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Review

Agriculture for sustainable food, energy and industrial development in the Sub-Saharan Africa: The case of Nigeria

J.T. Fasinmirin* and F. Braga

Centro de Ciências Rurais, Universidade Federal de Santa Maria, RS, Brazil.

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Global economic recession and the concomitant increase in food prices, unemployment, dilapidated infrastructures and poor industrial growth call for a concerted effort at ensuring a strong and efficient agriculture to meet the demands of ever increasing Nigerian population. No meaningful development can be attained without recourse to modern agriculture since virtually all facets of human endeavour relies primarily on products or bye-products of agriculture. This work evaluated Nigerian agriculture, the past, present and the challenges vis-à-vis the Brazilian type of agriculture that fosters sustainable development in food and energy production. The main reason for the slow agricultural development in Nigeria despite the volumes of scientific information to engender improvement was traced to poor government involvement in agriculture at the level of policy formulation and implementation. The very poor approach to the adoption of appropriate technology and scientific information in agriculture has resulted to loss of arable upland soils to the forces of erosion and floods and increase in greenhouse gas emissions through indiscriminate felling of protection trees and bush burning. Therefore, in order to bridge the wide gap in agriculture between Nigeria and other developing economy like Brazil and China, there is urgent need for a sincere and pragmatic involvement of the government and other non-governmental organizations in agriculture, with the use of modern and appropriate technology such that enough biomass could be produced for sustainable food, energy and industrial development.

Key words: Agriculture, mechanized farming, environment, soil tillage, Nigeria.

THE NIGERIAN CONCEPT OF AGRICULTURE

Nigeria was strongly an agrarian nation considering her economy during the pre and post colonial era and agriculture formed the means of livelihood of the people and a strong factor for the rise of states just as the case everywhere in the world (Lawal, 1997). The form of agriculture practiced and the crops planted were determined by the nature of soil and the terrain of the region. Shifting cultivation and crop rotation characterized agricultural practices in pre-colonial Nigeria, owing primarily to land tenure practice and lack of knowledge of highly mechanized farming (Ehimore, 2009). Usually in the past, farmers depended on implements such as digging stick, hoe, cutlass and sickles. The common crops produced based on territorial specialization included, yam, okra, vegetables, maize, cocoyam, cassava, plantains, bananas, kolanuts, cocoa, oil palm and forestry products. Soil conservation and irrigation of farms during dry seasons had been an ancient agricultural practice among Nigerian farmers and was not particularly influenced by conservation practice of the modern days but was regarded as the most effective and correct way to maintain soil fertility and crop productivity.

Nigerian economy similar to the Brazilian, during the first decade after independence was purely an agricultural economy because agriculture served as the main stay for economic growth (Ogen, 2003). Nigeria occupied the leading position in the export of major commodities such as cotton, groundnut, rubber, hides and skins (Alkali, 1997). The FAOSTAT (1999) showed that Nigeria was the leading country in cassava production around the world with over 30 million tons annually as at 1998 followed by Brazil with over 19 million tons. Grains such

*Corresponding author. E-mail: fasinmirin_johnson@yahoo.com.

as maize and sorghum, as well as groundnut were major foreign exchange earner for Nigeria. Nigeria had the highest oil palm production around the world but did not maximize her potentials from the very important crop until Venezuela took over as the world leader in oil palm production.

Though, farmers depended on implements such as digging stick, hoe, cutlass and sickles for their cultivation activities and could only produce at the subsistent level, the agricultural sector still contributed over 60% of the GDP in the 1960s (Lawal, 1997). This development was as a result of the strong will of farmers to produce beyond immediate consumption, coupled with the fact that most crops planted were indigenous; Nigeria was among the leading countries around the world in terms of exportation of raw farm produce for foreign exchange. While it is undeniable that some crops were introduced from other areas to Nigeria, it is evident that agriculture in Nigeria developed naturally and independently of foreign mechanism (Ehimore, 2009). All that was later introduced were only additional to the existing system

The history of agriculture in Nigeria showed that output has been increased in the past mainly through bringing more land into production and extending the agricultural frontier through conversion of forests and natural grass-lands. Though, there were not much of researches carried out in the past on either the soil and or crops that were grown, neither was there much of soil conservation strategy adopted due to low level of scientific information but Nigeria benefitted tremendously from the fertile forest soil that were suitable for tuber crops and the native grassland that yielded their maximum from grain production.

In recent years, the increasingly concentrated patterns of human settlement and the growing competition from other uses for land have greatly reduced the land area meant for agriculture. Worst still, the oil boom in Nigeria during the early 60s did more of evil than good to Nigerian agriculture considering the sharp decline in agricultural productivity within the shortest time space due to over-dependence in oil proceeds and that resulted to economic downturn in Nigeria especially during the military rule (Olagbaju and Falola, 1996) and since then Nigeria has been witnessing extreme poverty and the insufficiency of basic food items. Although, Nigeria is the largest oil producer in the continent of Africa but the country imports over half of its refined oil products because its own refinery capacity can not meet domestic demand. Consequently, the problem of limited energy supply from fossil fuels is of the highest level in Africa despite the greenhouse carbon effect on the environment that arises from its combustion and as well as the aggravation of the perils of global warming and energy crisis (Mohan et al., 2008). The south-south region of Nigeria is confronted with environmental problems such as land degradation due to heavy metal and fresh water pollution from oil spills. Therefore, most arable land areas that were previously used for crop production became unproductive. Consequently, obtaining more output from a given area of agricultural land has become a key developmental problem in Nigeria. This and many other factors led to lots of researches into soil quality, tillage and water conservation for agriculture.

Soil quality is of paramount importance to agricultural production as it determines the capacity of a soil type to function within a natural or adjusted ecosystem in the maintenance of water and air quality and support plant and human living (Brady and Weil, 1999). Thus, soil quality assessment reflects biological, chemical and physical properties of the soil, as well as the processes and their interactions within each resource unit (Karlen et al., 2001). Lal (2001) reported that soil supports life through five processes: (i) Biomass production; (ii) Restoration and resilience of ecosystems; (iii) Purification of water; (iv) Detoxification of pollutants and; (v) Cycling of Carbon, Boron, Phosphorus, Sulphur and H_2O. Soil quality is depleted as the soil is degraded through individual or combined processes of soil degradation which in the savanna region of Nigeria is mainly by soil erosion and compaction. The soils of the savanna region are physically fragile because the topsoil contains a large proportion of sand, causing weak aggregation and poor moisture holding capacity due to the low level of organic matter in this layer. The physical constraints are further compounded in gravelly soils or soils with shallow depth overlying hardpan layers (Adeoye and Mohammed-Saleem, 1990; Salako et al., 2002). The erosion of soil within the 0 - 15 cm was reported, could result to exposure of more gravel which eventually makes working on the soil difficult (Salako et al., 1999).

The concept of tillage which is mainly that of either physically, chemically, mechanically or biologically manipulating the soil to optimize conditions for germination, seedling establishment and crop growth, is still very much at the peasant level in Nigeria (FAO, 1984). However, No-tillage and minimum-tillage have been used since ancient times by the so-called “primitive cultures” for the production of crops, simply because man has not the muscle force to till any significant area of land to a significant depth by hand. Hence, handful of research information and recommendations had little or no impact on the systems of land cultivation in Nigeria as most farmers (more than 90% peasant) still adopt the primitive system of soil pulverization and mound making, which exposes the soil to erosion and structural depletion. Only very few farmers that have source to finance make use of conventional tillage technique during the yearly cropping seasons. This was widely believed to loosen the soil for crop root penetration but this often results in the decline of soil organic matter content (Hobbs and Brown, 1957; Johnson, 1950; Johnson and Davis, 1972; Johnson et al., 1974; Unger, 1968; Unger et al., 1973), which decreases soil aggregate stability (Johnston et al., 1943; Mazurak and Ramig, 1962; Kemper and Koch, 1966) and resulted

to deterioration of soil quality (Johnston et al., 1943). This is the case due to very little awareness on the need to effectively manage the soil to prevent it from nutrient depletion and other environmental hazards such as floods and erosion. Most arable lands that were degraded in Nigeria resulted from indiscriminate use of machineries to till the soil rather than natural cause.

Large volumes of scientific information are available on soil physical properties which are altered by tillage and the appropriate soil tillage technologies that could enhance productivity at the farm levels (Fapounda, 1986; Adeoye and Mohamed- Saleem, 1990; Igwe et al., 1995; Jagtap, 1995; Kirchhof and Salako, 2000; Lal, 1997a, 1997b; Salako et al., 1999, 2001, 2002). Recent researches include that carried out by Durodoluwa et al. (1999), Agbede (2006), Agbede et al. (2008), Igwe and Agbatah (2008), Fasinmirin and Olufayo (2003), Fasinmirin (2006), Fasinmirin et al. (2008, 2009) among others. Most works carried out by these authors were centered on identification of soil characteristics of the zones and regions of Nigeria, as well as investigation of the most appropriate soil and water management techniques for the different soil types in Nigeria.

Challenges to revolutionary agriculture and the way out

Revolutionary agriculture typical of the Brazilian experience can be attained in Nigeria if more commitment is shown from the point of policy formulation to its execution. Brazilian agriculture as it were today was a result of state intervention and protection policies as well as private sector participation (Ogen, 2007). Therefore, Brazil realized a general rise in the number of agricultural products exported especially during the 1980s, most significant of which were soybeans, coffee, cocoa and sugar. The volume, value and variety of semi-processed and manufactured agricultural products increased substantially, largely as a result of government incentives in favour of processed goods over raw crops (Akinbobola, 2001). Agriculture continued to play a significant role in the Brazilian economy through fiscal incentives and special credit facilities. The government strongly promoted greater efficiency in rural areas by altering the movement of people from rural communities to urban areas through extension of equal social opportunities and establishment of rational schemes for agrarian reforms, stimulating hitherto uneconomical small holdings and, in general, improving the quality of life in areas that are quite remote from the urban centers. Notwithstanding, the huge success recorded by Brazil in the area of agriculture, their revolutionary spirit has also enlisted the country among world leaders in the conversion of bio-resources such as sugarcane to environmentally friendly and affordable alcohol for the powering of cars in replacement of carbon fuel.

It is noteworthy that cassava which is largely produced in Nigeria has the raw capacity to produce green fuels efficiently, sustainably and in a cost-effective way. The potential for generation of electricity from cassava leaf and tuber was estimated at 16970 kwh/ha (Phalla, 2005). There is however a huge competition between human needs of the crop for consumption and its conversion to fuel to power car. It becomes important to embrace all round mechanization in the production of the bio-resource crops like cassava and sugarcane. Apart from the direct economic advantages, there will be associated social and environmental benefits from the use of the bio-resources to generate fuel and electricity and thereby increase employment in rural areas.

It is however very disheartening that the agricultural policies in Nigeria at present do not embrace farmers involvement either directly or indirectly, neither does it impact on the social and cultural well-being of the farmers and therefore farmers see policy formulators as having no sincerity of purpose. Though several millions of dollars go into the ministry of agriculture annually, there is rather very little to show in terms of farm output and this leaves the prices of food and several other commodities in astronomic increase and beyond the reach of the common people of Nigeria. However, the following recommendations if faithfully adopted will arouse the interest of existing and would be farmers to participate in massive production of food crops as well as cash crops, which will not only adequately meet Nigerian domestic needs but will also attract foreign exchange: government should endeavour to acquire arable lands for farmers cooperatives and individuals for the cultivation of crops at no cost; government should be ready to bear the responsibility of clearing and preparing acquired lands (at least for starter farmers) with the use of modern day farm machineries in replacement for cutlasses and hoes which hardly could go beyond the peasant level; farm inputs such as grains and cereals, fertilizers and herbicides should be made available by the government to farmers, the cost of which can be reclaimed at the point of sales of harvested produce; the ministries saddled with the responsibility of agricultural development should adequately educate farmers and follow up their activities from the point of planting to the point of harvest. Farmers should be adequately educated on the appropriate selection of fertilizer and the application rate to crop, the need for application of fungicides and pesticides to ward-off diseases and pests at the appropriate time and the precautionary measures to take against natural hazards such as erosion, drought and flood. Farmers should be adequately assisted during harvesting and in the processing of harvested produce for proper storage and this means that interested farmers should be assisted in the building of storage facilities such as mini-warehouses, silos, bins as well as conducive farm settlement equipped with basic infrastructures such as electricity and rural water supply; central marketing and price control systems

should be adopted at the local government or state level to ensure that prices of commodities are not unnecessarily heightened. Also, the government through the ministry of agriculture should monitor the sales and proceeds of farmers to ensure there is no loss and to be able to carryout checks and balances between the input of the government and the proceeds from sales of produce; adequate consultations in terms of scientific contributions should be sought from universities and other research institutions before loans and advances are issued to interested farmers. This could be in form of determining soil types, the nutrients availability and the best crop the soil could support. However, surety should be sought before loans are granted to farmers; establishment of agricultural banks closely monitored by the ministries of finance and agriculture and solely responsible for financial disbursement of loans and credits to farmers as and when due; government should be willing to assist experienced farmers in the acquisition and procurement of heavy duty farm machineries and implement such as tractors, disc plough, disc harrow, planters and boom sprayers, the repayment period for which can be spread over a number of years.

These and more, the government can do to wholly address the problem of food shortages and at the same time win the interest of many Nigerians to get involved in agriculture. Not only that, employments will be created either directly by the farmers or indirectly at the point of crop processing. This will help in no small measure at minimizing the problem of unemployment, which is at its height presently in Nigeria.

Conclusion

The history of Nigerian agriculture comparatively with the Brazilian experience has been well discussed in this paper. The paper also highlights the importance of agriculture in a developing economy like Nigeria, while critically examining the place of agriculture in the Industrial and economic revolution of Brazil. There is therefore the urgent need to diversify from the rather monolithic economy of over-dependence on crude oil, which rather than fostering development contributes to environmental degradation, ethnical crisis and national insecurity. A strong and aggressive shift to agriculture will not only afford Nigeria the opportunity of self-sustainability in terms of food production but will also serve as the basis for drastic industrial transformation, which eventually will yield tremendous foreign exchange earning to Nigeria.

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