



American Journal of
Agricultural Science

Keywords

Root,
Tuber,
Crop Production,
Food Security,
Farmers Productivity

Received: January 27, 2015

Revised: February 7, 2015

Accepted: February 8, 2015

Crucial Roles of Tuber Crops and the Development Activities in the Global Food System

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Citation

Edem I. D., M. E. Nkereuwem. Crucial Roles of Tuber Crops and the Development Activities in the Global Food System. *American Journal of Agricultural Science*. Vol. 2, No. 2, 2015, pp. 42-49.

Abstract

The production of roots and tubers in Africa has been restricted to assuring food security. Due to a lack of participatory policy making and institutional development, virtually all colonial governments neglected their production and trade in favour of cash crops such as tea, coffee, cotton, and cocoa or cereals. The technical (research), marketing and state support extended to most cash crops and cereals during this period was not extended to roots and tubers. This meant that, amongst other things, the private sector driven participatory plant breeding that characterized some of the cash crops bypassed roots and tubers, leading to prolonged use of (not necessarily high-yielding) traditional varieties and production techniques. Not only did this undermine food security in Africa, but it also shifted consumer preferences away from roots and tubers. In part, this led to a gross underestimation of the value of roots and tubers in Africa. The diversification in the utilization of roots and tubers in developing countries (as food, animal feed, industrial raw materials) has occurred in an uneven fashion, beginning in the 1960s and 1970s in Asia and Latin America, with Africa only taking preliminary steps in this direction from the mid-to-late 1990s.

1. Introduction

Roots and tubers, most notably cassava, sweet potato, yam and Irish potatoes (*Solanum tuberosum*) are some of the most important primary crops. They play a critical role in the global food system, particularly in the developing world, where they rank among the top 10 food crops (Scott *et al.*, 2000; Phillips *et al.*, 2004; Nweke, 2004). By 1997, the production of roots and tubers in developing countries had an estimated annual value of more than 41 billion U.S. dollars or nearly one fourth the values of the major cereals (Scott *et al.* 2000). Roots and tubers contribute to the energy and nutrition requirements of more than 2 billion people. They constitute an important source of income in rural and marginal areas. They have multiple uses, most notably as food security crops, regular food crops, cash crops, and they are increasingly used as livestock feed and raw material for industrial purposes. They have long served as the principal source of food and nutrition for many of the world's poorest and undernourished households and are generally valued for their stable yields under conditions in which other crops may fail (Anazodo *et al.*, 1989; Scott *et al.*, 2000).

Hence, the researcher attempts to review literature of various authors based on the following subheading; Root and Tuber technology, Importance of root and tuber technology, the effect of root and tuber technology on farmers productivity, criteria for

adoption of root and tuber technology by farmers – based organization (Agricultural Cooperatives) and enhancing the adoption rate of root and tuber technology by agricultural cooperative societies.

1.1. Statement of the problem

Past interventions into roots and tubers production by government and non-government agencies have succeeded in increasing production as evidenced in past reports (World Bank, 2004). Often increased production resulted in produce glut. This situation culminated into rock-bottom prices in the producing communities and dis-incentive to producers. Under the present dispensation, the Expanded Programme for Roots and Tubers (RTEP) has made provision for improved technologies to increase production. Above all, concerted efforts are in place to strengthen downstream activities. This is, believed would check incidence of low prices in producing farmers, bridge income disparities, enhance employment and check rural youth unrest.

There have been activities such as multiplication and distribution of improved planting materials, trainings and demonstration on improved agro-processing technology. In spite of all these activities to enhance roots and tubers production, several factors seem to constraint farmers in the adoption of new and improved technologies. These factors as observed in ASADEP (2009) are attributed to poor awareness of new technology on roots and tuber by the farmers; none relevance of the technology to the needs and aspiration of the farmers also affect their adoption. Others include high cost of technology, availability of personnel to operate or manage the technology, negatively affect farmers' interest in the technology (Ajav, 2000).

Another cardinal factor posing a challenge to the adoption of improved technology from RTEP by the farmers according to Idachaba (2009) is literacy level of the farmers. Most farmers in Nigeria are illiterates and so are very conservative. They find it difficult to let go some of the age long agricultural practices that have been handed over to them by their fore fathers. Even when they are willing to learn, they lack the means through which they can be taught because of their literacy level. More so, is the problem of pests/disease to their plant and so on. It is against these problems that the researcher attempts to evaluate the adoption rate of root and tuber technologies in Anambra state.

Scott *et al.*, (2000) simply put that they have long served as the principal source of food and nutrition for many of the world's poorest and undernourished households and are generally valued for their stable yields under conditions in which other crops may fail. They maintained that variation in the utilization of roots and tubers is attributed to differences in population and economic growth, cultural factors and urbanization. They further argue that, in much of Asia and North Africa, rising incomes and urbanization and a desire by consumed to diversity away from strictly cereal-based diets have increased the use of potato as either fresh food or in processed form, while the same forces have influenced foods.

According to them, these factors continue to generate demand for cassava (and the other roots and tubers) as a cheap, starchy staple.

1.2. Significance of the Study

This review work is justified by its prospective benefits to students, lecturers, management of various farmers groups (organizations), policy makers, researchers, farmers and the public at large.

To student, the review will help them appreciate the practices work towards better understanding on the objectives, components and successes of root and tuber Expansion Programme in their field of study. To lecturers, it will reveal to them the need for effective orientation and awareness of the duties of RTEP to students toward enhancing groups' activities.

To management of various farmers' group, the review will serve as a useful guide and insight to them on how they can effectively and efficiently adopt RTEP technologies with a view to changing or increasing their root and tuber production. To policy makers, such as federal government, ADP, World Bank, etc, this study will serve as a locus point where decisions taken will be referred to. To the farmers, this result of this research work will assist them in appreciating RTEP and adopting effectively its technologies to enhance their productivity.

To researchers, this research result will serve as a useful reference material in the area of roots and tuber production and related subjects/topics in future. Generally, the public will benefit from this study, as ideas and recommendation on the best processes of adopting RTEP technologies for enhancing root and tuber production.

2. Root and Tuber Technology

According IITA (2011), roots and tuber crops (Cassava, Yam and Cocoyam) are major staples in large parts of humid and sub – humid sub – Saharan African. In its report; Africa produces over 50% of the cassava and over 90% of the yam in the world. These crops are largely produced by small group farmers who rely on traditional, labour – intensive, practices that do not allow for optional exploitation of the crops, all the crops suffer severe yield losses due to wide range of pests and diseases (fungal and bacterial root and tuber rots, viruses, insects, mites, nematodes and rodents) low nutrient availability, inappropriate germ plasm and post harvest technologies.

Aseogwu and Aseogu (2007) noted that production and postharvest practices still lack appropriate levels of mechanization to reduce the labour for land preparation, planting, weeding, harvesting, processing and storage. It is on this premise IITA (2011) simply averred that innovations geared towards increased productivity in root and tuber technologies are necessary.

Ibrahim and Oruk (2010) reported that Cassava provides affordable food for rapidly growing urban populations in

addition to which new market opportunities in the starch and livestock feed industries are opening up. According to them, production costs are comparatively high in most part of African countries. Yam is a traditional African crop of increasing importance. Due to consumer preference for yam over other roots and tubers, there will be greater demand for it with increasing incomes in African countries. However, Ibrahim and Oruk (2010) put it that the high labour and high soil fertility requirement of yam are threatening its future. Cocoyam and Taro are important traditional crops, play a vital role for women in family food supply and income generation. Similar to yam, these crops are preferred staples but they have not received sufficient- research attention.

According to IITA (2011), expanding the scale of production, mainly of cassava, spurred by increasing demand and conducive policies, requires post harvest technologies capable of processing larger quantities into quality products. This requires good knowledge of the commodity chain and technical equipment to move processing up to an industrial scale.

NAMA, (2006) concluded that root and tuber crops export substantial soil nutrient depletion if not accompanied by appropriate and sustainable soil nutrient management strategies. According to them, poor crop husbandry in “no or low input” small – holder system aggravates yield losses due to late or insufficient weeding, low planting densities, inappropriate intercrops, untimely, planting and harvesting and poor processing techniques. Hence, the low yield, high production costs and thus, low productivity of many root and tuber systems / technologies are in stark contrast with the economic opportunities.

Nigeria produces roughly 40% of all the root and tuber crops in Africa, being the biggest producer of Cassava and yams. Root and tuber crops contribute more than 600 calories per capita per day in the following countries: Angola, DRC, Congo-Brazzaville, Central African Republic, Mozambique, Ghana, Côte d'Ivoire, Rwanda, Togo and Benin (FAO, 2000). Despite the importance of roots and tubers in Africa, African food policy over the last half a century has focused on achieving growth and self-sufficiency in cereals such as wheat, rice and maize, with growth rates in roots and tubers over this period largely driven by area expansion as opposed to yields (resulting from technological innovations such as improved varieties and production techniques) (Scott *et al*, 2000, Nweke, 2004).

Scott *et al* (2000) show that the supply, demand and uses of roots and tubers began to change significantly in the 1960s and 1970s, fuelled by a trend towards greater diversification in use and greater specialization in production by crop and region. Between 1983 and 1996, for example, the consumption of roots and tubers in developing countries increased by 22 % or 45 million Mt to reach 253 million Mt, with cassava (at 93 million Mt) accounting for the largest share of roots and tubers consumed as food, followed by sweet potato (65 million Mt) and yam (16 million Mt). Indicative of the changing trends in utilization of roots and tubers, sweet potato used as food contracted during this

period, whilst its use as animal feed increased rapidly, especially in China. All developing countries use roots and tubers as animal feed on some scale, with China and Latin America accounting for the largest share of this utilization of sweet potato. In the 1983-1996 period, the use of sweet potato as animal feed in the two regions increased by 50% to stand at 96 million Mt (Scott *et al* 2000).

Variation in the utilization of roots and tubers is attributed to differences in population and economic growth, cultural factors and urbanization (ibid). Scott *et al* (2000) argue that, in much of Asia and North Africa, rising incomes and urbanization and a desire by consumers to diversify away from strictly cereal-based diets have increased the use of potato as either fresh food or in processed form; whilst the same forces have influenced the use of cassava and sweet potato in Asia towards starch, livestock feed and processed foods. In Sub-Saharan Africa, they posit, population growth, low and stagnant per capita incomes and rapid urbanization continue to generate demand for cassava (and the other roots and tubers) as a cheap, starchy staple. More recent studies, however, point to signs of changing trends.

Phillips *et al* (2004), for example, demonstrate for Nigeria that cassava is increasingly gaining an urban market presence as a result of its increased use as processed food, with rural and urban consumption patterns becoming increasingly similar. Cassava appears to be a food of choice even in the face of alternative food options in urban area (Okigbo, 2004). This means that it is finally challenging its stigma as a less glamorous crop, which can only portend well for its future. Similar reversals in fortune can also be seen with increased sweet potato processing in other parts of Africa (Olifin, 2003; NINCIC, 1999).

3. The Effect of Root and Tuber Technology on Farmers' Based Group in Nigeria

Nigeria is one of the largest countries in Africa, with a total geographical area of 923,768 square kilometres and an estimated population of 140 million (2006 estimate). Nigeria has a highly diversified agro-ecological condition, which enables her to produce wide range of arable crops. Hence, agriculture constitutes one of the important sectors of the economy. The Nigerian agriculture had been at the subsistence level in the past years, but with the introduction of labour saving devices, tractors, equipment and tools, commercial agriculture is now being practiced (Ibeka, 1996). This section discusses some of the socio-economic impact of the introduction of technologies (machines, processes, and improved crop varieties, etc) on commercial agriculture in Nigeria, as well as some of the criteria that these technologies must meet before they are adopted.

3.1. Food Security

Food security guarantees all human beings physical and economic access to the basic foods needed to lead active and

healthy lives. It is a dynamic process that is closely linked to thematic topics of poverty, human capacity, creation of employment and generation of income in an ever changing spiral that can move upward and downward. With the introduction of improved technologies to arable farming in Nigeria, commercial agriculture has been boasted thus, resulting in the production of varieties of crops with high yield all year round, and to a reasonable extent securing the availability of food to the Nigerian populace.

3.2. Growth in the Agricultural Sector

With the advent of technologies, in agriculture, family farms which previously were at subsistence level have been encouraged to participate in agricultural trade thereby increasing their income. Their participation has resulted in the growth of the agricultural sector of the Nigerian economy.

3.3. Rural Development

With the application of technologies to agriculture, more agricultural crops and livestock are produced to service the agro-industries in the country. Most of these agro-industries are located near the commercial farms which are also located in the rural areas. As a result, rural road networks are improved and employment is generated for the rural dwellers. Other basic infrastructures like water and electricity are also attracted to the rural villages, thus bringing about rural development.

3.4. Value Addition to Agricultural Products

Before the advent of mechanization technologies for the processing and storage of agricultural crops, most commercial farmers export their farm produce like cocoa, rubber, coffee, cassava, fruits and vegetables, etc., to other countries at very low prices and in raw form. But with improved processing technologies, available, commercial farmers can now add value to their produce and process them locally to generate more income.

3.5. Increase in Productivity

The essence of technology in any business is to increase the productivity per labour and income. Technology input to commercial agriculture in Nigeria has helped to sustain business profitability. However, careful consideration of the choice of technology input that will ensure the desired profitability must not be neglected. Technologies like early maturing, high yielding and disease resistant varieties, etc., have no doubt impacted positively on the commercial arable farming in Nigeria; so, also are the mechanization technologies that have reduced labour, ensured timeliness of operation and improve productivity.

3.6. Stabilization of Market Prices

Investments of commercial arable farmers in Nigeria into improved storage structures for grains, cold storages for

livestock, fruits and vegetables, etc., during periods of surplus harvest has helped to stabilize and guarantee good prices for the farmers and agro-processing industries. For instance, about 55% of Nigeria's roots and tubers are consumed locally (especially potatoes, cocoyam, yam and cassava), while the balance of 45% is exported. Preferentially, the only way that prices of the exported products can be guaranteed is through better storage and transport facilities with corresponding value additions. Oil crops like groundnut, soybean, oil palm, etc., are processed into vegetable oil using appropriate mechanization technologies. As vegetable oil, they can be stored for longer period and sold at a guaranteed market price at a later date.

3.7. Diversification of Investments

With the introduction of technologies to commercial arable farming in Nigeria, the commercial farmers have been able to diversity their investment. Most commercial farms have various investments in fisheries, livestock, agro-processing, machine and spare parts production, marketing, research and development, etc. These diversified investments have yielded more income, generated employment and also sustained the commercial farming business in Nigeria.

4. Criteria for Adoption of RTEP Technologies for Farmers Based Groups in Nigeria

According to Ekpere, (1995), the last twenty years have witnessed great investment in agriculture and agricultural mechanization technologies, as well as in research and development of new technologies in Nigeria. The research efforts at the national and international research centers like IITA, Ibadan; NCRI Badegi; IAR&T, NCAM, NSPRI, ARCEDAM, etc., have resulted in significant yield in many crops, insect and pests control, livestock and fisheries production, processing and storage equipment; Yet farmers are skeptical in taking full advantage of these technologies. Technologies are viable only when they are used by farmers. No matter how well new technologies work on research stations, if farmers do not use them, their development would have been in vain (Sandra et al. 1989). Therefore, for technologies to be adopted for commercial arable farming in Nigeria, the following criteria they must met:

4.1. Proper Awareness

There is no doubt that various technologies for increase in production and drudgery reduction have been developed or imported into the country. But lack of awareness of such technologies by the farmers has hindered their adoption. Therefore, for any new agricultural technology to be adopted by farmers, adequate awareness of the technology must be ensured.

4.2. Relevance of the Technology

For any technology to be adopted, it must be relevant to

the needs and aspiration of the end user. There would be no need for an early maturing variety of cowpea or rice if there are no mechanical dryers to dry them as soon as they are harvested. Also, there would not be any need for a tractor mounted tuber harvester if there are no tractors. As a matter of fact, technologies must be demand-driven not supply driven before they can be adopted. Information on the specific needs and problems of farmers can be obtained in the annual cropping season evaluation surveys conducted by IAR, NAERLS, PCU and the Agricultural project Monitoring and Evaluation Unit (APMEU) in collaboration with HDPS' or other periodic diagnostic surveys. Such information is passed on to the Research and development centers or organization during the annual National Research Extension Farmers input linkage system (REFILS) planning meetings at NAERLS and at National Conferences, technical review meetings of ADPS, seminars and workshops.

4.3. Affordability of Technology

For a technology to be adopted by farmers, it must be affordable. Affordability does not end at initial cost of the technology. It also includes repairs and maintenance cost, availability of personnel to operate or manage the technology and the impact of the technology either to the environment or the immediate user.

4.4. Socio-cultural Compatibility of Technology

One of the reasons why some technologies are not adopted is because they may not be socially or culturally compatible with the people in the community where they are to be used. For instance, in a community where most of the available labours are female, they may not be allowed to operate some machines or equipment. In such an environment, no matter how effective that technology is, the adoption will be hindered.

4.5. Literacy Level (of End Users, Farmers)

Most Farmers in Nigeria are illiterates and so are very conservative. They find it difficult to let go some of the age long agricultural practices that has been handed over to them by their fore fathers. Even, when they are willing to learn, they lack the means through which they can be taught because of their literacy level. However, with proper extension services using local languages, this problem can be reduced.

5. Enhancing the Adoption Rate of Root and Tuber Technologies Among Farmer Based Groups/Cooperatives

Popularization of agricultural technologies for adoption by our farmers must be promoted by the Government and other interest groups to enable commercial farming take firm root

in Nigeria. The roles of these groups are as follows:

6. Role of Universities and Research Institutes

These institutions specifically go into research in agricultural technologies for adoption to enhance commercial farming. The universities carry out educational training and research on agricultural technologies while research institutes such as the National Centre for Agricultural Mechanization (NCAM), Ilorin, carry out adaptive and innovative research in design, fabrication and testing of proven agricultural technologies (Oni, 2003, 2004). The research institutes conduct programmes on adaptive research for the development of better agricultural tools, equipment and machines for land clearing, weeding, harvesting, crop preservation and processing, as well as the development of low cost machine and equipment appropriate for the effective mechanization of the Nigeria's farming operations which presently are predominantly small-scale. The institutes have deep and intricate knowledge of the local conditions and the constraints of the farmers. The future programmes of NCAM, for example, are aimed at linkage and collaboration on Research and Development (PIM, 2001) between NCAM and other Research Institutes and are geared towards achieving a better bilateral understanding with other agencies for an improved mechanization of the nation's agriculture (Onwualu, and Pawa, 2004). New horizon would be covered through bilateral cooperation with sister research institutes in Nigeria and some African Countries. Such a bilateral co-operation was to be entered into with the Republic of Equatorial Guinea for whom some machines and equipment would be fabricated by NCAM.

6.1. The Roles of Banks and Financial Institutions

The Nigerian banking system is geared primarily at larger corporate lending, where the transaction costs relative to the loans are low and the level of risk, security and borrower sophistication are good from a lender's point of view. To overcome this propensity towards the larger scale borrowers, of the commercial and merchant banks, the government has set up several development banks to assist the agricultural and industrial sectors of the economy. Aside from launching the Nigerian Agricultural and Cooperative Bank (NACB) as a financial institution devoted to agricultural finance in 1973, the government also introduced the Agricultural Credit.

Guarantee Scheme Fund in cooperation with the Central Bank in 1978, directed banks to allocate their credit portfolio to certain preferred sectors (Sandra et al., 1989), of which agriculture featured very prominently. However, ACGSF recorded very limited success. To ensure the continued relevance of ACGSF in the agricultural development efforts of government, a number of modifications have been made to the scheme since the SAP era, and they include the following:

- i) Self-Help Group Linkage Banking Programme
- ii) The Interest Draw Back Programme
- iii) Refinancing Scheme
- iv) Financial Intermediation through NGOs

In addition, Shyllon (1998) reported that the formation of the National Agricultural Cooperative and Rural Development Bank (NACRDB) from NACB, Peoples Bank and the Family Economic Advancement Programme (FEAP), and recent consolidation exercise in the Nigerian banking system lead to the formation of mega-banks has dramatically increased the scope and pool of available capital for commercial farming development. Essentially, the country now possesses the basic financial infrastructure required to fully realize its commercial farming potentials (Oni, 2004).

6.2. Role of Private Sector

It has been repeatedly canvassed that, for commercial farming to succeed in Nigeria, it must be based on domestic engineering initiative, to design, develop and manufacture locally most of the tools, equipment and machines needed for all the agricultural production, field operations and post-harvest processes. There is an overwhelming load of evidence to demonstrate that the establishment of an effective local agricultural machinery manufacturing industry is a pre-requisite for a viable agricultural industry anywhere (SPORE, 2006). All the homologous countries of the world which have achieved significant successes in their agricultural industry, such as India, China, Philippines, Brazil, Sri Lanka, Egypt, etc., started by establishing domestic manufacture of the needed machinery, based on national developmental a policy which emphasizes self-reliance as an operative technology ideology (Odigboh, 1997).

The role of the private sector in enhancing new technologies through Research and Development should not be overlooked. For this sector to embrace the mass production of equipment prototypes, various encouragements would have to be extended to the sector. This could be done through the provision of infrastructures and credit facilities to create a conducive environment for the establishment of industries.

On the other hand, the private sectors should also initiate linkages with research institutes by funding Research and Development activities in research institutions and higher institutions of learning so as to compliment the efforts of government in this aspect. The lack of confidence in the indigenously developed technologies by multinational companies had grossly affected the rate at which they support local initiatives of research institutions. The Federal Government of Nigeria should encourage and/or challenge these companies to contribute by offering them tax concessions for supporting research and development efforts of the various research and higher educational institutions in the country.

It is generally agreed that the surest and fastest way of promoting commercial farming development is through the promotion of private sector participation. The following areas, according to Simalenga (2000), clearly underscore

entrepreneurial opportunities through mechanization that can be explored by the would-be investors in commercial agriculture:

(i) Manufacture/fabrication of agricultural tools, implements, equipment and Machines by agriculture-led industries:

(ii) Fabrication of tillage, cultivation, planting and harvesting tools, implements and equipment;

(iii) manufacture or assembly of production agricultural machinery (engine powered);

(iv) manufacture/fabrication of animal-drawn implements and equipment; (v) manufacture/fabrication of spare parts for the above mentioned tools and equipment;

(vi) manufacture of spraying equipment;

(vii) manufacture of transport equipment;

(viii) manufacture of crop processing equipment (shellers, threshers, oil expellers, etc.); and

(ix) manufacture of fruits and vegetable processing and packaging equipment (fruit juice, vegetable purees, etc.).

6.3. The Role of Government

The roles the government plays in promoting the adoption of agricultural technologies for commercial arable crop farming are many. However, some of the most vital ones are in the area of land clearing, food processing and storage. Development of grain silos and other storage systems have enabled the long-term storage of, particularly, bulk grain produce. Silos (5 - 2500MT capacity) and warehouses (200 - 5000MT capacity) have been built by government agencies (e.g. the National Strategic Grain Reserve Unit) for storage of grain products at strategic locations all over Nigeria as intervention efforts and for research purposes to prevent food shortages. Warehousing of bagged grains stacked on pallets in well-ventilated buildings is widely used in research institutes and at the National Seed Services Centre (NSSC) in Nigeria (Adewumi *et al.*, 2005).

There is Crop Storage Unit (CSU) which has developed On-farm Storage Unit most relevant to each ecological zone. In an effort to reduce human drudgery, minimum labour cost and enhance overall productivity and efficiency, the government in putting in place appropriate infrastructure for mechanized agriculture in Nigeria, established various institutes, centre, parastatal and agencies such as the NCAM at Ilorin for the development of labour saving devices, machinery testing and machinery standardization, in collaboration with Standards Organization of Nigeria (SON) and strengthen the Rural Agricultural Industrial Development Schemes (RAIDS) for the manufacture of intermediate prototype processing machines with world bank assistance.

The Cassava Enterprises Development Project (CEDP) goal is to diversify and strengthen rural economy in selected geo-political zones in Nigeria using cassava as the engine of growth. This CEDP is administered by the International Institute of Tropical Agriculture (IITA). It is targeted at resource – poor producers, micro and small scale processors, most of who are women; as well as fabricators, traders, agribusiness entrepreneurs and consumers, as secondary

beneficiaries. The Cassava Initiative (CI) has shown encouraging statistics: production rose to 40 MT of tuber in 2005. In the same year, garri (processed cassava) was exported to Sierra Leone and first 40 MT of cassava chips to China (Opara, 2006). With the mechanization of CI, it is expected that production will reach 150 MT of tubers by 2008.

The Rice Initiative (RI) is being facilitated by the National Cereals Research Institute (NCRI) in collaboration with the West African Rice Development Association (WARDA) with the objective of attaining an output of 9 MT of milled rice in 2007. The Vegetable Oil Initiative (VOI) aims at developing large hectares of oil palm, groundnuts, cotton seed, soybean, sheanut, castor oil, melon, sunflower, beniseed, with the attendant mechanization for increased production and increasing the nation's capacity for edible oil production. With the ban on the importation of Vegetable oil, the organized private sector in Nigeria has taken the challenge and has sustained local consumption.

7. Summary and Conclusion

Adoption of appropriate technology for commercial farming by cooperatives in Nigeria will no doubt lubricate the wheels of economic activities of the country. This is because technology constitutes the engine for economic growth. It is absolutely necessary if the economy of Nigeria is to be revitalized. It must be emphasized that without appropriate knowledge, engineers and technologists can do very little. Hence, considerable attention has to be paid to the training of engineers, technologists extension agents, end users and allied personnel involved in every aspect of commercial farming in Nigeria. The roles of the government, financial institutions, the research institutes, the private sector and other interest groups must be carefully and effectively carried out if the dream of developing sustainable commercial roots and tuber farming in Nigeria is to be realized. The crucial challenges facing commercial farming in Nigeria are the understanding and learning from the past, becoming informed of a fast changing Nigerian society, improving the ways of conducting research and environmental studies as well as designing, constructing and manufacturing technologies as closed-loop and integrated ecosystems to the extent possible.

However, technology must lead the way to better resources management, innovative industrial processes, modified transportation system, infrastructure, better environmental management and restoration, and in commercial farming enterprise development. To break the cycle of poverty in Nigeria, the right attitudes to work must be developed and sustained.

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