude oil) since 2016. The economic recession due to fall in oil price has seriously affected the standard of living in Nigeria. It therefore becomes imperative for government to diversify her economy to improve the economic status of the country. The economic diversification process can only be achieved by establishing functional industries, construction of good roads and railways, improvement in transportation outfits and formulating policies to tackle ever increasing corrupt practices in Nigeria. This will make economic diversification a reality rather than myths.

#### **Recommendation**

It is pertinent at this juncture to mention some ways to fast track economic diversification in Nigeria.

##### **1. Adequate and functional transport systems should be provided.**

The transport outfit should include development of more and efficient seaports, airports, roads and railways to boost the transport of agricultural and solid minerals to places of need. Spare parts should also be made available and cheap.

##### **2. Adequate power supply:**

Installation of power sources such as electricity and gas pipelines are vital to serve industries cited in rural areas. Stable and efficient power supply will also encourage diversification of economy in Nigeria.

3. **Provision of functional infrastructure:** Roads and railway system should be established massively to connect the hither lands. Storage facilities like ware houses and ban are crucial to preserve the available commodities. Laboratories are also very important for testing the available commodities for export.

4. **Provision of sufficient funds for establishment of industries:** The Country can only diversify her economy by establishing enough industries which is dependent on available funds. The development of basic infrastructure also depend of funds and equipment.

5. **Corrupt practices should be discouraged:** Embezzling of public funds should be discouraged.

6. Government should also employ graduate to avoid brain-drain in the country.

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