

Transformation of Agricultural Education in Nigeria: Implication for Food Security

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Abstract

The paper examines the transformation of agricultural education and the implication for food security in Nigeria. The paper argues that the level of hunger in Nigeria was minimal at independence because majority of the people engaged in agriculture. However, the discovery of crude oil in the 1970s and subsequently exportation contributed over 90% to government revenue. This enables government to embark on massive projects which injected much money into the economy. This led to abandonment of agriculture to the rural poor who continue to use crude implements. The result is food insecurity and hunger resulting in mal-nutrition and disease in many homes. The paper further argues that one sure way to transform the agricultural sector and ensure food security is adequate education of the populace on the use and application of agricultural tools and implements. Consequently, the way forward for agricultural transformation in Nigeria is suggested in the paper.

Keywords: Agriculture, Education, Food Security, Transformation, Institution

1.1 Introduction

Nigeria has a highly diversified agro-ecological condition, which makes possible the production of a wide range of agricultural products such as cocoa, ground nut, palm produce etc (Modebelu and Nwkapdolu, 2013). The citizens could complain of poverty but not extreme hunger. This could be probably because virtually everybody was in one way or the other involved in agricultural activities. Although, the practice appeared crude and unnecessary energy sapping due to crude implements in use and inadequate application of modern agricultural practices, but it indeed ensure availability of food. Agriculture then seemed sustaining because everybody was involved, everybody had interest and it appeared to be everybody's major source of family sustenance. Consequently, there were less cases of unemployment due to less interest or crazy of white collar jobs. Thus, the sector is particularly important in terms of its employment generation and its contribution to Gross Domestic Product (GDP) and export revenue earnings.

However, despite Nigeria's rich agricultural resource endowment the agricultural sector has been growing at a very slow pace. For instance, less than 50% of the country's cultivable agricultural land is under cultivation (Manyong, Ikpi, Olayemi, Yusuf, Omonona, Okoruwa and Idachaba, 2005). This is even as smallholder and traditional farmers, who use rudimentary production techniques with resultant low yields, cultivate most of this land. The smallholder farmers are constrained by many problems including those of poor access to modern inputs and credit, poor infrastructure, inadequate access to markets, land and environmental degradation, and inadequate research and extension services (Manyong et al., 2005). Also, the advent of the oil boom led to complete diversion of the citizens and national interests from agriculture as source of income. The citizens now loss interest in agricultural practices because it is treated as business for the less privileged and peasants in the rural areas etc. The repercussions are that agricultural practices has been deserted, hunger and poverty have taken over.

Consequently, food security is now the order of the day especially at this era of incessant occurrence of various forms of natural disasters such as flood, erosion, desertification etc. The only way forward is re-embracing agriculture as a veritable source of income, food, employment, hobby, tourism etc. This is while majority of third world nations are leaving no stone unturned in repositioning their agricultural sector. They see it as one sure way of eradicating extreme poverty and hunger as recommended in millennium development goals (MDGs). Food security is one sure way to meet up with this number one goal of MDGs.

Ostensibly, increase in the incidence and severity of poverty in Nigeria is predicated on the dwindling performance of the agricultural sector where majority of the poor are employed. Furthermore, poverty in Nigeria has been assuming wider dimensions including household income poverty, food poverty/insecurity, poor access to public services and infrastructure, unsanitary environment, illiteracy and ignorance, insecurity of life and property and poor governance. In response to the dwindling performance of agriculture in the country, governments have, over the decades, initiated numerous policies and programs aimed at restoring the agricultural sector to its pride of place in the economy. However, no significant success has been achieved due to the several

persistent constraints inhibiting the performance of the sector (Manyong et al., 2005). From the perspective of sustainable agricultural growth and development in Nigeria, the most fundamental constraint is the peasant nature of the production system with its low productivity, poor response to technology adoption strategies, poor returns on investment and poor or inadequate education programme on agriculture.

To ensure transformation of agriculture activities in Nigeria, it is imperative that those constraints inhibiting the performance of the sector are first identified with a view to unlocking them and creating a conducive investment climate in the sector through enlighten education programmes such that, agriculture will become one of the most important growth points in the economy. It is against this backdrop that the study is undertaken. The rest of the paper is structured as follows. Section two undertakes brief conceptual literature as well as overview of agricultural transformation in Nigeria. In section three, some factors inhabiting agricultural sector growth were identified. Section four contains ways forward for food security in Nigeria while section five concludes the paper.

2.1 Conceptual Literature

Agriculture can be defined as the practice of cultivating the soil and raising livestock to produce plant and animals useful to humans and in some instances animals (Asoegwu and Asoegwu, 2007). According to Udoh (2000), agriculture is the economic mainstay of the majority of households in Nigeria and is a vital sector for the economy. The important benefits of the agricultural sector to Nigeria's economy include: the provision of food, contribution to the gross domestic product, provision of employment, provision of raw materials for agro-allied industries and foreign exchange earnings (Oni, Nkonya, Pender, Philips and Kato, 2009).

On the other hand, food security refers to a situation where a nation has ready food to consume in their reserves. This is while Abbey (2011), argues that food security is a situation where all the individual, household, national, regional and global levels at all times have physical and economic access to sufficient safe and nutritious food to meet their dietary needs and food preference for active and healthy life. Sort (2001) describes food security as a world where person has access to sufficient food to sustain a healthy and productive life, where malnutrition is absent and where food originates from efficient, effective and low-cost food systems that are compatible with sustainable use of natural resources. Achor (2003) observes that food security is one of the major challenges facing the third world nations. He discovers that government inability to provide sufficient food for its ever increasing population has been the root cause of extreme poverty and hunger among the citizens.

Anyanwu and Anyanwu (2008) report that cases of food insecurity ensued due to sudden population increase which meant that the quantity of food and fruit gathered during hunting and local farming are now insufficient. They argue that it is easy to make more food available to the ever increasing populace and conclude that food security issue is not peculiar to Nigeria alone as many other developing nations are also facing acute food shortage due population explosion, poor management of resources, inability to adapt to new technology and utilizing education to explore new challenges.

2.2 Overview of Nigeria Agricultural Policies

A number of agricultural policies have been formulated in Nigeria before and after independence. In the Colonial Ten Year Development Plan (1946–1956), the commodity crop production emphasized was mainly oil palm, cocoa, rubber, cotton and groundnuts. The document contained very little or no proposal for increased food production. After independence, the first National Development Plan was 1962-1968. The policy sought for increase in the production of export crops through better seed distribution and more modern methods of cultivation as well as through the increase in area under cultivation. Consequently, farm settlements and cooperative plantations as well as Tractor Hiring Units were established and agricultural extension services were greatly expanded (Asoegwu and Asoegwu, 2007). This Plan Period was a success as cash crops accounted for about 80% of total export and 45% of the gross domestic product (GDP). However, no mention was made of the food sector in this plan that had 11.6% capital allocation by both Federal and State Governments to Agriculture (Osakwe and Ojo, 1986).

In the period 1970-74, the government lunched The Second National Development Plan during which the National Agricultural and Cooperative Bank (NACB) was established in 1973 to facilitate agricultural financing to farmers. Also, the National Accelerated Food Production Programme (NAFPP) was initiated which laid emphasis on agricultural research and extension support to farmers. However, with massive exploration of crude oil which contributed over 98% to total export and 73% of GDP, the agricultural policies and programmes were clumsily executed and virtually abandoned by succeeding military regimes (Opara, 2006). Consequently, capital allocated to agriculture for crop production, irrigation, research, credit (loans or subsidy), mechanization, man-power and agricultural extension services, declined (Osakwe and Ojo, 1986). For instance, the cocoa plantations suffered serious setback, the cotton and groundnut pyramids disappeared, hides and skin became food for the embattled Nigerian populace, and the oil palm plantations which were battle fields during the Biafra/Nigeria Civil War died natural death due to neglect. The disaster on agriculture and food production was enormous and the effect on Nigerians has not been ameliorated till date (Asoegwu and Asoegwu, 2007).

The Third National development Plan (1975-80) was the first to spell out provisions for food security

because of serious deficit in food production. In 1976, the Operation Feed the Nation (OFN) programme was inaugurated to create awareness among Nigerians about the consequences of an empty national food basket. Also, a number of Marketing Boards were abolished and Production and Marketing Companies were established. There was also the establishment of River Basin Development Authorities (RBDAs), Agricultural Development Projects (ADPs) and many research and tertiary institutions among others were established with the aim of improving agricultural food production (Asoegwu and Asoegwu, 2007). However, there was no commensurate capital allocation to Agriculture and this led to decline in food production (Osakwe and Ojo, 1986).

The Fourth National Development Plan (1981-85) saw the emergence of the Green Revolution which tried to give more powers and impetus to the River Basin Development Authorities and the ADPs to produce more food for the nation with more capital allocated to the agricultural sector (Osakwe and Ojo, 1986). Even though these efforts seemed to have been guided by genuine concerns, they failed to make the necessary impacts in the agricultural sector because of fundamental structural problems in the economy. According to Asoegwu and Asoegwu (2007), agricultural sector contribution to GDP declined by about 20% during the period. This resulted in increased shortage of food as evidenced by increased food imports and increased high prices (Asoegwu and Asoegwu, 2007).

Experience from the three National Plan Periods convinced Government that there can be no alternative to well-designed and articulated agricultural policies as instruments for promoting agricultural growth and development in Nigeria (Igbeka, 2003). In 1988, the Federal Government published the first ever agricultural policy document for Nigeria aimed at redressing the underdevelopment of agriculture, streamlining policies in all tiers of government and ensuring policy stability (Opara, 2006). However, many factors worked against the implementation of this policy. They include poor funding and poor state of infrastructure; poor administration of government support to agriculture and abandonment of projects midstream due to political reasons; lack of appropriate technology to reduce drudgery in agricultural production and processing and inadequate availability of inputs such as improved seeds and breed stock among others (Asoegwu and Asoegwu, 2007).

In the periods between 1992-1998, succeeding governments saw that women involvement in agriculture was high and as such government policies were centered on women. Thus, programmes such as Better Life for Rural Women; Family Support Program (FSP); Family Economic Advancement Programme (FEAP) were initiated. These were meant to empower the women for more and better involvement in agriculture and other rural activities in order to enhance the production of food and agricultural raw materials.

The current democratic dispensation began 1999 and the various governments till date have implemented different reform programmes ranging from privatization, commercialization, deregulation to corruption and financial crimes. These are meant to stabilize the economy and make it more productive ensuring that the era of subsidies and over-protection of key sectors of the economy including agriculture is over (Van Otterdijk, 2005). In 2001, New Agricultural Policy was introduced and in order to fast track the gains of the policy, government set up Presidential Initiatives in Agriculture (PIA) in 2004 and the National Special Food Security Program (NSFSP) and FADAMA II in 2005. At the moment, there are NSFSP and FADAMA I, II and III, all targeted at raising agricultural productivity and production as well as food security and eliminate poverty among resource poor rural farmers.

2.3 Trends in agricultural education and training

In Africa in general and Nigeria in particular, food security is still a critical issue and therefore food production will continue to be a major focus of agricultural education and training institutions for some time to come. African agriculture has gone through considerable changes over the years and a number of these changes are unfolding. Some of the emerging trends and developments affecting agriculture and agricultural education in Africa include but not limited to.

Shift in focus from agriculture to rural development: One of the challenges to post-primary agricultural education in Nigeria is how to meet the challenge of providing education and training for rural development rather than for agriculture alone. It is clear that the older curricula which concentrated on production agriculture only are no longer able to produce educated people who can deal with the wider problems of rural development. To address this problem therefore, post-primary agricultural education and training needs to be applied on practical base rather than purely theoretical. Learning needs to emphasize inductive reasoning skills so that students can interpret problems and devise solutions.

Rapid population growth rates and urbanization: Excessive population growth and its problematic distribution in a number of countries pose one of the greatest challenges for successful tackling of food and agricultural problems in sub-Saharan Africa (SSA). One fact that is not always recognized is that the rapid rate of urbanization in SSA is bound to make urban food insecurity and poverty a major problem. The rates of urban population growth in SSA in general and Nigeria in particular are among the highest in the world. It is generally agreed that rural-urban migration is the single most important cause of the explosion in the growth of the continent's urban population. As the overall population of African countries has increased at an accelerated pace, agricultural

productivity has declined as the absence of appropriate technologies force farmers to start cultivating marginal lands. The results have been rapid degradation of the environment and increasing levels of food insecurity and poverty. Because of the well known urban bias in national policies, the provision of physical, social and economic services in many rural areas is often either non-existent or extremely appalling. On the other hand, the provision of these services in the urban centers, although inadequate, appears in the eyes of the rural population, to be much better. As a result, the pull of the cities becomes irresistible for many rural people, particularly the youths. Post-primary agricultural education and training institutions need to incorporate population education concepts and principles into their curricula (Vandenbosch, 2006).

HIV/AIDS: The rate at which HIV/AIDS pandemic is spreading in some countries in SSA is worrisome. There is a real risk that agricultural production will be drastically reduced. Agricultural educators and trainers need to analyze the challenges posed by this phenomenon and to make institutional changes to meet the replacement human resources needs and provide the education and training required by those left behind in the rural areas. The influence of HIV/AIDS on skills development is devastating. It reduces productivity while driving up the cost of labour. It deskills the work force while reducing incentives for investing in skills.

Environmental degradation and unsustainable water use: Environmental constraints are already posing serious limitations to food security in several African countries particularly in areas where population densities are increasing rapidly. Today, virtually no inhabited area of Africa is unaffected by environmental degradation of one sort or another. The problem is being compounded by reduced levels and erratic patterns of rainfall and accelerated by destructive cultural practices leading to severe soil problems and loss of valuable agricultural land. Rangelands are being destroyed as a result of overgrazing and wasteful and inadequate management of available water resources.

Increases in incomes and wealth: Ironically as the continent's resources are used to create wealth, the resulting growth in the per capita income of the poor will increase their purchasing power, upgrade the quality of their diets and create additional challenges for more food (Vandenbosch, 2006). This further aggravate the competition for land between agriculture and construction of cities, factories and roads as well as increase the demand for wood-based products, including fuel wood, lumber for construction, poles, furniture and paper. National and sub-regional markets will play more important roles due to the high population increases in cities and urban centres. This will also have implications for the continent's forests, soils, wildlife habitat and biodiversity.

3.1 Problems of Agricultural Transformation in Africa

Soil erosion caused by water and wind is one of the main problems of agriculture in Africa. The lack of development in low-lying flood plains also hinders the development of agriculture in the continent. In addition, the dependence on imported foods has disincentive effect on investment in local farming. Specifically, some of the problems confronting agricultural productivity include:

Soil Infertility: The problems of agriculture in Africa begin with the soil. Most of the farmable land in Nigeria contains soil that is low to medium in productivity. The main problem that affects soil fertility is soil erosion. Wind erosion, in particular, is quite damaging. Overtime, strong winds expose seedlings and crop root systems by blowing away loose, fine grain soil particles. Another effect is the accumulation of soil particles in drifts, which can cover crops. Also, wind erosion changes the texture of the soil. The particles responsible for water retention and fertility, such as clay, silt and organic matter are generally lost, leaving behind a sandy soil. Wind erosion can be greatly reduced by planting trees near farming areas which will absorb most of the wind and prevent the loss of soil particles.

Poor Irrigation: The low-lying flood plains are very fertile during the rainy season, but the lack of rain during the dry season hinders agricultural development. The lack of water management systems in these areas is a concern for many agriculturalists and farmers. By adding irrigation canals and access roads to these areas, yearly production yields are expected to increase. Unfortunately, irrigation system in Nigeria is poor.

Food Processing Issues: It is estimated that about 20-40% of the yearly harvest is lost during processing. The primary cause is the lack of efficient harvesting techniques. Most farmers harvest crops by hand, instead of using machines. Also, storage methods are not generally up to standards. Most of the crops are lost to physical damage caused by insects, bacteria or fungus.

Impact of Imported Food: Africa is a net importer of food. The country does not produce enough food to meet the demand of its people. This produces a lot of problems with regard to agricultural development. Generally, there is less incentive for local farmers to grow local foods, when cheaper, more palatable foods are imported. This forces local farmers to reduce prices, which reduces the income generated by the farm. The consequence is decreased farm production and food insecurity. To combat the effects of imported food on development, several initiatives are suggested, including providing farmers with micro-credit that is subsidized and increasing tariffs on imported food.

Infrastructural Inadequacies: Infrastructure here includes roads and railway system, educational and health facilities, social services such as electricity and communication system. In many parts of Africa, physical and

marketing infrastructure is poorly developed, storage facilities are rudimentary and access to information and markets is highly restricted. The infrastructure constraint has persisted due to poor governance, poor political leadership, poor maintenance culture and poor funding. In terms of road facilities, the constructed roads do not often last for more than three to five years before they start to crumble due partly to poor maintenance culture. In addition, the railway system has been comatose for years thereby restricting the movement of agricultural inputs and outputs to the road transport system (Olukunle, 2013). The educational and health facilities are largely urban-biased. Electricity supply is often epileptic and communication system is still poor. Although recent expansion of the Global System of Mobile Communication (GSM) infrastructure and Internet services has improved the communication situation somewhat, the services are urban-biased and too expensive for the average people.

Unstable Input and Output Prices: A major problem inhibiting investment in agriculture is the escalating cost of major farm inputs. Average prices of farm inputs such as hoe, machet, sprayer, tractor and agrochemicals have been rising over the years. The rising prices of inputs are the results of instability in the factor markets arising from instability in macroeconomic policy actions leading to inflationary pressures, high interest rates and volatile exchange rate. Moreover, the rising prices of fuel have led to rising cost of transportation of farm inputs thus aggravating the rising cost of production. The situation not only made procurement difficult but again resulted in cost escalation arising from the depreciated naira exchange rate. Consequently, the rising costs of farm inputs combined with dearth of investible funds pose a serious constraint to investment in agriculture all of which leads to food insecurity.

3.2 Challenges in Agricultural Transformation in Nigeria

Nigeria faces two central challenges to her agricultural sector and food security: they include population dynamics and climate change.

(1) Population Dynamics

The Nigeria population is believed to be growing at over 3%.¹ A number of lessons emerge from the current and projected future population dynamics of Nigeria with major implications for agriculture and food security. According to Nwajiuba (2013), the lessons include:

- (i) Nigeria's population is growing even as the country's food security challenges grow with it. At the current growth rate of domestic food production, Nigeria is unable to feed its growing population. Domestic food production will have to expand at a faster rate.
- (ii) Nigeria's urban population will soon outstrip the rural population. The population shift to urban centres is projected to become even more pronounced in the future. Despite its roots, the urban population is disconnected from the food production system and will rely on the market for food supply. This supply will have to come from domestic production or imported food.
- (iii) Youth make up a growing share of the population. They are the bulk of urban migrants and are thus unavailable for agricultural vocations. This raises the challenge of retaining and educating the next generation of farmers. As agricultural technology development and diffusion has stagnated, the sector continues to rely on human labour for farm power. This stagnation is due to a lack of local innovation, especially in mechanization that is appropriate to the ecology. Farmers cannot afford the equipment, and in turn there is a lack of local maintenance capacity. Mechanization and labour saving devices are in urgent need and require the development of local capacity.
- (iv) Rural poverty will increase just as urban poverty has increased. Employment and income will have to be created for a large and growing youth population. With modern research and technology, agriculture provides a great opportunity to turn rural poverty and stagnation into development. At least in theory, the rural youth could produce the food that the urban youth consume. However, this would assume that the urban youth have the required purchasing power. Can there be agricultural jobs without consumers? Can there be high demand for agricultural products without jobs for youth? Thus, agriculture as a development issue will remain a core challenge for Nigeria for the coming decades (Nwajiuba, 2013).

To address these challenges, Nwajiuba (2013) argues that Nigeria's agricultural and food security policy and programmes should adopt a twin-track approach, on one side encouraging commercial agribusiness, while on the other side supporting the huge population of subsistence producers, as this is critical to rural food security, social cohesion and poverty alleviation.

¹ . Population in 2011: 162 million people.

Population in 2050: between 230 and 430 million people.

Urban population in 2011: 51%, and growing.

Population earning less than US\$ 2 per day in 2009 was 84%.

Nigeria in 2011: the world's 7th most populated country.

Nigeria in 2050: the world's 3rd most populated country after India, China, outstripping the USA.

(2) Climate Change in Nigeria Agriculture

Nigeria's climate is changing. Evidence from The Nigerian Meteorological Agency (NIMET) clearly shows that the weather is becoming more extreme, be that in form of drought or rain, leading to different impacts according to climate and geographical zones (Nwajiuba, 2013). Climatic change is already having adverse effects on agriculture and, therefore, food security in various parts of the country.

4.1 Agricultural Transformation and Development in the Economy

Agricultural transformation is not only about food production, it is also about the development of the economy. FGN (2011) argues that economic development through agricultural transformation is achievable through the following four phases:

Import substitution agricultural development: Agricultural development with a focus on self-sufficiency via import substitution lowers the cost of food, increases real wages and drives down inflation.

Export-oriented agricultural sector: This involves a rapid transition to export-oriented agricultural policy that diversifies the economy and increase foreign exchange reserves as well as stabilizes the exchange rate. This policy will reduce inflation in the domestic economy and lead to macro-economic stability. Macro-economic stability will in turn significantly increase the level of foreign direct investment (FDI).

Grow value added agro-processing sector: Growth in foreign direct investment will lead to economies of scale derived from an export oriented large/efficient agricultural sector. This will provide inexpensive raw materials to stimulate investment in the agro-processing industry.

Backward integrate into higher value added manufacturing: With growth in agro-processing industry, backward integrate into higher value added services and manufacturing of industrial equipment and products for the burgeoning industry.

4.2 Way forward for Effective Agricultural Transformation in Nigeria

Effective transformation of the agricultural sector is the only sure way to ensure food security and reduce hunger and mal-nutrition. To ensure this, the followings are recommended.

Land Resources: Land is a major resource for agricultural development. Different types of equipment are used for land development and once land is opened up for agricultural purposes, it should be protected against erosion. Agricultural land should not be cleared with heavy equipment to avoid soil structural degradation and compaction. Desert encroachment and wind erosion is managed by planting drought-resistant trees as wind breaks while soil erosion is mitigated by mechanical, biological and cultural approaches.

Availability of Capital: Capital is a vital resource that should be properly managed. Agricultural financing is very delicate. Agricultural credits should be utilized upon the purpose it is meant for. Loans should be used to expand the agricultural land, buy machinery and other inputs (fertilizer, pesticides, herbicides, seeds and seedlings) for increasing agricultural production. Thus, the effort of the Government of Nigeria at directing commercial banks in the country to put aside some percentage of their transactions for agriculture and give as loans to farmers with good feasibility studies and the capacity to repay the loans is a good step in the right direction. This loan should not be given to absentee farmers.

Management of Labor: Labor is the most important resource in agriculture, since labor includes the manager and the operator of any agricultural business. Labour may include the agricultural scientists, technologists and engineers that is acquired through education and which bring about the innovations in agricultural practice. Labor should be well trained, regularly retrained and properly motivated to sustain interest in and for agriculture and its natural environment. However, with the abundant unskilled labour in the rural areas of Nigeria, care must be taken to develop machinery that will empower them and be user-friendly.

Water Resources: Agriculture activities in Nigeria have been largely rain-fed. However, with the development of dams on rivers in the northern part of the country for agricultural production, hydroelectricity and domestic use, it becomes imperative to manage river resources properly. Rivers have been used as sinks for the disposal of waste materials and effluents. Pollution, rising demands and climate change limits water resources availability. Conscientious use and conservation of water resources includes monitoring, controlling and reducing river water pollution and making it available for irrigation, industry, hydroelectric power generation, navigation and wastewater treatment plants' effluent dilution. Groundwater aquifers are also used in agriculture as they are hydraulically linked to rivers.

Agricultural Power and Machinery: Many tractors and machines for agriculture may have been imported into or manufactured in Nigeria. Managing them should include scheduling them for work timely, for maintenance and repair with genuine spare parts to make them operable and making sure that only properly trained manpower operate them for optimum use. Managing them also means, making sure that proper records are kept on each equipment and machine. In Nigeria most of the agricultural machineries are imported and maintenance is usually difficult. Many unserviceable machines litter many institutions. However, with the use of IT and ICT technologies, scheduling and monitoring of machinery could be made easier.

Storage Facilities: Storage is an essential phase between harvesting, processing and consumption. Traditional grain storage with cribs, rhombus, gourds, sacks, by hanging on roof tops, trees and fire places and barns have not provided adequate protection from rain, insects and rodents, resulting in 20-65% loss annually in Nigeria (Asoegwu and Asoegwu, 2007). Modern silos and warehouses of different makes (metal, concrete, wood, mud and composite) and sizes to handle between 5-2500 metric tons of grains are available in Nigeria. Managing grain storage means that the prevailing environment of low moisture, relative humidity, temperature and oxygen is maintained so that sprouting, mould, rot and black spot growth, respiration rate, heat and moisture transfer, micro-organisms, insects and rodents will be minimized, if not mitigated.

Livestock Manure: Manure constitutes an unavoidable by-product of any livestock production system. Management of livestock manure is by recycling and may be by 1) direct recycling as a feed ingredient for livestock; 2) on-farm or 3) off-farm recycling for crop production; 4) recycling for non-agricultural uses; and 5) discharge to the environment (Richard, 1998). The different and highly variable physical, chemical and biological properties of livestock manure impinge on the environment and can result in both positive and negative impacts on air, soil, water, fauna, and flora (Statistics Canada, 2000). Manure can become an important source of pollution when the management systems are deficient (AAFC, 1980).

Management of IT Inputs: Farmers in Nigeria are expected to access new machines and integrated information systems. They should spend time interacting on high management decisions. In a situation where ITs, global positioning systems (GPS) and geographical information systems (GIS) are applied to the management of farms, the goal is to improve the efficiency of operations and the quality and consistency of agricultural products by compensating for the spatial variability of the soil environment. The farmer professional education should be enhanced to enable him benefit from the new technology in order to monitor and manage his land, protect and improve his income and advance his living environment.

Management of other Inputs: The management of Nigeria's research and education in agriculture should focus on the indigenous crops and animals, many of which are going into extinction. The ingenious cultural practices should be modernized to be influenced by science, technology and engineering through communication of relevant information on new approaches and innovations in agriculture. Fertilizers, pesticides and herbicides should be applied as at and when due and in the appropriate quantity to avoid pollution of water resources systems. Rural farmer education is as critical as any other resource for increasing agricultural productivity through agricultural mechanization and environmental management.

5.1 Conclusion

The study examines the transformation of agricultural education and implication for food security in Nigeria. At independence in 1960, the level of hunger in Nigeria was minimal because majority of the people engaged in agriculture which they saw as means of sustenance. However, from 1970s when crude oil was discovered and subsequently exported, over 90% of government revenue came from crude oil export. This enables government to embark on a number of projects which injected much money into the economy. Consequently, agriculture was abandoned to the rural poor who continue to use crude implements. The result is food insecurity and hunger resulting in mal-nutrition in many homes. In order to transform the agricultural sector and ensure food security there must be adequate education especially on the use and application of agricultural tools and implements.

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