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### **Nigeria: removing barriers to market access through infrastructure development and supply chain innovation**

Nigeria is a developing country in western Africa that has experienced periods of political and communal violence. It has the largest population on the continent, estimated at over 150 million people, and its infrastructure is not fully functional or well maintained. Small-scale farmers overcome problems in food production, which include; Lack of basic farming skills, Lack of basic knowledge of modern and sustainable farming practices, Lack of government support- Governments do not take farming as a priority, Lack of basic scientific research to invent new effective and sustainable farming practices, High level of corruption in developing countries, Lack of storage facilities. These result in high farm inputs in terms of farm inputs-time, resources etc and low farm products as the result of wastage in course of transportation. Years of military rule, corruption, and mismanagement have hobbled economic activity and output in Nigeria, despite the restoration of democracy and subsequent economic reform.

Petroleum plays a large role in the Nigerian economy, accounting for 40 percent of the GDP. It is the twelfth largest producer of petroleum in the world and the eighth largest exporter, and has the tenth largest proven reserves. Mineral resources that are present in Nigeria but not yet fully exploited are coal and tin. Other natural resources in the country include iron ore, limestone, niobium, lead, zinc, and arable land. Despite huge deposits of these natural resources, the mining industry in Nigeria is almost non-existent.

Typical poor nomadic Fulani family comprised of the male, the head of the household and one or more wives. They may have children who normally stay with them. At times, the settled Fulani may live in a large compound with their eldest married son or sons. These people live in thatched houses and live in hamlets in bushes or small villages with no access to water, electricity, no schools. Accesses to Markets are also limited. They go to markets in urban areas on special days to purchase goods. Access to health facilities is limited. Most of them patronize traditional health experts. The diet of the Fulani family is solely grains- millet, guinea etc. They occasionally feed on the meat and milk they produced. Majority of the Fulani people are illiterates. Access to education before the 1990s was limited. It was in 1990s the Federal government of Nigeria enacted a law for the establishment of nomadic schools to cater for the educational needs of the nomadic Fulani. Such schools comprised of mobiles schools erected in the settlements of the Fulani known as ruga. Majority of the nomads do not have access to health care facilitates. They patronize traditional health experts or embark on self-medication whenever they are ill. The wage of the Fulani people comes from the sales of their dairy products such as milk, yogurt, cheese, hide and skin as well as from the sales of the cattle. Generally, they don't participate in any thing government. Where they typically purchase food: Most if not all Fulani purchase their local food items and other basic necessities of life from the Markets in nearby villages or towns. The issue of living wage or employment doesn't arise in the Fulani setting. They are self-employed. The Males are responsible for rearing and the sales of their cows. The males also decide for the household Issues such health problems, grazing sites and time for migration. On the other hand, the females are the sole distributors and sellers of the diary products such as milk, yogurt, cheese etc

A majority of school children lack the food they need, thereby inducing malnutrition, now posing a serious threat to education, particularly in developing countries, including Nigeria. Malnutrition causes poor growth in children, leading to impaired mental development, poor scholastic and intellectual development. A report by the United Nations Children's Fund (UNICEF), describes these effects as the

most serious long-term results of malnutrition. Although several organizations worldwide, governmental and private have made efforts to combat and stop malnutrition, not much has been achieved in this direction. Malnutrition is caused by a deficiency in the intake of nutrients by the cells of the body, which results to death.

Adequate nutrition: Research conducted among the Fulani community in Sokoto State showed that over forty percent of the Children are malnourished. Many families have gained a lot when barriers were removed from market access. Food prices became lower and everyone had adequate nutrition. Agricultural projects established aided small-scale farmers with farming tools, land, chemicals, etc. The food prices are becoming low and this helps reduce malnutrition in the country. For people working in the agricultural sectors, they earn more than before. Farmers aided by these projects produce a large quantity of food for processing.

Regarding traditional milk and other dairy products production and marketing strategies, the production process starts early in the morning by the male folk of the household. He milks the cattle and takes the milk to the female member of the household or wife of the head of household. The wives of Fulani pastoralists usually process fresh milk into various traditional milk products, depending on the intended market and time. These products include nono (sour milk), kindirmo (sour yoghurt), maishanu (local butter), cuku (Fulani cheese) and wara (Yoruba cheese). The milk produced by the cows is for both household consumption and direct sales to local consumers as fresh milk, clarified fat (ghee) or other forms of traditional dairy products. The dairy products are stored and distributed in calabashes, covered by a material called fepe. There is no standard method of storage at home or while on transit to the nearby market. This situation exposes the product to a host of health hazards. Similarly, it results in wastage due to spoilage. It has been estimated fifty percent of the dairy products produced daily are lost due to spoilage as the result of lack of appropriate storage facilities or preservatives. The production, processing, marketing and consumption dairy produced by the Fulani people is highly unorganized and conducted under unhygienic conditions. This could be attributed to host of factors such as; Poverty, Low literacy level, Lack of organized managerial mechanism

#### MARKET AND MARKETING SYSTEMS

The ready markets of the dairy product of the local Fulani are the nearby villages or urban centers. They either reach those markets on foot, bicycles and very few on vehicles. While in those villages or urban centers the elderly woman but mostly girls of tender age hawked her product from one point e.g. rural markets, roadside hamlets or one office to another on foot. The most pathetic aspect of this is that these women or girls carry these products on their heads. While on road they encounter a lot of challenges. These challenges range from spoilage in transit due to distance, to attack by robbers and other local tribes. The main problem of the marketing and sales of the dairy product of the Fulani people is that there is no organized or conventional method for the disposal of their products. The female hawker decides on when, where and how to sell her product. This has affected the pricing mechanism, resulting in huge economic loss to the household as well as the community.

Fulanis are nomads moving from one place to another. Their main vocation is cattle rearing or animal husbandry. Research has revealed that the Fulani's accounts for the supply of over ninety percent of meat and other dairy products such as cheese, manure hides and skins etc to Nigerians. Livestock production contributes about 12.7% of the agricultural GDP (gross domestic product). Livestock play a very important role in Nigerian agriculture contributing about 12.7% of the agricultural GDP (CBN 1999). The livestock population comprises about 14 million cattle, 34 million goats, 22 million sheep and about 100 million poultry (RIM 1990). The livestock resource survey carried out by the Federal Department of Livestock and Pest Control Services in 1990 puts the cattle population of Nigeria at 13.9 million (RIM 1990). Of these, 13.5 million (96%) are in the hands of the pastoral Fulani. This pastoral herd is the most important source of domestic milk in Nigeria. The livestock subsector is dominated by traditional systems

of production, processing and marketing. Pastoral communities produce the bulk of milk consumed in the rural and urban areas of Nigeria. In most rural settings, the Fulani's provide the cows for ploughing, harrowing etc). In addition the Fulani's add revenue to the coffers of the government through tax of cattle trade and other forms of tax (jangali).

Similarly, the livestock industry is one of the main source employers of labor to Nigerians- providing means of livelihood to a reasonable number of rural pastoral families in the Northern parts of Nigeria. According to FAO (1988), an estimated 183 thousand rural households derived some income from the dairy industry in 1986. This portrays the fact that the Fulani's are contributing immense to the health well being of the community; the economy of the household, the local community as well as the Nigerian Nation.

The federal government established projects that have managed to complete the following in certain areas in order to reduce food insecurity in the country; Increase in farmers knowledge in farming techniques, Employing capacity building for farmers, Refresher training for local famers- how to use new farming techniques and tools, Collaboration with local farmers to invent local farm tools and methods that is acceptable to local farmers. Such tools and techniques can be managed by local farmers with little education. Projects like, farm settlement schemes, and national accelerated food production program (NAFPP) were established to help farmers improve food production and security in the country, help improve livestock production and their main objectives were to introduce more modern agricultural method through farming settlement, co-operative (nucleus) plantation, supply of improved farm implements (e.g. hydraulic press for palm oil processing). Transportation issues are being tackled in some rural areas whereby reducing barriers to market access.

Like many developing nations, Nigeria has accumulated a significant foreign debt. Many of the projects financed by these debts were inefficient, bedeviled by corruption, or failed to live up to expectations. Nigeria defaulted on its debt as arrears and penalty interest accumulated and increased the size of the debt. After a long campaign by the Nigerian authorities, in October 2005 Nigeria and its Paris Club creditors reached an agreement that will see Nigeria's debt reduced by approximately 60 percent. Nigeria will use part of its oil windfall to pay the residual 40 percent. This deal will free up at least \$1.15 billion annually for poverty-reduction programs. In April 2006, Nigeria became the first African country to fully pay off its debt (estimated at \$30 billion) owed to the Paris club.

The 2012 annual budget allocated 1.66% to the agricultural sector (which is far better than what was given 2011). Since 1974 the Bank has committed \$1.2 billion for Agricultural Development Projects (ADPs) to increase farming and livestock production, market access and welfare among smallholders in Nigeria. OED reviewed five ADPs and a supporting Agricultural Technical Assistance Project (ATAP), all implemented between 1979 and 1990. Only two of the six projects had satisfactory outcomes. In general, rain fed agricultural production was far below projections. Macroeconomic conditions, some national policies, and particular design and implementation problems prevented a more significant impact. Low-cost irrigated development of lowland areas (fadama) was, however, quite successful. Village water supply components exceeded their targets. The ADPs have evolved to be "permanent" institutions for rural infrastructural development and agricultural services, but their role alongside the regular state departments needs to be reviewed.

The ADPs were designed in response to a fall in agricultural productivity, and hence a concern to sustain domestic food supplies, as labor had moved out of agriculture into more remunerative activities that were benefitting from the oil boom. Conversely, domestic recycling of oil income provided the opportunity for the government, with Bank support, to develop the ADPs. The projects provided agricultural investment and services, rural roads, and village water supplies. The government's adoption of the ADP concept put the smallholder sector at the center of the agricultural development strategy, and marked a clear shift

away from capital-intensive investment projects for selected areas of high agricultural potential.

The first ADPs in Nigeria were enclave projects each covering a specific region within a state. Their early results impressed both the federal and state governments, and there was pressure to replicate the approach across whole states.

Two of the projects audited--Ilorin and Oyo North--were enclave projects, and were located in the "middle belt" of Nigeria whose main crops are rain fed cereals and root crops. The three other ADPs audited--Bauchi, Kano, and Sokoto--were statewide projects in Nigeria's northern zone. Cropping in this zone is based on rain fed cereal crops and pulses, with localized areas of fadama in drainage lines that can support higher-value crops.

All the five ADPs sought to increase food production and farm incomes. In all of them it was assumed that productivity increases would come from the use of improved technology, especially planting material and fertilizer. The agricultural components of the projects were designed around systems for developing technology and transferring it to farmers, distributing modern inputs, and land development including small-scale irrigation of fadama areas and land clearing.

Investments in infrastructure included an expanded feeder road network, construction of farm service centers for input distribution, and facilities for ADP staff and operations. To support its agricultural and market development goals the federal government introduced controls on food imports and continued its substantial subsidies on farm inputs, particularly fertilizer. The technical assistance project was designed to support the ADPs and strengthen the capacity of the Department of Rural Development in the Federal Ministry of Agriculture (FMOA) to plan and coordinate agricultural production programs.

The emphasis on modern technology in the ADPs led their agricultural research and extension services to focus on relatively high-input technology for sole cropping systems. These systems were not used by the majority of smallholders. Most smallholders, especially in the semi-arid north, used mixed/relay cropping systems as a rational strategy to reduce risks. They were also conservative in their use of cash inputs, even though such items as fertilizer were heavily subsidized. It was only after mid-term reviews that the projects began to focus on the constraints and potentials of the mixed/relay cropping systems actually used by local smallholders, and only very late in the projects that the changed focus began to be reflected in the work of extension services. The fadama programs in the northern ADPs, though small in area relative to rain fed crops, were successful and exceeded their targets for developing small-scale irrigation. They used cheap techniques for extracting shallow groundwater, which permitted high-value vegetable crop production. A free-standing fadama development project has ensued.

The feeder road construction programs largely met their targets. But their reliance on force account required extensive supporting infrastructure, paid for out of scarce public funds. Some expensive mistakes were made in procurement. Of more lasting importance, however, is the lack of effective arrangements for maintaining the roads built, about half of which are already in poor condition. The rural water supply programs based on boreholes and hand pumps were successful, and the local government councils are cooperating in their maintenance arrangements.

At project closure, most of the ADPs had a weak and uncertain funding structure, and were providing poorer services than should be expected of such semi-autonomous development institutions. Though they were developed to perform a temporary role, in providing investments and services in lieu of relatively ineffective line agencies, the ADPs have nonetheless assumed a permanent status--which supports the contention that this type of agency was needed to implement the development envisaged under the projects. They are now recognized as the major agricultural development institutions in the states, but

difficulties persist with their funding (as with other government agencies and departments). Their functions need to be rationalized with regard to those of the state departments of agriculture and of related sectors. There is a similar need to rationalize the FACU and APMEU institutions alongside other federal entities, which have some overlapping functions in the agriculture sector.

Many of those technologies that were adopted by farmers can be expected to go on having positive effects on production in the near medium term. But some problems in the farming systems need more attention: The northern fadama areas are facing increasing pest and other problems associated with intensive cultivation, and the traditional millet-sorghum-cowpea system is subject to an increasing challenge from the parasitic "striga" weed. Hopefully, the recently approved natural agricultural technology support project will address these technical issues. The pervasive subsidies in the agricultural sector and in the ADPs created many inequities and distortions. Most important were the effects of the government's monopoly in procuring and distributing subsidized fertilizer:

The inadequate quantities procured, combined with the high level of subsidy, led to illicit rents being obtained in the distribution process. In recent years, farmers have been paying much more for fertilizer than the official prices, diverting a significant part of the subsidy to the rent seekers. The high fertilizer subsidy absorbs a substantial part of the federal and state budget allocations for agriculture. Much of the expenditure on subsidies could be used more beneficially in the sector.

All projects except that in Ilorin supported improvements in rural water supply. This impressive program exceeded its targets and has probably benefitted 300,000 - 500,000 people, bringing them better health and saving time spent by women collecting water. These were investments, which villagers needed and appreciated, and the experience with their maintenance emphasizes the advantages of involving beneficiaries in investment decisions. The water supply was developed mainly through constructing wells or drilling boreholes equipped with hand pumps, with the agreement of local governments. For boreholes, the ADPs successfully used private contractors, engaged through international tenders and supervised by consultants. Where boreholes were not feasible--in parts of Oyo North-- the ADP built dams with water filtration systems. Dams were constructed by force account. Communities successfully manage the boreholes, wells, and hand pumps. The ADPs developed maintenance systems in which local government councils and villagers participate. Some early problems with pumps were corrected and local production of spare parts facilitated the maintenance program.

Research institutions in developing countries should be well funded to embark on research so as to produce basic or local farming tools. Similarly, they can provide blueprints for farmers on how to cultivate different crops under various environmental conditions; the research institutes in developing countries like Nigeria should collaborate with scientists in different parts of the globe- to share knowledge, ideas and new innovations.

One of the important factors that affect farmers and reduce food supply is weather fluctuation. This has led to the loss of billion dollars worth of food. This could be through flooding, drought, earthquake or hurricane. To reduce the impact of this menace, government should have sound and reliable weather monitoring and warning systems that will guide farmers on their activities. Most of the farm products in developing countries are perishables, can decay within hours while on transit. This can be avoided or the loss can be reduced by governments providing storage facilities at designated points. Such facilities could be solar powered refrigerators since power is one of the major challenges in developing countries. Similarly, refrigerated vans can be used to transport farm products from one locality to another. Governments should look for ready markets for their farmers. This will go along way in reducing wastage on transit.

Genetically modified food, milk etc. Single Cell proteins, protection (crops) against Pathogens, Protection against pests, increasing shelf life of farm products- meat, dairy product should be considered

by government. Governments in developing countries should enact laws to regulate the activities and behaviors of farmers, there should be agric extension workers in all farming villages to assist guide farmers on innovative techniques, farm management techniques etc. Increase farmer knowledge in farming techniques, Employ capacity building for farmers, Refresher training for local farmers- how to use new farming techniques and tools, Collaboration with local farmers to invent local farm tools and methods that is acceptable to local farmers. Such tools and techniques can be managed by local farmers with little education. For Nigeria to achieve the Millennium Development Goals and ensure that over fifty percent of Nigerians have adequate nutrition and sustainable source of income the agricultural and market power should be reactivated, reinforced by the government, community, stakeholders, researchers, etc. The Fulani people need more empowerment from government in education and market since they are the largest producers of dairy products in the country.

In order for the Nigerian government to achieve their goals towards food and market, they have to slow and ultimately stop agriculture expansion especially into tropical forest and savannas. The demise of these ecosystems has far reaching impact on the environment especially through lost biodiversity and carbon dioxide emissions (land clearing). Slowing deforestation would dramatically reduce environmental damage while imposing only minor constraints on global food production. Food production cannot only be boosted through agricultural expansion, existing farmlands can be improved by efficient irrigation system, better seeds, and more effective fertilizers (environmental friendly). Resources have to be used efficiently by both government and farmers. Consumers, government, farmers, marketers etc. have to reduce food waste in the country by adequate portions not of the food and not wasting them in the trash whereby wasting over 50% of food produced in the country.

There is no gainsaying the fact that the dairy industry is one of the most important sources of livelihood nutrition to most people of Nigeria especially the Fulani of Northern Nigeria. According to FAO (1988), an estimated 183 thousand rural households derived some income from the dairy industry in 1986. The dairy industry, through which better nutrition can be provided to the citizens, was given adequate attention in these development plans. In some selected areas, the government established dairy farms with local and imported breeds of cattle. In addition, milk collection centers including mobile collection points were established.

All being said above, infrastructural development and supply-chain innovations are progressing in Nigeria. The government has tried in the aspect of food, transportation farmer and nomadic education, roads and water supply for its rural and urban farmers or citizens Research shows that the 2012 annual budget shows that a little attention is given to the agricultural sector so as to reduce food insecurity and barriers in markets. It is pertinent to note that one of the cardinal principles of the Nigerian government (via its various programs such as the Development plans (first in 1962/68 and the fourth in 1981/85; operation Feed The nation, NEEDS etc.) as well as the MDG (Millennium Development Goals) is the improvement of the living standard of Nigerians and has been the major focus of various national governments. The government alone cannot accomplish these goals they also need support from the farmers and citizens whereas, the government provides infrastructures and aid farmers, farmers should use resources provided to them efficiently, and the citizens help conserve nature. This means everyone has a role to play in food security where by making development faster and easier (division of labor).

Nigeria is a developing country and yet the government is trying so hard on food production unlike other developing countries in Africa and that is why it is referred to as the giant and heart of Africa.

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