CHAPTER 7

Resuscitation of Organic Farming in Nigeria: an Inevitable Option for a Country that Abandoned Agriculture for Crude Oil.

'Tola Badejo
Department of Zoology, Obafemi Awolowo University, Ile-Ife
email: ***mbadejo@yahoo.com*** GSM No: 0803 8251 321.

Discovery of Crude Oil in Nigeria and the Decline of Agricultural Production.

It is doubtful if many Nigerians know that crude oil exploration in Nigeria dates back to 1903 when Nigerian Bitumen Corporation conducted exploratory work in the country. This firm lacked the technological and financial resources needed to make any impact. As a result, the colonial government then under Lord Frederick Lugard (1914-1919) and Sir Hugh Clifford (1919 to 1925) gave licences to two companies: D'Arcy Exploration Company and Whitehall Petroleum. When these two companies did not find oil of commercial value, they returned their licensees in 1923 (Frynas, 1999). A new licence was later given to Shell D'Arcy Petroleum Development Company of Nigeria, a consortium of Shell and British Petroleum (Shell-BP). The company began exploratory work in 1937. Drilling activities by this consortium did not start until 1951 with the first test well drilled in Owerri area. Oil was eventually discovered in non-commercial quantities at Akata, near Eket in 1953 (Frynas, 1999). It was in 1956 that Shell-BP eventually found oil in commercial quantity in Oloibiri in the Niger Delta area (now Bayelsa State) and the first oil field began production in 1958 (Anon, 2012). Subsequently, non-British firms such as Mobil, Tenneco, Gulf Oil, Chevron, Agip and Elf were granted licence to explore for oil. This was between 1955 and 1962. Ironically, Nigerians living in the oil-producing areas prior to the discovery of oil, thought the developers were looking for palm oil (http://news.bbc.co.uk/2/hi/africa/7840310.stm). During this period, Nigeria strongly relied on agricultural exports to other countries to sustain the economy.

Prior to the civil war in Nigeria (1966-1970), the Federal Government of Nigeria confined its financial involvement in the oil industry to taxes and royalties on the oil companies. The war however had a largely negative impact on the oil industry. Total Crude oil output dropped significantly by 66% between 1966 and 1968 and the oil companies began experiencing uncertainty as to the future of their investments depending on who prevailed in the war. Relations between oil companies and the Federal Government became strained, with the government at one point accusing some oil companies of favouring the secessionists and enlisting the aid of France for their cause. But for Britain's staunch support of the Nigerian government in the war, the Federal Government would have lost all the oil output to the secessionists (Uche. 2008).

It was during the civil war that the Federal Government changed the relationship between the government and the petroleum industry. The military government under General Yakubu Gowon instituted the 1969 Petroleum Decree which dismantled the existing revenue allocation system that had divided revenue from oil taxes equally between federal and state governments. Thus, an

allocation formula was put in place to ensure that the Federal Government controlled the dispensation of revenues to the states (Khan, 1995).

After the civil war, the Government of General Yakubu Gowon, in May 1971, nationalized the oil industry by creating the Nigerian National Oil Corporation (NNOC) via a decree. The idea was to secure and gain more control over the oil industry. Nigeria joined OPEC later that year (Soremekun, 1983; Iwayemi, 1984) which encouraged member states to acquire 51% stakes in their oil sector.

This is the story of the oil boom of the 1970s which the successors of Yakubu Gowon (Murtala Mohammed and Olusegun Obasanjo) inherited. It was indeed an era when the political economy of petroleum in Nigeria became characterized by endemic patronage and corruption by political elites in military uniform and their civilian cohorts.

In 1972, the military regime under Gowon declared that all property not currently owned by a foreign entity was legally the property of the government. This gained jurisdiction over the sale and allocation of concessions to foreign investors. In 1974, another Decree increased the participation in oil industry by government to 55%. In 1975, a Decree increased Federal Government's share in oil sector to 80%, with only 20% going to the states. In 1976, the first exploration and development venture by NNOC was undertaken to uncover commercial quantities of petroleum off-shore. The successive military governments in the 1970s continued to garner control over oil revenues through decrees. In 1978, the Federal Government under General Olusegun Obasanjo created the Land Use Act which vested control over state lands in military governors appointed by the Federal Military regime. This eventually led to Section 40(3) of the 1979 constitution which declared all minerals, oil, natural gas, and natural resources found within the bounds of Nigeria to be legal property of the Nigerian Federal Government (Smith and Simon, 2014). In 1979, the NNOC and the Ministry of Petroleum were merged to form the Nigerian National Petroleum Corporation (NNPC) thereby establishing further control over the oil industry.

Subsequently, fluctuations in oil revenue followed the trajectory of political instability as civilian and military governments exchanged batons. Agricultural production, which was the mainstay of the country's economy, started dropping as Federal Revenues from oil was increasing. Available data show that at independence in 1960 the contribution of agriculture to the GDP was about 60%. This declined over time to 25% in 1979. Between 1970 and 1982, population growth was between 2.5 to 3.0 per cent per annum but agricultural production stagnated at less than one percent annual growth rate. There was a sharp decline in export crop production, while food production increased only marginally. Thus, domestic food supply had to be augmented through large imports. The food import bill rose from ₦112.88m annually during 1970 - 1974 to ₦1, 96b in 1991 (Ayoola, 2001).

Between 1972 and 1983, Cocoa production, a cash crop which provided revenue for the Western region of the country in the 1950s and 1960s dropped by 43%. Production of cotton, groundnuts and rubber in other regions dropped by 65%, 64% and 29% respectively. National output of staple foods also fell drastically (Ayoola, 2001). This was a retrogressive development for a country which in 1960, just after independence, was self-sufficient in terms of food production. It is on record that before independence, agricultural production was responsible for 97% of all revenue from exports. Today, Nigerians rely on food importation for survival.

According to Okoi (2019), the most provocative policy of the Nigerian government was the dependence on oil resources as a source of foreign exchange earnings to the detriment of agriculture. The collapse of oil prices every now and then produced severe consequences such as a shift in the global economy that triggered a crash of the stock market, soaring inflation, and high unemployment rate in Nigeria. By implication, the dependence on oil revenue to finance national development has made the Nigerian economy highly susceptible to oil price volatility which has been accentuated by rising commodity prices, gross devaluation of the naira against the U.S. dollar, and the effect of poor economic performances on unemployment, poverty, crime, and insecurity. Consequently, successive Nigerian governments since 1999 under a more stable democratic dispensation have been forced to seek economic diversification and have identified agriculture as one of its key goals to help address the country's dependence on oil and food imports.

History of Agricultural practices in Nigeria

The agricultural history of Nigeria is inextricably intertwined with its political history. This can be assessed from the pre-colonial, colonial and post-colonial periods. In the pre-colonial period (1500 – 1800), the Yorubas who occupied the area referred to as the western region in and after the colonial era organized themselves into patrilineal groups that occupied village communities and subsisted on agriculture. In subsistent agriculture, farmers grow food crops to meet the needs of themselves and their families. Farm output was targeted to survival and is mostly for local requirements with little or no surplus for trade. The typical subsistence farm had a range of crops and animals needed by the family to feed and clothe themselves during the year. Planting decisions were made principally to satisfy what the family will need during the coming year, and secondarily toward market prices. Waters (2007) defined subsistence peasants as people who grow what they eat, build their own houses, and live without regularly making purchases in the marketplace.

There was self-sufficiency in subsistence farming in the pre-colonial and colonial era. With time, elements of trading crept in, first by barter, later through cash as demands for materials not produced in their farms grew (Miracle, 1968). In subsistence farming, a patch of forest land is cleared by a combination of felling and burning after which crops are grown. After 2–3 years the fertility of the soil begins to decline, the land is abandoned and the farmer moves to clear a fresh piece of land elsewhere in the forest as the process continues. While the land is left to fallow, the forest regrows in the cleared area and soil fertility and biomass are restored. After a decade or more, the farmer returns to the first piece of land. This form of agriculture is sustainable at low population densities, but higher population loads require more frequent clearing which prevents soil fertility from recovering, opens up more of the forest canopy, and encourages scrub at the expense of large trees, eventually resulting in deforestation and land erosion (de Janvry and Sadoulet, 2011).

Organic inputs have never been alien to subsistence farming. The slash and burn component provide fertilizers (ash) while farms near the homestead regularly received household refuse, domestic animal droplets and compost. Irrigation is sometimes done if the farm is close to a water source.

In the more northern parts of the country, Fulani herdsmen migrate along with their animals from one place to another in search of fodder for their animals. Generally, they rear cattle, sheep, goats, camels etc. for milk, skin, meat and wool. They carry their belongings, such as tents, etc., on the backs of donkeys, horses, and camels, an agricultural practice known as Pastoral farming.

Population growth in Nigeria.

The population of Nigeria has been rising steadily from 41.1m in 1955 to 206.1m in 2020 (Table 1). The Table shows the different population parameters in Nigeria in selected years before and after independence. Growth rate was highest during the oil boom decade i.e. in the 1970s.

Table 1. Population growth and densities of the people of Nigeria from 1955 to 2020, (Adapted from: http://worldpopulationreview.com/countries/nigeria-population/)

Year	Population	% Male	% Female	Density (km²)	Growth Rate
2020	206,139,589	50.68%	49.32%	206.10	2.58%
2010	158,503,197	50.57%	49.43%	171.58	2.68%
2000	122,283,850	50.41%	49.59%	132.38	2.53%
1990	95,212,450	50.31%	49.69%	103.07	2.64%
1980	73,423,633	50.27%	49.73%	79.48	2.99%
1970	55,982,144	50.01%	49.99%	60.60	2.23%
1960	45,138,458	49.91%	50.09%	48.86	1.90%
1955	41,086,100	49.89%	50.11%	44.48	1.65%

The soaring population during the oil boom era was one of the reasons why pressure on land made subsistence agriculture unsustainable. Fallow periods became shorter, crop yields became lower and the desire to feed the increasing human populations led farmers to transit to inorganic means of increasing productivity. Government started formulating policies that gradually eroded the sustainability factor in subsistent agriculture.

Agricultural establishments and programmes aimed at increasing food production in Nigeria

In an attempt to address the dwindling resources accruing from Agriculture, several agricultural research institutes and their extension research liaison services were established, some of which are:

- Agricultural Extension and Research Liaison Service (AERLS) at the Ahmadu Bello University, Zaria established in 1963
- The International Institute of Tropical Agriculture (IITA) established in 1967
- Institute of Agricultural Research and Training (IAR&T) Ibadan established in 1969
- International Livestock Centre for Africa (ILCA) established in 1994

So also, programmes and initiatives aimed at increasing food production and reviving agriculture were established. These include:

- National Accelerated Food Production Programme (NAFPP) in 1972
- National Agricultural Cooperative Bank (NACB) in 1973
- Agricultural Development Projects (ADP) in 1974
- Operation Feed the Nation (OFN) in 1976
- The River Basin Development Authority (RBDA) in 1976
- The Green Revolution (GR) programme in 1980
- Directorate for Food Roads and Rural Infrastructure (DFRRI) in 1986
- Better Life Programme (BLP) For Rural Women in 1987
- The Nigerian Agricultural Land Development Authority (NALDA) in 1992
- National Fadama Development Project (NFDP) in the early 1990s
- Family Support Programme (FSP) in1994
- Family Economic Advancement Programme (FEAP) in 1996
- National Economic Empowerment and Development Strategy (NEEDS) in 1999
- Presidential Initiatives on selected commodities: Cassava, Rice, Cocoa, Vegetable oil, Livestock and Fisheries in 1999
- National, Special Programme on Food Security (NSPFS) in 2002
- Root and Tuber Expansion Programme (RTEP) in 2003
- Agricultural Transformation Agenda (ATA) in 2011

All these programmes failed one after the other. The reasons they failed in quick succession have been elucidated by Nwachukwu and Igbokwe (2012). The challenges facing Nigeria in the area of eradication of hunger and food insecurity remain up till date as a result of these failures. So also, the elements of sustainability which organic farming has the potential of retaining remains elusive.

Food Insecurity in Nigeria

Food insecurity in a country has been defined as lack of access to enough food and can be either chronic or temporary (Adeoti, 1989). In chronic food insecurity, which arises from lack of resources to produce or acquire food, the diet is persistently inadequate (Badejo, 2016).

In the 20th Century, food insecurity was seen as a failure of agriculture to produce sufficient food at the national level. The 21st Century notion of food insecurity has advanced beyond this. Food insecurity is now seen as a failure of livelihoods to guarantee access to sufficient food at the household level (Clover, 2003).

It is quite disheartening to note that in the pre-colonial era, Nigeria did not have to contend with the problem of food insecurity. Peasant farmers were able to feed their households. The system was able to feed her citizens and at the same time export surplus food items to neighbouring communities. Every region of the country specialized in the production of specific food or cash crops. The North produced groundnut in excess of local demands. The West produced cocoa; the east produced oil palm and kernel heaps while the Midwest was known for the rubber plantations that yielded foreign exchange. Crude oil discovery in 1956 and exportation of it in 1958 changed the whole situation. Hoes and machetes went on holiday and the door was locked to sustainable mechanized farming.

Omonona and Agoi (2007) investigated the incidence of food insecurity in urban households in Nigeria and reported that food insecurity in Nigeria is influenced by factors such as the age, gender, profession and level of education as well as income of household heads. They concluded that Nigeria was yet to attain food security as defined by the World Bank. According to the World Bank, the main goal of food security is for individuals to be able to obtain adequate food needed at all times, and to be able to utilize the food to meet the body's needs thereby ensuring an active and healthy life. (World Bank, 1986). Food security obtains when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO, 1996).

Akinyele (2010) took a glimpse at rural food and nutrition security in Nigeria and declared that malnutrition is widespread in Nigeria, especially in rural areas. He reported further that Nigerians are vulnerable to chronic food shortages, erratic supply, poor quality food, and fluctuating food prices and concluded that the huge investment in ensuring food and nutrition security for Nigerians had recorded limited success.

In order to guarantee food security in Nigeria, Attah (2003) suggested the following strategies: Rural development; easy access to basic farm inputs; adequate budgetary allocations to agriculture; appropriate policies for food sub-sector; political stability; reduction in poverty at the rural level; Peasant Farmers' Education. None of these measures can be faulted when considered individually. However, when viewed as a whole, intensification of organic farming is conspicuously missing. This is not surprising because this concept had never featured in successive agricultural policies of the country since independence.

The rudiments and benefits of organic farming

Simply put, organic farming is a farming method which involves cultivation of plants and rearing of animals in natural ways. Biological materials are used and synthetic substances as well as genetically modified organisms are avoided as soil fertility and ecological balance are maintained. By doing this, environmental pollution is minimized and wastage is prevented.

The rudiments of organic farming include ecologically balanced agricultural principles like crop rotation, green manure, organic waste, biological pest control, mineral and rock additives. The general principles of organic production, based on the Canadian Organic Standards (Martin, 2009) include the following:

- Protection of the environment by minimizing soil degradation and erosion, decreasing pollution and optimization of biological productivity thereby promoting a sound state of health
- maintaining long-term soil fertility by optimizing conditions for biological activity within the soil
- maintaining biological diversity within the system
- recycling materials and resources to the greatest extent possible within the enterprise
- providing attentive care that promotes the health and meets the behavioural needs of livestock

- preparing organic products, emphasizing careful processing, and handling methods in order to maintain the organic integrity and vital qualities of the products at all stages of production
- relying on renewable resources in locally organized agricultural systems

Research work in International Livestock Research Institute (ILRI) in Fashola village, a suburb of Ibadan and Oyo as well as in the National Centre for Research in Agrobiology (EMBRAPA) in Seropedica, Brazil have revealed that organic residues (legume mixtures) and cover crops (live mulches) improved soil fertility and increased crop yield in the derived savanna zones of Nigeria and Brazil respectively (Badejo *et al*., 2003; Badejo *et al*., 2004a; Badejo *et al.*, 2004b).

In a more extensive study, Tian *et al.* (2007) studied the effects of residue quality and climate along a transect from humid forest to Sahel in the West African belt. Locations where samples were collected during the dry and rainy seasons include Ijebu-Ode, Minna and Kano in Nigeria and Zinder in Niger Republic. Based on the abundant evidence from literature that decomposition of plant residues is related to their Carbon/Nitrogen (C/N) ratio and their lignin and polyphenol contents, a plant residue index (PRQI) which was developed by Tian (1995) was revised to integrate properly the effect of the residue C/N ratio and polyphenol concentration (%) and lignin concentration (%) on the decomposability of the residues. This revised decomposition equation which was defined as: **PRQI = [1/(0.423*CX/N + 0.439*lignin + 0.138 *polyphenol)]*100** was applied to each of the agroecozones investigated and three hypotheses were confirmed: i) the increase in rate of decomposition and nutrient release of plant residues with the increase in residue quality can be observed only in wet regions; ii) the decrease in the rate of decomposition and nutrient release of plant residue from humid to arid regions of West Africa can be observed only for higher quality residues; iii) the low quality plant residue could decompose and release Nitrogen (N) and Phosphorous (P) faster in the dry than wet zones and in the dry regions it could decompose and release N and P faster than the high quality plant residue.

In Brazil, Badejo *et al*. (2002) compared the densities and dynamics of soil oribatid mite communities under three species of perennial cover crops namely *Arachis pintoi, Macroptilium atropupureum* and *Peuraria phaseoloides* with *Panicum maximum* (grass) and bare plots in the derived savanna zone and reported that legume cover crops, especially *Arachis pintoi*, and their residues have potential in restoring oribatid mite populations to pre-cultivation levels. The selective influence of the cover crops on different species of soil-dwelling oribatid mites was also reported. As illustrated in Figs. 1 and 2, the densities of species such as *Nothrus seropedicalensis*, *Archegozetes magna* and *Scheloribates* spp improved tremendously under the cover crops while *Galuma* spp though higher in densities under the cover crops than in the pasture, were still less than their densities in plots where there was no vegetation cover.

Similarly, investigations of the oribatid mite fauna of organically maintained plots in the same zone revealed that there was always an initial reduction in the populations of soil mites and the activity of epigeic forms whenever a plot was opened up and disturbed mechanically in preparation for cultivation (Badejo *et al.*, 2004a). Moreover, this investigation revealed that oribatid mite diversity was higher in the organic plots than in the pasture but lower than in the forest, where relatively large species of mites such as *Belba* sp. and many Eremobelboid Bracyphiline genera were present, but absent in the organic plots and pasture. It has been widely reported in literature

that oribatid mites being the most abundant microarthropod group in forest and arable soils, as well as earthworms, play a major role in the early stages of decomposition and as a result are indicators of soil health and fertility (Tian and Badejo, 2001; Badejo, 2004).

From the foregoing, it is clearly evident that organic farming can raise the fertility status of degraded soils in the tropical zone where there is abundant evidence that intensive mechanisation, exposure of soil to the sun and indiscriminate application of pesticides decrease the fertility of soils over time (Badejo, 2004).

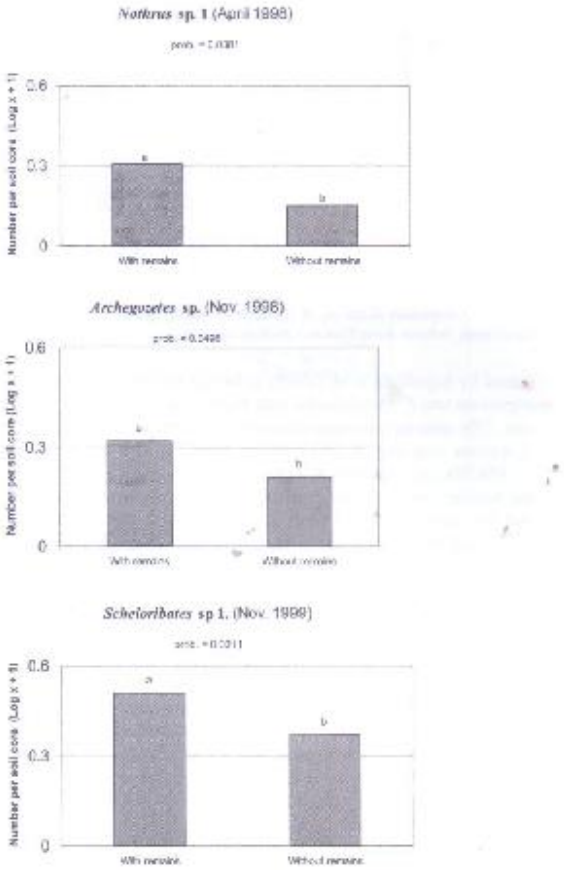

Fig 1. Semi-Logarithm plot of the numbers of oribatid mites trapped from the soil surface in the experimental plots. Values on each bar are x + 1 to eliminate zero vales. (Source: Badejo *et al*., 2002).

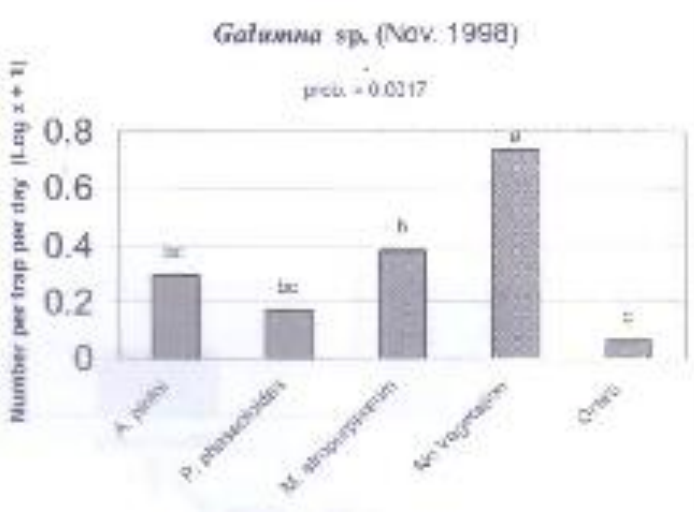

Fig. 2. Comparison of activity of *Galumna* sp. among treatments. Bars with same letters are not significantly different using Duncan's Multiple Range Test. (Source: Badejo *et al*., 2002).

Organic farming is widely practiced in the world. It is an alternative agricultural system which originated early in the 20th century in reaction to rapidly changing farming practices. Certified organic farming accounts for 70 million hectares globally, with over half of that total in Australia (Paull, 2019). The concept of 'certified organic farming' began in the 1970s when private associations started setting standards to regulate production methods for organic agriculture. In the 1980s, governments began to produce organic production guidelines. In the 1990s, a trend toward legislated standards began, most notably with the 1991 EU-Eco-regulation developed for European Union (NOP, 2007) which set standards for 12 countries, and a 1993 UK program. The EU's programme was followed by a Japanese programme in 2001, and in 2002 the U.S. created the National Organic Programme (NOP) Halberg (2006). As of 2007, over 60 countries regulate organic farming. In 2005, International Federation of Organic Agriculture Movement (IFOAM) created the Principles of Organic Agriculture, an international guideline for certification criteria IFOAM (2005). Typically, the agencies accredit certification groups rather than individual farms.

"Certified organic" is a term given to products produced according to organic standards as certified by one of the certifying bodies. In Canada, a grower wishing to be certified organic must apply to a certification body requesting an independent inspection of their farm to verify that the farm meets the organic standards. Farmers, processors and traders are each required to maintain the organic integrity of the product and to maintain a document trail for audit purposes. Products from certified organic farms are labelled and promoted as "certified organic." (Martin, 2009).

In the US, the Organic Food Production Act of 1990 (OFPA,) as amended, specifies that a farm cannot be certified as organic if the compost being used contains any synthetic ingredients. The OFPA singles out commercially blended composts as fertilizers disallowing the use of any compost that contains prohibited materials. Farmers need to keep their land free of most chemicals for a full three years before they can be certified as organic. Farmers must be certified for their produce and products to be labeled "organic," and there are specific organic standards for crops,

animals, and wild-crafted products and for the processing of agricultural products. (Halberg, 2006).

Organic Farming in Nigeria

Nigeria is one of the 179 countries in the world with data on certified organic agriculture. According to the latest survey of the Research Institute of Organic Agriculture (FiBL) (see: https://www.fibl.org/en/about-us.html) conducted in 2017, there are 5,021 ha of certified organic land with 101,261 producers, 80 processors and 80 exporters in Nigeria (Olowe, 2020a).

Nigeria is the most populous country in Africa, with an estimate of slightly more than 200 million people. Agriculture provides employment for 70% of the population, and contributes 32% to the gross domestic product (GDP). The total area comprises 91 million ha land area out of which 82m is arable, but only 42m is cultivated. In 2007, Nigeria had 3,154 ha certified organic land and no data on producers. By 2014, certified organic land had increased to 9,521 ha with 597 producers (Olowe, 2020b).

Currently, organic farming is at two levels (certified and non-certified) in Nigeria. The certified organic practice is mainly through Participatory Guarantee System (PGS) and the produce is for local consumption. Certification and adhering to organic standards are the major challenges of organic farmers in Nigeria. Consequently, there is the need for massive advocacy among stakeholders to update them on the implications of certification and standards. (Olowe, 2020a).
In the colonial era, the agricultural policy of the government of Western Region under Chief Obafemi Awolowo was that agriculture must be benchmarked against global knowledge bank. The eco-friendly Israeli Kibbutz system of agricultural collective was adapted. Farmers were successfully organized into functional cooperative movements, especially around the cocoa farmers marketing cooperative (Olaopa, 2014). Cocoa contributed a large percentage of revenue earnings in the western region during this period. Unfortunately, majority of farmers (more than 65%) still use the crude method of farming in that region today. The marketing cooperative societies have collapsed, storage ideas and facilities have not improved much and losses incurred from postharvest handling are still very high. Infrastructure development has not progressed to meet the current challenges, resulting in stagnation of processes and logistical nightmare. Access to markets remained a recurring headache making the idea of farming very unattractive to most people. (Miracle, 1968).

In 2011, the Central Bank of Nigeria reported that beyond all of the shortcomings of the agricultural sector in Nigeria, the fact remains that the sector has enormous potential, with an opportunity to increase output by 160% by 2030 (CBN, 2011). This can only be achieved if certified organic farming is intensified.

According to Tamuno (1972), the most significant economic development in Southern Nigeria since 1807 was the transition from the pre-colonial emphasis on subsistence agriculture to an increasing concentration on production for sale. Commercial and wealthy farmers gradually abandoned the natural and ecofriendly way of food production in preference for inorganic farming methods which are perceived as being more economically viable in commercial scale. Thus, ecofriendly farming was left to poor farmers who do not have the financial buoyancy to afford chemical fertilizers and pesticides. Unfortunately, the output proportion of these poor farmers was

relatively small when compared to Nigeria's total food output. What this meant was that most Nigerian consumers had little or no access to organically produced foods. It also meant that most of our exported foods were produced by commercial farmers who had adopted non-organic farming methods. (Miracle, 1968).

This trend of transition from ecofriendly farming to one in which there are inorganic inputs such as chemical fertilizers and inorganic pesticides were encouraged by agricultural policies of the Federal Government of Nigeria such as Operation Feed the Nation (OFN) in 1976 and the Green Revolution programme in 1980. These policies encouraged the inflow of fertilizers and pesticides that are not eco-friendly into the country and increased extensive mechanized farming which is not well suitable for our agricultural terrain in the southern agroecozones.

Recently, there was a spirited effort by the Federal Government of Nigeria to regulate and control biotechnological research in the country. The National Biotechnological Development Agency (NABDA) was established through Federal Executive Council approval on the 23rd of April, 2001 with a mandate to coordinate, promote and regulate the development of biotechnology in the country (Badejo, 2011). While the Nigerian government should be commended for this, care must also be taken for us not to veer into modern biotechnological techniques such as tissue culture, genetic engineering and solid-state fermentation because of their limitations and unresolved problems which will be counterproductive in Nigeria as well as other tropical African countries. Efforts should be geared at biotechnological techniques that have the potentials to rescue the food insecurity situation in Nigeria. These include microbial inoculation of plants in crop production (Odeyemi, *et al*., 1982, Odeyemi and Okonkwo, 1989), livestock production and food processing. For instance, in food processing, research must be focused on the purification of local biotechnology processes and production of dairy products (*Waara* and *Fura*), alcoholic beverages (*Burukutu*; *Pinto*) and Foods (*Gari", Lafun, Fufu* from cassava*; Ogi, Kunnun*, from maize and other cereals; "*Ogiri*" from melon; "*Iru*" (*Dawadawa*) from Locust bean seed) (see Badejo, 2016).

Many countries in the world (South Korea, China, USA, India etc.), have placed ban on the importation of inorganic foods. It is on record that lots of our farm produce were rejected at the European border in 2012 and 2014 on the grounds of excessive chemical content. The situation has reached a stage where one can categorically say that the future of agriculture in the world is organic. Therefore, Nigeria which is supposed to be an agrarian country needs to key into this trend.

There is enough evidence in literature that countries such as Sri Lanka, India and South Korea to mention a few, whose large-scale farmers moved completely from chemical farming regimes to organic farming regimes have had no crop loss or reduced productivity. In this regard therefore, Nigerian farmers who have turned into chemical farming regimes should move back to organic farming regimes with no perception of risk. Afterall, facilities and incentives to fully practice chemical farming are inadequate in the country. The Nigerian government as a matter of urgency needs to start an agricultural plan in consultation and collaboration with relevant stakeholders in agriculture, with a view to putting in place more commercially feasible organic farming methods (Ekanem, 2018).

It is evident from literature that progress has been made in Nigeria in respect of organic agriculture. For example, many organizations are involved in the development of organic agriculture in Nigeria. Some of them as listed by Olaito (2014) are:

- **Dara/Eurobridge Farm.** This is the pioneer organic farm in Nigeria and produces lemongrass, turmeric, ginger, plantains and medicinal herbs.
- **Organic Agriculture Project in Tertiary Institutions in Nigeria (OAPTIN).** OAPTIN's activities focus on capacity building and networking of academics in organic agriculture by organizing conferences, seminars and workshops regularly since 2004.
- **Olusegun Obasanjo Centre for Organic Agriculture Research and Development (OOCORD)**. This organization was established in 2007. It is the first of its kind in Nigeria. It focuses on research and development in organic agriculture. In collaboration with agronomists at the University of Ibadan, OOCORD has developed organic fertilizer from waste products generated in large quantities in urban centers and has also raised the awareness of the importance of organic produce for better health.
- **Nigerian Organic Agriculture Network (NOAN).** NOAN was formed as an initiative of OOCORD and designated to be an umbrella body for organic agriculture activities in Nigeria in August 2008. Its function is to network organic agriculture organizations in Nigeria.
- **World Wide Opportunities on Organic Farms (WWOOF)**. WWOOF is a network of national organizations that help volunteers to live by and learn organic farming properties. WWOOF has a passionate team who believe in the potential of organic farming in Nigeria. They bring volunteers from around the globe to work on farms in Nigeria and also work to promote organic agriculture among the Nigerian population.
- Organic Farmers Association of Nigeria.
- Organic Fertilizer Association of Nigeria.

One of the few institutions that support Organic Farming in Nigeria is **Ladoke Akintola University of Technology, Ogbomosho (LAUTECH)** whose Vice-Chancellor in 2014 disclosed that "LAUTECH is the first tertiary institution in Africa that has an organic farm with the European Union Certification, by the Institute of Market Ecology (IMO), Switzerland, for the Organic Production of Ginger, Turmeric, Lemon grass and Cashew. This, according to him, opens an opportunity for international trade with Europe and other countries (Olaito, 2014; Olowe 2020b).

Conferences and seminars have been held to promote organic agricultural practices in Nigeria in the past one and a half decades. Notable among these is the National Conference of Organic Agriculture held in 2005 and the first West African Summit on Organic Agriculture which was held in University of Ibadan, Nigeria in 2012. In 2014, the Third National Technical Workshop on Organic Agriculture was held in Wesley University, Ondo (now WesleyUni), from April 6 to April 11 by NOAN. The theme of this workshop where 27 papers on different aspects of organic farming were presented was: **"Mainstreaming Organic Agriculture into the Agricultural Transformation Agenda (ATA) of Nigeria"**.

Similarly, Universities in Nigeria have organized projects and summer programmes on organic agriculture to train farmers, researchers and other interested groups. These activities have helped to rekindle hope for farmers who are interested in organic farming. The recent pronouncement by the African Union (AU) to assist in the development of organic agriculture in the continent, of which Nigeria is a front runner, has helped in boosting organic agriculture.

MTN Foundation, a mobile telecommunications giant in Nigeria, has provided funding support for integrated organic fertilizer processing plants at strategic places in Oyo and Ondo states. The Nigeria Network for Awareness and Action for Environment (NINAFFE), a local non-governmental organization, has assisted in distributing the products to small scale farmers to "create wealth from waste". The products are now in high demand among farmers in Ondo State, Nigeria's largest cocoa producing state (Olowe, 2020b).

Notable among the private entrepreneurs in organic farming in Nigeria is Olusola Sowemimo the founder of **Ope Farms**, a certified organic farm enterprise. Olusola Sowemimo is a trained lawyer, an experienced human resource personnel consultant and a passionate advocate for organic agriculture, Olusola Sowemimo was awarded **"The Farmer of the Year 2019"** by Ecological Organic Agriculture in Nigeria. With a law career spanning over thirty-four years, Olusola Sowemimo has created time and energy for organic farming (see https://www.afrimash.com/going-organic-what-you-need-to-know/),

Presently, certified agricultural products in Nigeria are: ginger, turmeric and lemon grass tea. In the case of livestock production, the standards for certification are being developed, while a few farms are transitioning to organic production. Badejo (1998; 2019) has already advocated **Pastoralist grazing** as the only good option after aerial application of phosphorous which in addition to nutrients from animal sources is capable of stimulating the growth of naturally occurring leguminous plants which will provide food for livestock.

The Way Forward

Ekanem (2018) in his write up on 'Getting Nigerian farmers into the mainstream of nature farming' has already suggested the way forward in intensifying eco-friendly farming in Nigeria. Some of his suggestions are stated below:

- ✓ To encourage patronage of naturally produced foods the Nigerian government should raise national consciousness among the populace through awareness programmes that will stress the relationship between food quality and production method and emphasize the health benefits of the final consumers.

- ✓ To create a national foundation which will encourage long-term commitment towards the movement in protecting natural resources of water, land, soil vegetation etc. This foundation can work in partnership with IFOAM and organic farmer associations in the country. This foundation could be a public-private enterprise which will have the government on one side and association of organic materials and organic food producers on the other side. This way, the movement in favour of nature farming will be successful as the main objectives of the foundation will align with the core objectives of the respective partners.

- ✓ This proposed public-private constituted foundation will work with extension agents to help farmers apply the knowledge and principles of organic farming in the smartest way to ensure high level of productivity and returns on investment. This may involve training farmers on cheap methods of composting manure and mixing it with other specific organic materials, to produce very rich fertilizers.

Training on the use of natural predators, inhibitors, repellants and pheromones to keep predators and pests away will be equally done.

- ✓ Government should in consort with other relevant partners such as NGOs, development partners, international bodies, farmers, companies who can provide biological inputs for sustainable agriculture, companies who can market and export organic products, standards institutes, organic certifiers, educational institutions etc. must be committed to start an agricultural plan aimed at building a toxin-free nation. This can be made a policy to commit the relevant stakeholders and the government itself.

- ✓ The Ministry of Agriculture (which represents the government's interest), should work to ensure that the policy for the promotion of ecofriendly food production is consolidated. This may equally include providing greater technical support for organic farmers while partnering with the Nigerian export promotion council to ensure a seamless export and import procedure for organic foods.

- ✓ NGOs (especially agricultural and health focused organizations) should collaborate with development partners and international bodies like multinational corporations to garner support for nature farmers. the support may come in the form of financial empowerment and provision of technical support to organic farmers.

- ✓ Educational institutions and research centres will be required to conduct more researches on organic farming especially with regards to the development of crops that are more aggressive feeders and are resistant to most pest and disease types. The research may also cover simplified methods or producing high quality organic fertilizers that are specific to crop needs so as to completely make farmers independent of inorganic fertilizer use. Noteworthy is the fact that these research findings on improved organic farming methods will be promptly released and made accessible to farmers and extension agents for onward dissemination to farmers.

- ✓ As a business strategy, companies involved in the production of inputs for organic farming such as organic fertilizer and pesticide producing firms will need to key into this movement as it will have a multiplier impact on their business on the long term. They can key in by supplying organic farm inputs at very reasonable and competitive prices for farmers. This will encourage increasing number of farmers to profitably venture into nature farming even with minimal capital. This will create a huge customer base for these companies as the farmers get established and more dependent on organic farming.

- ✓ Companies who are already into or interested in venturing into marketing and export of organic foods should engage in a contractual agreement with farmers to produce organic farm produce for them and get compensated. This will equally ensure that the cost of input will be supplied by these companies and farmers are compensated for their labour.

- ✓ Standard organization of Nigeria (SON) and other related regulatory bodies, and organic certifiers will be required to analyze and issue certification for product which will meet the product quality standard recommended by IFOAM. This will boost consumer confidence on the product quality and willingness to pay the extra cost which goes with organic food products.

Conclusion

Unlike many small countries in the world, Nigeria has six different agroecozones where the type of organic farming that is eco-friendly differ between agroecozones. Each zone has its specific organic requirements and details on how and when to apply what. Badejo (1998) for example suggested that Pastoralist grazing is the only good option for restoration of degraded Savanna and Sahelian agroecosystems in Northern Nigeria. Cowpea (*Vigna unguiculata*) and groundnut (*Arachis hypogaea*) have been identified as leguminous crops that could be planted by the farmers because they can fix nitrogen and their seeds can be consumed by people while their shoot can be used as protein-rich forage for fattening cattle. This is not applicable in the more humid agroecozones in the south. As a result, the emphasis in this paper is on the benefits of organic farming in general and not of the fine details that are specific for each agroecozone.

Organic farming is based on the following principles:

i) taking **care** of the environment by not using synthetic chemicals, some of which have a long retention time in the soil

ii) ensuring the **health** of the soil community as well as humans who consume the farm products. A recent focus group study conducted in Denmark in 2016 has revealed that the consumption preferences of consumers are based largely on health reasons. In explaining why they purchased organic food products, they claimed that organic food is considered healthy because it is pure (Ditlevsen *et al.*, 2019).

iii) emulating the natural **ecological systems and cycles** with a view to sustaining them on the basis that every organism has a role to play in agroecosystems

iv) ensuring **fairness** in our relationships with our environment and the opportunities that life offers us by ensuring the safety of non-target organisms while we get rid of pests in our farms. (see https://www.conserve-energy-future.com/organic-farming-benefits.php)

The above represents the CHEF Principle (i.e. Care, Health, Ecology, and Fairness) that organic agriculture embraces.

The traditional slash, burn and fallow farming systems in southern Nigeria as well as all other traditional farming processes in Northern Nigeria when there was no population pressure, are closer to organic farming systems than inorganic farming systems largely by default (Atoma, 2015). That is why a call for the intensification of organic agriculture in all the agroecozones of Nigeria is indeed a call for the resuscitation of it with inculcation of entirely organic inputs. The practice of organic farming in Nigeria has great strengths that can be exploited by government and the people to eliminate hunger and accelerate development.

References

Anon, (2012). (*"Archived copy". Archived from the original on 10 April 2012.* Retrieved, 26 November 2012).

Adeoti, J.A. (1989), "Economic Crisis in Developing Countries: The Food Dimension". *Ilorin Journal of Business and Social Sciences*, Vol. 1.

Akinyele, Isaac (2010). Ensuring food and nutrition security in Rural Nigeria: An assessment of the challenges, information needs, and analytical capacity. Nigeria Strategy *Support Program, IFPRI.* Brief No 18.

Atoma, C. N. (2015). *Analysis of rural households' use of organic farming practices in south – south, Nigeria.* Unpublished PhD Thesis submitted to the Postgraduate School, Federal University of Technology, Owerri in November, 2015. pp. 251.

Attah, A.J. (2012). Food Security in Nigeria: The Role of Peasant Farmers in Nigeria. *African Research Review*. Vol. 6 (4), Serial No. 27, pp.173-190.

Ayoola, G.B. (2001), Essays on the Agricultural Economy 1: A Book of Readings on Agricultural Development Policy and Administration in Nigeria: Ibadan: TMA Publishers.

Badejo, M.A. (1998) Agroecological restoration of savanna ecosystems. *Ecological Engineering*, 10: 209-219.

Badejo M.A., Jose Antonio Azevedo Espindola, Jose Guilherme Marinho Guerra, Adriana Maria de Aquino, Maria Elizabeth Fernandes Correia (2003) Soil oribatid mites under three species of legumes in an ultisol in Brazil. *Experimental and Applied Acarology* 27: 283-296.

Badejo M.A. (2004). The Interface between Entomology and Acarology in Ecosystem Engineering and Ecotoxicology. Inaugural Lecture delivered on November 9, 2004 published by OAU Press. 35pp.

Badejo M.A., G. Tian, S.A. Tarawali, M. Peters and M.B. Sosan (2004a). The soil acarine fauna in maize fields in the derived savanna zone of Nigeria after legume mixtures and grazing. *Focus* 9: 26-33.

Badejo, M.A., Adriana Maria de Aquino, Helvecio De-Polli, Maria Elizabeth Fernandes Correia (2004b). Response of soil mites to organic cultivation in an ultisol in southeast Brazil. *Experimental and Applied Acarology* 34: 345-365.

Badejo 'Tola (2016). Biotechnology and the Food Security Question in Nigeria. Archives of Basic and Applied Medicine. 4: 95 -102. www.archivesbamui.com

Badejo 'Tola (2019). Challenges of Sustainable Agriculture and Food Security in the Sub-Sahara. In: Badejo M.A. and Togun A.O. (eds) *Strategies and Tactics of Sustainable Agriculture in the Tropics.* Volume 3. College Press, Ibadan & Concrete Communications, Lagos. pp. 84-106.

Central Bank of Nigeria (2011). Nigeria Incentive Based Risk Sharing for Agricultural Lending (NIRSAL). In: Agriculture in Nigeria. https://www.agriculturenigeria.com/research/history-of-agriculture-in-nigeria/

Cernansky, R. (2018). We don't have enough organic farms. Why not? https://www.nationalgeographic.com/environment/future-of-food/organic-farming-crops-consumers/

Clover, J. (2003). Food Security in Sub-saharan Africa, African Security Review, Vol. 12, No.1.

De Janvry, A and E. Sadoulet (2011). "Subsistence farming as a safety net for food-price shocks". *Development in Practice.* **21** (4–5): 472–480. *doi:10.1080/09614524.2011.561292. ISSN 0961-4524.*

Ditlevsen K., Sandøe, P. and Lassen, J. (2019). Healthy food is nutritious, but organic food is healthy because it is pure: The negotiation of healthy food choices by Danish consumers of organic food. *Food Quality and Preference.* 71: 46–53. www.elsevier.com/locate/foodqual.

Ekanem, K. (2018). Getting Nigerian Farmers into the Mainstream of Nature Farming. Agriculture. https://www.thenigerianvoice.com/news/273358/getting-nigerian-farmers-into-the-mainstream-of-nature-farmi.htmlFAO (1996). Socio-Political and Economic Environment for Food Security, Food and Agriculture Organization of the United Nations, World Food Summit, Vol. 1, Sec. 1.4.

FiBL (2017). The Research Institute of Organic Agriculture (FiBL) https://www.fibl.org/en/about-us.html

Frynas, J. G. (1999). Oil in Nigeria: Conflict and litigation between oil companies and village communities. Münster: Lit Verlag. http://news.bbc.co.uk/2/hi/africa/7840310.stm Retrieved 26 November 2012

Halberg, N. (2006). Global development of organic agriculture: challenges and prospects. CABI. p. 297. ISBN 978-1-84593-078-3.

Iwayemi, A., (1984). "Nigeria's Internal Petroleum Problems: Perspectives and Choices," Energy Journal, 5: 45–54.

IFOAM. (2005). The IFOAM Norms Archived 10 February 2006 at the Wayback Machine.

Khan, A. (1995). Nigeria: The Political Economy of Oil ISBN 0-19-730014-6

Martin, H, (2009). Introduction to Organic Farming. Factsheet 09-077. http://www.omafra.gov.on.ca/english/crops/facts/09-077.htm

Miracle, M.P. (1968). "Subsistence Agriculture: Analytical Problems and Alternative Concepts", *American Journal of Agricultural Economics*, Volume 50 (2) pp. 292–310.

NOP (2007). "National Organic Program Regulations". Archived from the original on 11 December 2007. Retrieved 27 November 2007. https://en.wikipedia.org/wiki/Organic_farming

Odeyemi, O., M. O. Fifi, and A. Abiola (1982). An investigation of possible cross-inoculation among some strains of cowpea *Rhizobium* and different cowpea group cultivars. *Turrialba*, 32:161-167.

Odeyemi, O. and N. Okoronkwo (1985). The Suitability of local materials as carriers for rhizobia in legume inoculants production in Nigeria. In: Biological Nitrogen Fixation in Africa. Eds Ssali, H. and S. O. Keye. African Association for Biological Nitrogen Fixation, Nairobi, Kenya, pp. 135-150.

Okoi, O (2019). The paradox of Nigeria's oil dependency. https://www.africaportal.org/features/paradox-nigerias-oil-dependency/

Omonona, B. T. and Agoi, G. A. (2007). An analysis of food security situation among Nigerian urban households: Evidence from Lagos state, Nigeria. *Journal of Central European Agriculture.* Volume 8 No. 3 (397-406).

Olaito P. (2014). Organic Agriculture in Nigeria. USDA Foreign Agricultural Service. Global Agricultural Information Network. 13pp.

Olaopa, T. (2018). The core of South West success story under Obafemi Awolowo. https://guardian.ng/politics/the-core-of-south-west-success-story-under-obafemi-awolowo/

Olowe, V.I. (2020a). Mapping emerging challenges in organic agriculture in Nigeria. http://isofar.org/isofar/index.php/2-uncategorised/169-mapping-emerging-challenges-in-organic-agriculture-in-nigeria

Olowe V.I. (2020b). Recent national events on organic agriculture in Nigeria. http://isofar.org/isofar/isofar/index.php/2-uncategorised/101-recent-national-events-on-organic-agriculture-in-nigeria

Paull, J. (2019) Organic Agriculture in Australia: Attaining the Global Majority (51%), Journal of Environment Protection and Sustainable Development, 5(2):70-74.

Smith, R. and Simon, J. (2014). *"How To Steal A Million Barrels Of Oil"*. *Planet Money*. NPR. Retrieved 1 November 2014.

Tamuno, (1972). The Evolution of the Nigerian State p. 14.

The New Daily. (2014) "Organic food: the hidden dangers that might surprise you". (https://en.wikipedia.org/wiki/Organic_farming.)

Tian, G., Brussaard, L. And Kang, B.T. (1995). An index for assessing the quality of plant residues and evaluating their effects on soil and crop in the (sub-) humid tropics. *Appl. Soil. Ecol*. 2: 25-32.

Tian, G. and Badejo, M.A. (2001). Soil Fauna and Soil fertility. In: Tian *et al*. (eds) *Sustaining Soil Fertility in West Africa*. Soil Science Society of America and American Society of Agronomy (SSSA) Special Publication no 58. pp. 45-67.

Tian, G., M.A. Badejo, A.I. Okoh, F. Ishida, G.O. Kolawole, Y. Hayashi and F.K. Salako (2007). Effects of residue quality and climate on plant residue decomposition and nutrient release along the transect from humid forest to Sahel of West Africa. *Biogeochemistry* 86: 217 – 219.

Uche, Chibuike (2008). "Oil, British Interests and the Nigerian Civil War". The Journal of African History. **49** (1): 111–135. doi:10.1017/S0021853708003393. ISSN 1469-5138.

USDA (2008). NOP Program Standards. https://en.wikipedia.org/wiki/Organic_farming

Waters, T. (2007). *The Persistence of Subsistence Agriculture: life beneath the level of the marketplace*. Lanham, MD: Lexington Books.

World Bank (1986). Poverty and Hunger; Issues and option for food security in developing countries. A World Bank policy study, Washington.