

A Concise Review on The Current Status of Agricultural Mechanization and Environmental Considerations in Nigeria

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ABSTRACT

The recent innovation in mechanical farming techniques has provided a rapid advancement in farming occupations and has increased both efficiency and productivity in the sector. This review work has investigated the current status of mechanized farming; farm machinery, the domestic factories of the farm implements and their importations, as well as the challenges confronting agricultural mechanization in Nigeria. The paper also discussed and provided the insightful information about the environmental considerations in agricultural mechanization practices.

Keywords: mechanized farming; environmental considerations; farm machinery; factory of farming implements

INTRODUCTION

The Nigeria's location is situated in western Africa on the Gulf of Guinea, and has a total area of 923,768 km² (356,669 sq mi) [1], making it the 32nd largest country in the world. Nigeria shares borders with Benin republic (773 km or 480 mi), Niger republic (1,497 km or 930 mi), Chad (87 km or 54 mi), and Cameroon (1,690 km or 1,050 mi) with a population of over 215 million. Its coastline is at least 853 km (530 mi) [1]. Nigeria lies between latitudes 4° and 14°N, and longitudes 2° and 15°E, this is entirely within the tropical zone. The highest point in Nigeria is Chappal Waddi at 2,419 m (7,936 ft) while the main rivers are the Niger and the Benue, which converge and empty into the Niger Delta. This is one of the world's largest river deltas and the location of a large area of Central African mangroves. The average temperature in Nigeria is 27.5°C in the southern part of the country and 36.9°C in the north. Nigeria is a founding member of the African Union and a member of many international organizations, including the United Nations and Commonwealth of Nations.

CLIMATE

The climatic profile in Nigeria varies depending on the geographical location. The far southern part of the country is known by its tropical rainforest climate, where annual rainfall is 1,500 to 2,000 millimeters per year [1]. In both the southwest and the southeast coastal plains can be found [1] and mangrove swamps are found along the coast [2]. The areas that lie between the far south and the far north are called savannah, characterized with not much tree cover, with grasses and flowers located between trees. Rainfall is more limited to between 500 and 1,500 millimeters per year [1].

In the dry northeast corner of the country lies Lake Chad, which Nigeria shares with republic of Niger, Chad and Cameroon.

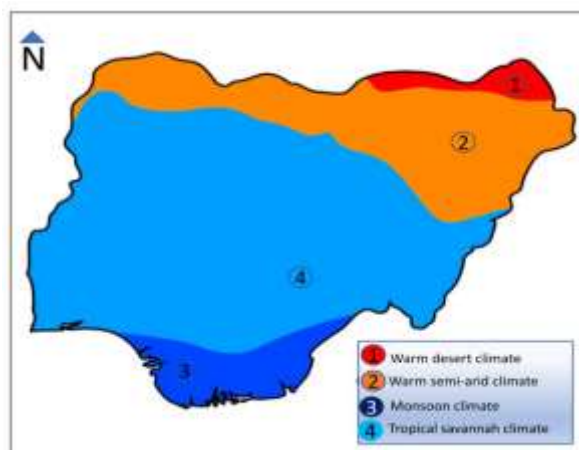


FIGURE 1: Map of Nigeria showing distribution of climate

PLANT ECOLOGY

Nigeria has abundant plant species, most of them are native while few are exotic. A greater percentage of man-made forests in the country is dominated by exotic species [3, 4]. The country is being defined as a state of forests and savannas. In Nigeria, some ecological reports have shown that fewer than 10 invasive plants exist in the country. The *Rattus rattus* and Avian influenza virus were also considered invasive alien species [5].



FIGURE 2: Massive Maize plantations

Many indigenous species, including soybean and its varieties, serve as a very significant source of protein and oil in this region. Medicinal plants are also available, used for the purpose of curation and prevention from diseases. Some of these vegetations include Euphorbiceae, which is used for malaria treatment, gastrointestinal disorders and many other infections. Different stress factors such as poor soil nutrients, droughts and susceptibility to pests have contributed to massive maize plantations being an integral part of agriculture in this region [6].

ENVIRONMENTAL ISSUES

Environmental issues such as waste management including sewage treatment, the issue of soil degradation and deforestation, as well as global warming or climate change in general are the major environmental problems in Nigeria.

In 2005, Nigeria had experienced the peak rate of deforestation, according to the Food and Agricultural Organization of the United Nations [7 - 9]. In that year about 11,089,000 hectares had been forested throughout the country.



FIGURE 3: Global Forest Watch map showing forest loss and gain in Nigeria between 2001-2012
 Source: Butler, R. (2014)

It was also disclosed that between 1990 and 2000, each year Nigeria lost an average of 409,700 hectares of forest, equivalent to an average annual deforestation rate of 2.4% and then between 1990 and 2005, cumulatively Nigeria had lost 35.7% (6,145,000 hectares) of its forest cover [10].

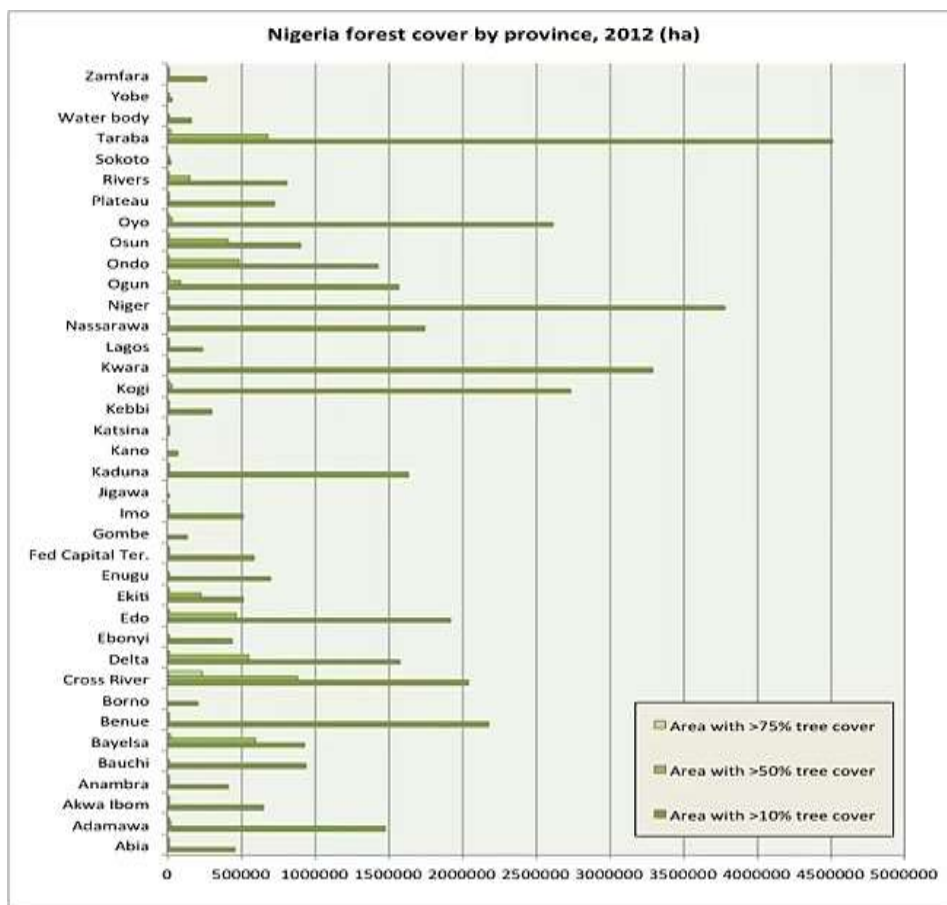


FIGURE 4: Forest cover by individual state in Nigeria
 Source: Butler, R. (2014)

In Northern Nigeria, the semi-arid zones face manifold natural hazards but the major ones are drought and flood. These invariably cause famine, food insecurity as well as an abject poverty [11, 12]. However, the communities may have a variety of devised measures in growing drought-resistant and early-maturing indigenous crop varieties, gathering wild fruits and vegetables, and wetlands cultivation which can enable them to survive climatic hazards with little or no support from the outside world [11].

STATUS OF AGRICULTURAL MECHANIZATION IN NIGERIA

Although in Nigeria, the role of mechanization has been for a long time considered as part of the country’s overall agriculture and food security policy, the practice and achievement of utilizing modern machineries and automatic devices for the improvement of agricultural activities has been gradual, and is probably lower than it should be under ideal conditions [11, 13]. Agricultural mechanization is supported through various efforts of government in different programs including distribution of subsidized tractors to individual farmers, or private-sector machinery hiring service providers [14]. The attention has gradually been shifted from the farmers to the private-sector machinery hiring service providers over the years, as it has increasingly been recognized that hiring services more efficiently meet smallholder demand [15, 16].



FIGURE 5: Distribution of Tractors to farmers by Federal Government
 Source: Federal Ministry of Agriculture, 2019

In addition, many national agricultural research organizations, such as the Institute of Agricultural Research in Samaru, Zaria, Kaduna State support the development of machinery, such as tractor-attachments [17].

The government has also promulgated some regulatory measures, including checking and testing the machines as well as certifying the machines and operators [17, 18].

In terms of affordability, the Nigerians embraced the purchase of used-tractors because often provide affordable alternatives to new tractors, with spare parts and repair services available in local markets, but their supply and demand are not matched spatially [19, 20].

MECHANIZED FARMING

The demand for agricultural mechanization may be attributed to various factors such as population density, farming systems and labor wages [15]. In Nigeria, the fate for mechanization services has been always based on regional capacities, with an uneven supply across locations.

Current mechanized farming may be highly constrained by the lack of supply and many other factors that might be due to low operational capacity and poor maintenance of equipment in public tractor-hiring services, distribution of non-standard subsidized tractors, and the high costs for starting up a private mechanization service [21, 22].



FIGURE 6: Mechanized farming in Nigeria

However, the use of heavy machineries such as tractors is still relatively rare in Nigeria. In 2010 during rainy season, only 6 percent of the country’s farmers used tractors in the Northwestern region, either their own or rented (Table 1) [22]. The most commonly practice is the use of animal traction, particularly in the Northeastern part of the country, where over 60% of farmers practiced traction with either their own animals or rented ones [23]. Hence, the level of mechanization has remained low in Nigeria [24].

TABLE 1: The Percentage of Farmers using Tractors/Animal Traction in 2010 During Rainy Season in Nigeria

Region	Tractor			Animal Traction			Neither Usage of Tractor/Animal Traction
	Total	Owned Tractor	Rented Tractor	Total	Owned Tractor	Rented Tractor	
North-West	6	2	4	27	17	10	67
North-East	2	1	1	62	36	26	36
North-Central	15	4	11	5	3	2	80
South-East	0	0	0	0	0	0	100
South-South	0	0	0	0	0	0	100
South-West	4	3	1	1	1	0	95

Source: Takeshima et al. (2013)

FARM MACHINERY

In the early of last decade, agricultural research and development (R&D) activities had gained an awesome attention. About eighty percent of the total landmass slotted for Nigerian agricultural sector as well as 0.4 percent of gross domestic product (GDP) was used for that purpose [25, 26]. The institutions, enterprises and activities involved in agricultural machinery in Nigeria include; Factory of Agricultural Machinery, Import of Agricultural Implements etc.

FACTORY OF AGRICULTURAL MACHINERY

Allamit Nigeria limited, Odo Ona, Ibadan and Hanigha Nigeria limited, Kaduna are the two major private agricultural machinery manufacturers in the country. Agricultural machinery such as tractor and majority of related implements for large scale production had not been manufactured in Nigeria. However, the Nigeria Machine Tools Limited (NMTL), Osogbo remained the only public agricultural machinery manufacturer in the country. Some farm tools such as cassava planter, seed planter, threshing machine for rice and soybean, cassava peeler, shelling machine for maize, pellet machine, livestock feed mixers, hammer mills, cassava graters and plants shredders are being manufactured for small and medium scale production in the country [27, 28].

IMPORTATION OF AGRICULTURAL IMPLEMENTS

Nigeria depends on importation of agricultural implements. The two leading importers in the country are Dizengoff West Africa Limited and Bertola Machine Tool Limited. Imported agricultural implements include tractor, diesel engine, power tiller, harrow, plough, combine harvester, threshing machine, rice transplanters, self-propeller transplanter, etc. The main companies and enterprises responsible for the importation of these implements include but not limited to Famousil Rich Enterprises, Niji-Lukas Nigeria Limited, Base Bond International Limited, Dizengoff West Africa Nigeria Limited, Bertola Machine Tool Limited, Mantric Nigeria Limited, El-Hanan-Ventures Limited, Centro Machinery Nigeria Limited, Jopfack International Limited, and TaboV Nigeria Limited etc [27, 29].

CHALLENGES CONFRONTING AGRICULTURAL MECHANIZATION IN NIGERIA

Nigeria as a developing country is critically confronted with many challenges that are adversely affecting the agricultural industry and agricultural mechanization. These challenges include but not limited to poor supporting agricultural infrastructure such as railways for conveying heavy farm-produce loads, roads, and irrigation dams; lack of access to land and land management; unavailability of farm inputs such as fertilizer, seeds/seedlings, and animal feeds; purchase of machines and spare parts at non-affordable prices; poor funding of mechanization research and development; gender differences in human resources; lack of non-interrupted electricity supply etc. [30, 31, 32, 33].

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