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The role of Nigerian agriculture in West African food security

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THE NIGERIA STRATEGY SUPPORT PROGRAM (NSSP)

REPORTS

ABOUT NSSP

The Nigeria Strategy Support Program (NSSP) of the International Food Policy Research Institute (IFPRI) aims to strengthen evidence-based policymaking in Nigeria in the areas of rural and agricultural development. In collaboration with the Federal Ministry of Agriculture and Rural Development, NSSP supports the implementation of Nigeria's national development plans by strengthening agricultural-sector policies and strategies through:

- Enhanced knowledge, information, data, and tools for the analysis, design, and implementation of pro-poor, gender-sensitive, and environmentally sustainable agricultural and rural development policies and strategies in Nigeria;
- Strengthened capacity for government agencies, research institutions, and other stakeholders to carry out and use applied research that directly informs agricultural and rural policies and strategies; and
- Improved communication linkages and consultations between policymakers, policy analysts, and policy beneficiaries on agricultural and rural development policy issues.

ABOUT THESE REPORTS

The NSSP Reports either contain preliminary results or support ongoing research. They are circulated in order to stimulate discussion and critical comment.

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Abstract

Ensuring food security remains a major challenge confronting West African countries¹. Though food production has increased in the recent past, the region as a whole is not likely to meet the first Millennium Development Goal (MDG) of halving the number of malnourished people by 2015. Nigeria is a leading food producer and marketer in the sub-region – it is the largest producer of almost every major agricultural product and has the largest market for agricultural commodities in West Africa. While different studies have recognized the leading role of Nigeria in the region, very few have researched into the role of Nigerian agriculture in West African food security. Given the significance of the Nigerian economy in West Africa – with approximately 60 percent of the population and over 50 percent of regional gross domestic product (GDP) – it is important in the context of regional initiatives to understand the country's role in regional food security (World Bank, 2006). Understanding Nigeria's role is also important for strengthening regional cooperation for collective action to achieve improved food security in the region.

The main objective of this study is to examine the role of Nigerian agriculture in West African food security. The study discusses the implications of Nigeria's agricultural production, the potentials for Nigerian export of agricultural products to enhance regional food security, and the role that the Comprehensive Africa Agriculture Development Program (CAADP) could play in supporting agricultural research and development (R&D) efforts in the region. The study is based on a critical review and analysis of secondary information on Nigerian agriculture in relation to cross-border trade and food security in the West Africa region. The data were obtained from the Central Bank of Nigeria (CBN), the Food and Agricultural Organization statistical database (FAOSTAT), and databases of the Economic Community of West African States (ECOWAS) and the National Bureau of Statistics (NBS).

The study showed that, on average, 17 percent of the 280 million people living in West Africa are still food insecure, while about 30 percent live below the poverty line. Thirty-three percent of children under five years of age are stunted, 28.3 percent are underweight, and 10 percent are wasted. Average dietary energy supply (DES), a measure of food security, ranges from 2,500 kcal per capita per day in the coastal regions to 2,400 kcal per capita per day in the savanna regions. In terms of contribution to regional food security, however, Nigeria currently contributes only 51 percent of the total food supply in West Africa. Endowed with the largest agricultural potentials in the region, there are opportunities for Nigeria to contribute more to regional food security, when constraints such as low mechanization, inadequate access to improved inputs, poor markets, insufficient access to credit, policy inconsistency, and inadequate infrastructure are removed.

It was shown that agriculture and trade are the two main drivers of food security and that, in these two sectors, Nigeria is the leading country with the greatest potentials in West Africa. Therefore, with increased integration, Nigerian agriculture could contribute in no small way to improving food security in the region. In terms of production of cereals, root and tubers, legumes, and livestock products; the reviewed literature shows that Nigeria has the greatest potentials in the region for production and export to other countries. Increasing the capacity of Nigeria through regional cooperation for increased production of these agricultural commodities could further improve food availability in the country, which could enhance food security in the region as a whole. In this regard, the ECOWAS common agricultural policy could focus more on the interface between it and regional food production hubs such as Nigeria in fulfilling its mandate. International donor agencies and development partners could also focus on supporting Nigeria's efforts at increasing food production and supply. In particular, they can increase their support for Nigeria's agricultural R&D, in addition to assisting the country to attract foreign direct investment to the agricultural sector to boost

¹ West Africa is comprised of the Republic of Benin, Burkina Faso, Cape Verde, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo. It covers a total land area of 5,112,903 Km² with a total population of 280 million people in 2008 (USAID, 2010).

food production. In terms of trade, the study showed that the volume of intra-regional trade between Nigeria and ECOWAS countries is small at the moment. Regional organizations such as ECOWAS and the West African Economic and Monetary Union (UEMOA) have been pursuing the goals of regional integration in trade through the establishment of a common external tariff (CET) and other harmonization policies. Strengthening these regional initiatives will improve trade volumes between Nigeria and West African countries, a factor which the study identified as an important ingredient for assuring regional food security.

Key words: West Africa, Nigeria, food security, agricultural commodities, intra-regional trade, regional integration

Acronyms

ARCN	Agricultural Research Council of Nigeria
AU	African Union
CAADP	Comprehensive Africa Agriculture Development Program
CBN	Central Bank of Nigeria
CET	Common External Tariff
CILSS	Permanent Interstate Committee for Drought Control in the Sahel
CORAF	West and Central African Council for Agricultural Research and Development
CMAP	Common Market for Agricultural Products
DES	Dietary Energy Supply
DPT	Degressive Protection Tax
ECOMOG	ECOWAS Monitoring Group
ECOWAP	ECOWAS Agriculture Policy
ECOWAS	Economic Community of West African States
EPA	Economic Partnership Agreement
EU	European Union
FAAP	Framework for African Agricultural Productivity
FAO	Food and Agriculture Organization
FAOSTAT	FAO Statistical Database
FARA	Forum for Agricultural Research in Africa
FTA	Free Trade Area
FTE	Full Time Equivalent
GDP	Gross Domestic Product
MAPP	Multi-country Agricultural Productivity Program
MDG	Millennium Development Goal
NAIP	National Agricultural Investment Plan
NARI	National Agricultural Research Institute
NBS	National Bureau of Statistics
NEPAD	New Partnership for Africa's Development
R&D	Research and Development
RAIP	Regional Agricultural Investment Plan
RPFS	Regional Program for Food Security
RFIS	Regional Food Security Information System
SAP	Structural Adjustment Programs
SIT	Special Import Tax
SPFS	Special Program for Food Security
TAC	Technical Aid Corps
TLS	Trade Liberalization Scheme
UEMOA	Union Economique Et Monetaire Ouest Africaine
UN	United Nations
USAID	United States Agency for International Development
WAAPP	West Africa Agricultural Productivity Program
WACM	West African Common Market
WAEMU	West African Economic and Monetary Union
WAMZ	West African Monetary Zone
WTO	World Trade Organization

1.0 Background

Ensuring food security remains a major challenge confronting West African countries.² Though food production has increased in the recent past, the region as a whole is not likely to meet the first Millennium Development Goal (MDG) of halving the number of malnourished people by 2015. About 60 percent of the West African population lives in rural areas and depends mostly on agriculture, which contributes 35 percent of the regional gross domestic product (GDP) and over 15 percent of exports earnings of the region. Despite its high agricultural potentials, the region is a net importer of food: 80 percent of food needs are covered by local production while the remaining 20 percent are covered by imports. Agricultural productivity in the region is among the lowest in the world and this seriously erodes the competitiveness of its products on world and domestic markets (World Bank, 2001). About 30 percent of the West African population is living below the poverty line and 17 percent is undernourished (ECOWAS, 2005).³ One third of all children under five years of age is stunted, 28.3 percent are underweight and about 10 percent is wasted (Lopriore and Muehlhoff, 2004).

Given the significance of the Nigerian economy in West Africa – with approximately 60 percent of the population and over 50 percent of regional GDP – it is important in the context of regional initiatives to understand the country's role in regional food security (Grain del Sel, 2010). As the second largest economy in Africa and the largest in West Africa, Nigeria occupies an important strategic position in the region. Not only is the country dictating the pace of its own economic development, but progress made in Nigeria also often spills over to other countries in the region. Particularly in the agricultural sector, Nigeria has been playing a leading role in regional food security improvement. Nigeria's relatively large domestic market provides substantial growth opportunities for both local and regional producers of agricultural commodities. Nigeria is the largest producer in the region of almost every major agricultural product, and is responsible for 50-60 percent of all regional cereal production (Grain del Sel, 2010). However, regional production only covers about 80 percent of West African food needs, with the remaining 20 percent being met by imports from outside the region. In particular, as a net importer of cereals and livestock products, West Africa is severely affected by the current rise in global food and fuel prices. This scenario reinforces a growing recognition within the region of the exigency for regional cooperation to strengthen food security and trade through the agriculture-led growth initiative of the Comprehensive Africa Agriculture Development Program (CAADP).

While different studies have identified the leading role of Nigeria in regional trade and economic development (Eboh et al., 2004; Bach, 2010; Sempere, 2010), very few have examined the role of Nigerian agriculture in food security in the region. An understanding of the roles of Nigerian agriculture (both current and potential) in West African food security is essential in order to suggest appropriate policy initiatives that will improve the contribution of the country to regional food security. In addition, this knowledge is essential for strengthening regional cooperation for collective action to achieve improved food security in the region. The main objective of this study is to establish the role (current and potential) of Nigeria in West African food security. The study will answer the following research questions: 1) What are the implications of Nigeria's increased agricultural production for food security in West Africa?; 2) What roles can Nigerian agricultural exports play in enhancing food security in West Africa?; 3) What can CAADP do to support regional food security, especially through a regional framework for research and development (R&D)?; and 4) What

² Food security has been defined as a situation in which all people, at all times, have physical and economic access to sufficient, safe and nutritious food needed to maintain a healthy and active life (FAO, 1996).

³ ECOWAS is the regional economic organization of countries in West Africa. Countries that belong to ECOWAS include Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra-Leone and Togo. In many parts of this report, West Africa and ECOWAS are used interchangeably.

are the key policy issues affecting regional agriculture and food security, and what is Nigeria's influence on these?

The study is based on a critical review and analysis of secondary data on Nigerian agriculture in relation to food security and cross-border trade in the Economic Community of West African States (ECOWAS) region. Data were collected on food output, production, import, export, and intake for Nigeria and ECOWAS countries. The data were then analyzed to draw inferences on the contributions of Nigerian agriculture to regional food security. The data were collected from the Central Bank of Nigeria (CBN), the Food and Agricultural Organization statistical database (FAOSTAT), and databases of ECOWAS and the National Bureau of Statistics (NBS). Deductive logic was applied to form judgment and conclusions about Nigeria's role in West Africa food security. Specific country evidences on the contributions of Nigerian agricultural export to food availability in ECOWAS countries are also discussed.

The paper is structured as follows. Section 2 presents first an overview of agricultural production and food security in Nigeria and West Africa, and later examines the contribution of Nigerian agriculture to regional food security. Section 3 discusses the contribution of cross-border trade to West African food security. Utilization of agricultural commodities and the contribution of crops, livestock and fisheries to daily food intake in Nigeria and the region are discussed in section 4. Section 5 examines regional R&D and the role of CAADP. Section 6 summarizes the key policy issues affecting regional agriculture and food security and the roles and influence of Nigeria, while section 7 concludes with recommendations for strengthening regional cooperation for food security.

2.0 Overview of agricultural production and food security in the ECOWAS sub-region: The role of Nigerian agriculture

2.1 Current state of food security in the ECOWAS sub-region

About 60 percent of the population in ECOWAS countries lives in rural areas and depends mostly on agriculture, which contributes 35 percent of the regional GDP and over 15 percent of exports (ECOWAS, 2005). Despite its high agricultural potentials, the region is a net importer of food: 80 percent of food needs are covered by local production, while the remaining 20 percent is covered by imports (World Bank, 2011). Main staple food crops in the region include rice, sorghum, millet, cassava, yam, plantain and maize. Cocoa, cotton, rubber and oil palm are the main cash crops. Agricultural productivity in the region is among the lowest in the world and this seriously erodes the competitiveness of the region's products on world and domestic markets (World Bank, 2001). About 30 percent of the population in ECOWAS countries is living below the poverty line and 17 percent is undernourished (ECOWAS, 2005). One third of all children under five years of age are stunted, 28.3 percent are underweight and about 10 percent are wasted (Lopriore and Muehlhoff, 2004).

However, in the recent past, food security conditions have improved marginally across West Africa. Dietary energy supply (DES) increased by 20-25 percent from about 2,000 kcal per capita per day in the 1980s to more than 2,500 kcal in 1999-2001. During this period, availability of protein rose by about 15 percent from 45g to 50g per capita per day (Lopriore and Muehlhoff, 2004). Table 1 shows that undernourishment in West Africa currently ranges from 5 percent in Ghana to 35 percent in Sierra Leone. However, the trend in DES improvements differs between the drier Sahelian countries and those closer to the coast. For example, while DES is around 2,500 kcal per capita per day in the coastal zone, it is less than 2,400 kcal in the Sahelian zone (Lopriore and Muehlhoff, 2004). In contrast, protein deficiency is more common in coastal countries than in the Sahelian zone. While DES has increased in the ECOWAS region, dietary quality and diversity have not improved. Staple foods contribute up to 80 percent of total dietary energy, with cereals accounting for 50 percent and roots and tubers for some 30 percent (Lopriore and Muehlhoff, 2004).

The modest improvement in food security in the region has been driven by several factors. In general, there has been an upward trend in total food production in the region. Though not as spectacular, increases in per capita food production have also been recorded in most countries in the region. For instance, Ghana increased its food production and reduced the proportion of undernourished people from 64 percent to 12 percent between 1979 and 2000 (Lopriore and Muehlhoff, 2004). An expansion in the production of maize, yam, cassava and plantain accounted for most of the increase in DES (Flores, 2004). Similarly, there have been substantial increases in agricultural productivity in recent years in the region (FAO, 2001). For example, the index of agricultural productivity increased to 186.8 in Benin, 167 in Ghana, 156 in Nigeria, 142.9 in Burkina Faso and 142 in Guinea in 1999. In these countries, increases in per capita agricultural output were equally robust.

Apart from increased food output and agricultural productivity, cross-border trade between West African countries has boosted food security in the region. For instance, the cross-border trade in grain and livestock between Niger and Nigeria has helped to improve food availability in the two countries. In the same vein, countries such as Cameroon, Mali, Benin and Ghana that have links with Nigerian agricultural markets have been able to improve food supply in their countries through cross-border trade with Nigeria. Finally, the ECOWAS Agricultural Policy (ECOWAP), adopted by the ECOWAS heads of state in 2005, has begun to impact positively on food availability and accessibility in the region. The cumulative effect has shown on regional food security improvement in the recent past.

2.2 Relative magnitude and composition of Nigeria's agricultural production within the ECOWAS sub-region

With an estimated 79 million hectares of arable land, Nigeria is by far the largest agricultural producer of staple crops in the ECOWAS sub-region (Ayoola, 2009). In Nigeria, agriculture presently contributes about 41 percent of the GDP and employs about 70 percent of the workforce (Ayoola, 2009). The contribution of agriculture to the GDP is made up of crops (85 percent), livestock (10 percent), fisheries (4 percent) and forestry (1 percent) (Ayoola, 2009). The most important staple crops include maize, millet, sorghum, rice, wheat, beans, potato, cassava, yam, cocoyam, and plantain. The important cash crops include cocoa, cotton, rubber, oil palm, kola nut, and cashew.

Output of major agricultural commodities has continued to increase in Nigeria. It has grown by 30-40 percent between 1990 and 2006 (Table 2). Figure 1 shows that the total output of major staple agricultural commodities rose to about 140 million tons⁴ in 2007. The increase in food output is caused by an increase in cultivated land for the various commodities. For instance, maize cultivated area increased by 9 percent between 1998-2000 and 2001-2003, while cassava and rice areas increased by 12 percent and 24 percent respectively between the same period (Eboh et al., 2004). Another reason for the observed increase in food output is the increase in agricultural productivity in the country. The total index of agricultural productivity has increased since 1983 reaching about 160 point in 2007 (Figure 2). The index of individual commodities output of staple crops, livestock and fisheries has continued to grow and this has contributed to the increase in food availability in the country (Figure 3).

Generally, both total food output and food output per capita has continued to increase in Nigeria and this has been driven by the increased production of roots and tuber crops on the one hand, and grain crops on the other. Root and tuber crops dominate agricultural production, accounting for 89 million ton in 2008 (this is about 69 percent of the ECOWAS regional supply). These crops account for two-thirds of staple crops grown in Nigeria. Production is estimated to have tripled in the last twenty years, thanks to an increase in area cultivated and improved yields. Nigeria is the world's leading producer of cassava and the second largest producer of sweet potatoes (Eboh et al., 2004).

⁴ Throughout this document, 'ton' indicates metric tons

Domestic cassava production increased greatly since the late 1990s, rising by 44 percent in seven years to attain 44 million ton in 2008 (Eboh et al., 2004). The increase is primarily due to increased area cultivated as yields have stagnated at a low level of 12 ton per hectare (Eboh et al., 2004). Yam production, though it has witnessed a very unstable growth rate, has continued to increase since 1985 (Eboh et al., 2004). Output of yam stood at around 35 million ton in 2008. In terms of grain, Nigeria alone grows about 50 percent of the grain crops produced in West Africa (Grain de Sel, 2010). The country accounts for 69 percent of total millet, 53 percent of maize and 48 percent of rice grown in West Africa (Grain del Sel, 2010). Grain production in Nigeria has doubled over the past twenty years (Grain de Sel, 2010). Maize production recorded an exceptionally high growth rate between 1983 and 1988 (Eboh et al., 2004). Its output increased from one million ton in 1980 to over 7.8 million ton in 2007 (Table 4). Millet production grew by 3.8 percent between 1980 and 2008, though the growth has been highly unstable (Eboh et al., 2004). Presently, about 9 million ton of millet are produced in the country (Eboh et al., 2004).

Sorghum is the second most cultivated grain in Nigeria after maize. Its production has increased at a very slow rate, with an average yield of 1-1.5 ton per hectare over the 2000-2006 period (Eboh et al., 2004). The output of sorghum stood at about 9 million ton during this period (Eboh et al., 2004). Rice is the third most commonly grown staple cereal crop in Nigeria after maize and sorghum. Rice output in Nigeria increased by 3.8 percent between 1980 and 2006, reaching 4.7 million tons in 2007 (Eboh et al., 2004). Wheat production in Nigeria remains low at about 70,000 tons per year in 2007, though output continued to increase, albeit irregularly, since 1993 (Eboh et al., 2004). Cowpea production has grown steadily in Nigeria, achieving an average growth rate of about 7.4 percent between 1994 and 1998 (Eboh et al., 2004). Nigeria is the world's largest producer of the crop, with 3 million tons produced in 2008 (Eboh et al., 2004). This is about 58 percent of total regional production of West Africa (Eboh et al., 2004). Nigeria also produces 3.8 million tons of ground nut or about 57 percent of all ground nut grown in West Africa (Grain de Sel, 2010).

In terms of livestock production, output has been growing, but the growth has been less stable with years of decline. About 30 percent of slaughtered livestock is being imported from neighboring countries (Grain del Sel, 2010). This is necessary because domestic production falls short of the demand. Fish production has been growing at a slow rate, with an estimated 600,000 tons of output per year in 2006 (Eboh et al., 2004). Poultry farming is the leading source of meat production in the country, amounting to 350,000 tons per year (Grain del Sel, 2010). It account for 36 percent of total livestock production and covers 19 percent of domestic meat needs (Grain de Sel, 2010). Regarding cash crops, cocoa production has witnessed unstable growth and even negative growth in Nigeria since 1980s. The growth rate was about 9 percent between 1998-2000 and 2001-2003. During the latter period, output stood at about 500,000 tons per year. Coffee and oil palm production have also grown at 2 percent and 3 percent annually respectively between 2001 and 2003 (Eboh et al., 2004).

Overall, the trends in food output in Nigeria over the years have been characterized by relatively stable and mostly positive growth rate. The estimated coefficient of variations—an indicator of growth variability—is less than 50 percent over the period 1970 to 2006. Though Nigeria has witnessed unstable political conditions within these periods, the stable climatic conditions coupled with abundant agricultural resources have helped to maintain the relative stability of food availability in the country.

It should be noted that, in comparative terms, total food output and food output per capita in both Nigeria and West Africa followed similar trends between 1970 and 2007 (Figure 4). This gives the impression that Nigeria is one of the ultimate drivers of food output in the ECOWAS region—when output increases in Nigeria, it also increases in the ECOWAS region and vice versa. Food availability in Nigeria between 1970 and 2007 was about 57 percent of the West African total on average (Table 3). These statistics are not surprising as Nigeria has the biggest share of agricultural output for most staple crops in the region. For

instance, the country accounted for 58 percent of total cowpea, 69 percent of millet, 53 percent of maize, 48 percent of rice and 69 percent of root and tuber output in the region in 2009 (Grain de Sel, 2010).

Notwithstanding the modest improvement in food availability in the ECOWAS region over the last few years, the food balance table for the region still reveals a large shortfall. Food demand is larger than production and the shortfall is met by imports. For example, in the 1998-1999 season, about 6 million tons of cereals were imported to supplement the shortfall in production in the region (Gavian and LeVallee, 2002). West African countries import food from countries inside and outside of the region, especially Asian countries. As Nigeria remains the largest food producer in the ECOWAS region, it is also the largest importer of food into the region. In terms of food import, Nigeria is followed by Ghana, Cote d'Ivoire and Senegal. The most important food imports include rice, wheat, wheat flour, meat, sugar, milk, and vegetable oil (Table 6).

Because of its population, food shortfalls are more pronounced in Nigeria, and subsequently food imports are bigger than those of other countries in the region. Nigeria's food imports rose from NGN1.2 billion⁵ in 1980 to about NGN128 billion in 2000 (CBN, 2000). The increase in domestic demand for staple crops is as a result of the growing population, improved living conditions and expansion of the processed food and livestock industries. Demand for grain is dominated, for example, by human consumption followed by food processing and biofuel production industries. Domestic demand for rice has been about 5 million tons per year since 2008 and Nigeria imports more than 3 million tons annually, making it one of the largest rice importers in the world. In addition to direct importation, a percentage of rice flowing to Nigeria is re-exported through the Republic of Benin (Grain del Sel, 2010). Nigeria also imports more than 2 million tons of wheat annually, mainly for household and confectionary use (Grain de Sel, 2010). While Nigeria is itself a net importer of food, it exports agricultural commodities, such as grain, gari, and yam to neighboring West African countries to boost food availability in the ECOWAS sub-region (Grain del Sel, 2010).

2.3 Evidence of the contribution of Nigeria's agriculture to regional food security

In relative terms, Nigeria's agricultural GDP was about 35 percent of the regional agricultural GDP between 1961 and 2000 (Eboh et al, 2004). This indicates that Nigerian agriculture is a major component of regional agriculture and, consequently, whatever happens to Nigerian agriculture will have considerable impact on the region. A comparison of the relative values of agricultural production in Nigeria and the West African region also reinforces the role of Nigeria in regional agricultural production. For instance, the total value of agricultural production in Nigeria over the period 1961-2000 was US\$9,401⁶ million, which represents 47 percent of the total value of agricultural production in the region, estimated at \$21,183 million (Eboh et al., 2004). The disaggregated values indicate that crop production accounted for \$8,530 million in Nigeria, compared to \$17,234 million for the entire region (Eboh et al., 2004). Thus, crop production in Nigeria accounts for 50 percent of the value of crop production in the region. The value of livestock production showed a similar trend, as Nigeria's livestock production accounted for 36 percent of the total value of regional livestock production (Eboh et al., 2004). Although average yields are relatively low in Nigeria, the country ranks best with regards to production and cultivated area of most agricultural commodities in the ECOWAS sub-region (Table 7).

Practical evidence of the role of Nigeria in regional food supply is the supply of grain to Niger. FEWSNET (2010) showed that 80-100 percent of markets in Niger were supplied each week with about 4,300 tons of dry grains from Nigeria during the 2004-2005 food crisis. Presently, Nigeria supplies about 60-70 percent of Niger's grain imports (mostly maize, millet, and sorghum). This supply of grain helped to assure food security for the people of Niger (Diao, 2010).

⁵ Throughout this document, 'NGN' indicates Nigerian naira

⁶ Throughout this document, '\$' indicates US dollars

2.4 Nigeria's potential and comparative advantage for production and supply of key agricultural commodities in the ECOWAS region

Nigeria is a country with huge agricultural potential. The country is characterized by diverse physical and agro-ecological conditions ranging from the tropical forest in the south to the dry savannah in the far north. The country has a total land area of 92.4 million hectares and agricultural land area of 79 million hectares, out of which 32 million hectares is under cultivation (Ruma, 2009). About 30 percent of arable land in the ECOWAS sub-region is found in Nigeria (Grain de Sel, 2010). In terms of labor resources, about 70 percent of the population is engaged in agriculture. These are mainly smallholder farmers with land averaging about two hectares. These smallholder producers account for 81 percent of total cultivated land and 95 percent of agricultural output (Shaib et al, 1997).

Nigeria also has relatively high irrigation potentials among ECOWAS countries. With about 3.1 million hectares, the country accounts for 26 percent of potentially irrigable land in the region (Ruma, 2009). Natural lowlands, known as fadama, are estimated at between 5-8 million hectares in Nigeria, representing half of the total such land in the ECOWAS sub-region (Grain de Sel, 2010). There are 267 billion cubic meters of surface water and 57.9 billion cubic meters of underground water in Nigeria (Ruma, 2009), with an annual rainfall ranging between 300mm – 4,000mm. In terms of other agricultural inputs, Nigeria alone has 70 percent of the tractors in ECOWAS countries with about 30,000 tractors in 2009 (Grain de Sel, 2010). The average tractor density is one per 1,000 hector. There is an average of one extension agent per 12,000 farmers and an average fertilizer demand of about 3 million tons per year (Ruma, 2009). The huge agricultural resources in Nigeria are complemented with large produce markets, which guarantee demand for the commodities. With greater trade liberalization policies, agricultural commodities are expected to be profitable and competitive. This would further encourage production of key agricultural commodities and supply of the same to regional agricultural markets. Given Nigeria's enormous agricultural potentials, it goes without saying that the country holds the key to food security in West Africa. With proactive and sufficiently stable national agricultural policies and improved regional integration, Nigeria can improve food supply and thereby food security in the ECOWAS region.

3.0 Contribution of cross-border trade to West African regional food security

3.1 Structure of West African regional trade

West African trade has continued to expand in the recent past, particularly in terms of intra-regional trade and trade with Asian countries. This is in contrast to trade with North America and Europe, which has not expanded in similar proportions. For instance, exports from ECOWAS countries to other African countries (including other ECOWAS countries) have risen from 4 percent in 1997 to 15 percent in 2003 (Gesellschaft für Technische Zusammenarbeit, 2010). Agriculture accounts for about 10 percent of intra-regional trade (Gesellschaft für Technische Zusammenarbeit, 2010). This is less than its share of total exports of about 20 percent. The main export commodities are cocoa and cotton. Agricultural imports account for about 15 percent of total imports. The two leading imports are rice and wheat, which represent 17 percent and 12 percent respectively of the total imports (FAO, 2002).

ECOWAS as a whole has not generated sufficient intra-regional trade, and few countries in the region have recorded percentage increases in total intra-regional trade between 1995 and 1999 (Eboh et al, 2004) (Table 8). It is to be noted, however, that a significant share of regional trade in staple foods is unrecorded and not accounted for in official statistics. It is widely accepted that actual transactions are larger than is reported in official figures, so that the value of trade could be more than reported. As a whole, West Africa maintains a negative trade balance. Imports were 12 percent greater than exports in 1996, leading to a

trade deficit of \$3 billion (Table 9). The regional trade deficit was fuelled primarily by large trade gaps in Niger, Mali and Burkina Faso. Nigeria had a trade surplus of \$966 million and accounted for 54 percent of West African imports and 44 percent of West African exports in 1996 (Table 9).

The north-south complementarities between the Sahel, the Savanna and the coastal zones have stimulated long distance trade in West Africa. Consequently, several trade corridors have evolved ranging from the eastern zone (Nigeria, Niger, Benin, and Togo) over the central zone (Ghana, Cote d'Ivoire, and Burkina Faso) to the western zone (Guinea, Senegal, and Mali) (Gesellschaft für Technische Zusammenarbeit, 2010). Trade corridors such as the Ouagadougou-Bamako-Dakar-Niamey-Accra and Kano-Maradi are important to the trade in maize, livestock and other grain crops. Meat and cereals from the Sahelian zone are mostly destined toward the coastal zone; while tubers, fruits, and vegetables from the coastal zone are taken towards the northern coastal areas and Sahel countries. This cross-border trade in agricultural commodities has significantly increased over the last few decades, although the volumes are difficult to measure (Gesellschaft für Technische Zusammenarbeit, 2010).

Markets are highly integrated in West Africa and price changes due to supply or demand shocks are easily transmitted among neighboring countries. For instance, any reduction in Nigeria's cereals production usually pushes up regional cereal prices, seriously affecting food security in neighboring countries. In the eastern part of West Africa, a high degree of integration exists between Niger, Benin and Nigeria. In a normal year, Nigeria and Benin export cereals to neighboring Niger's deficit areas. In years of low output, however, Benin and Nigeria utilize a larger share of their domestic production and sometimes import grains from Niger. Parity prices of imports from regional markets are, therefore, key determinants of food supply in all the countries. The supply of agricultural commodities to the regional market is usually affected by shocks in the major producing countries. For example, in 2007, cereal production declined significantly in Nigeria due to poorly distributed rainfall and inadequate supply and high prices of fertilizers. Ghana also experienced significant crop losses due to a long dry spell followed by flood during the 2007 cropping season. The market effects of these weather-induced production shocks have been shown through the current price increase, leading to a tight food market in the sub-region.

Right from time of harvest in 2007, significant increases in grain prices were observed in West Africa, raising serious concerns over the food security outlook. Although food prices increased significantly across West Africa, increases varied from market to market and from country to country, leading to significant changes in trade patterns (FAOSTAT, 2009). While millet price have increased in Niger by 23 percent since the 2007 crisis, it increased by 32 percent in Nigeria leading to unfavorable import parity prices in Niger (Grain del Sel, 2010). Moreover, much higher prices in central and southern Nigeria meant that southward trade within Nigeria became more attractive, limiting trade flows between Niger and Nigeria. Trade in West Africa is fostered by trade liberalization and regional integration, which is spearheaded by ECOWAS and the West African Economic and Monetary Union (UEMOA). While ECOWAS has free trade areas (FTAs) and full economic union objectives, UEMOA focuses on customs and currency union objectives. Regional economic integration leads to reductions in tariff levels in the region, though the principles of free flow of goods without any custom duties or quantitative restrictions in West Africa are still not applied in all cases.

The European Union (EU) is still the UEMOA region's main trading partner, though its significance has declined over the years, with Asia and other African countries becoming increasingly important (Gesellschaft für Technische Zusammenarbeit, 2010). Asia now accounts for 13 percent, Africa 20 percent, and the EU 38 percent of UEMOA's trade (Gesellschaft für Technische Zusammenarbeit, 2010). Cross-border trade within the UEMOA region has increased only marginally since the FTAs were created in 1996. Presently, there is still more intra-regional trade in the UEMOA region than in any other region in Africa (IMF, 2008). Agricultural products dominate this trade. There are significant trade

complementarities between the UEMOA and ECOWAS countries, particularly between coastal and landlocked countries. Similarly, there are trade complementarities between ECOWAS countries, which could promote regional trade tremendously. For instance, Cote d'Ivoire and Senegal have average export complementarities indices⁷ of 51 percent and 39 percent, respectively. This is because their economies are diversified and they are coastal countries which are likely to re-export to landlocked countries (Gesellschaft für Technische Zusammenarbeit, 2010). In contrast; Benin, Niger and Burkina Faso have an average export complementarity of less than 25 percent, suggesting that their exports only partially meets the import needs of other member countries (Gesellschaft für Technische Zusammenarbeit, 2010). In view of the trade liberalization policy which began in 1996, agricultural trade in the ECOWAS sub-region has continued to expand, but there is certainly room for more intra-regional trade that could foster food accessibility and security.

3.2 Nigeria's place in intra-regional trade in agricultural commodities

The trade between Nigeria and other ECOWAS countries is intense and longstanding. Because of its size (Nigeria accounts for over 50 percent of the total GDP of ECOWAS countries), Nigeria participates in more than 60 percent of the intra-regional trade in West Africa (Grain del Sel, 2010). This trade involves primarily agricultural products, manufactured goods, and petroleum (Grain de Sel, 2010). Trade in agricultural products between Nigeria and its neighbors has expanded greatly over the last 30 years and now has a well established structure, including both formal and informal elements (Bernard, 2010). In addition to bilateral trade that complies with established regulations, there is trade that exploits multiple trade, fiscal and monetary divergences between Nigeria and its francophone neighbors (Grain de Sel, 2010). Until the middle of the 1980s, Nigeria's trade policy was highly protectionist. Agricultural products—especially grains and oil—were subjected to high customs duties of between 50 and 100 percent from 1978 to 1982 (Ogunkola, 2010). Quantitative import restrictions were placed on some 200 agricultural products between 1982 and 1985, and export of nearly all agricultural foodstuffs was banned (Ogunkola, 2010).

Beginning with the era of the Structural Adjustment Program (SAP) in 1986, agricultural trade started enjoying progressive liberalization in Nigeria. During this period, duties on agricultural products were reduced and import bans were eliminated. Import and export license regimes were also eliminated. The number of products subject to duties of less than 50 percent rose between 1988 and 2000, while the number of products subject to duties of over 50 percent fell from 13 percent in 1988 to 7 percent in 2000 (Douillet, 2010). As a member of ECOWAS, Nigeria applied the trade liberalization measures that took effect in 2004. Trade between Nigeria and other countries thus expanded tremendously, although trade was not completely liberalized. The incomplete liberalization of trade fostered widespread informal trade in the sub-region, particularly in agricultural products (Ogunkola, 2010). For instance, trade between Nigeria and Benin has been characterized largely by informal flows.

In terms of intra-regional trade in agricultural commodities, Nigeria occupies a very strategic position in the ECOWAS sub-region. The country has played a more significant role than any other country in facilitating access to key agricultural commodities through intra-regional trade (Grain de Sel 2010). As a producer of 75 percent of the dry grains grown in western and central Africa, Nigeria is a net supplier of millet, sorghum, and maize to Niger, Chad, and occasionally northern Cameroon (Grain del Sel, 2010). The volume of this trade is about 500,000 tons annually and it constitutes a food safety valve for Niger and Chad, countries that regularly experience more or less severe food shortages (Soule, 2010). Apart from this, it is also noteworthy that the intensity of trade between Niger and Nigeria is based primarily on the competitive advantage of the countries. A very large proportion of livestock raised in

⁷ The export complementarities index measures similarities between the export structures of two countries. The index ranges from zero, indicating no similarity, to 100, indicating perfect similarity.

Niger is exported to Nigeria while Nigeria in turn exports grain to Niger. These trade flows has contributed in no small way to improved food security in the two countries and particularly in Niger.

After grains, root and tubers are the second largest category of agricultural products exported by Nigeria to ECOWAS countries, in particular yams and cassava products, such as gari (Soule, 2010). While total production is estimated at around 80 million tons, Nigerian exports of yam and cassava do not reach the volume of grain exports. Nigeria also exports seasonal crops such as potatoes and tomatoes to neighboring ECOWAS countries, especially Benin. Nigeria only imports a limited range of farm and livestock products from the ECOWAS countries. These include cowpea and tiger nuts, mainly from Niger. Live animals have also been exported to Nigeria by Niger and Burkina Faso. It is estimated that about one million heads of cattle are traded each year (Soule, 2010).

On the whole, while Nigeria accounts for a large share of trade in agricultural products in the region, ECOWAS countries account for a negligible share of Nigeria's trades. For instance, in 2000, ECOWAS countries accounted for 2 percent of Nigeria's imports and 5 percent of its exports (Eboh et. al., 2004). One can only hope that, with continued regional integration, the volume of trade between ECOWAS countries and Nigeria will increase. This is important as it could lead to an increased food supply in the region.

3.3 ECOWAS tariff structure and regional agricultural trade

The common external tariff (CET) is one of the instruments established to deepen regional trade integration in West Africa. The CET stipulates a single tariff schedule for all the ECOWAS member countries. The CET was established to facilitate regional trade among ECOWAS countries by helping to reduce the rate of protection, open up the market, and reduce transaction costs resulting from different exchange rates at different national borders. The adoption of the CET in 2005 followed from an initial agreement by ECOWAS to liberalize intra-regional trade in 2000. The initial progress towards this liberalization was slow, prompting the establishment of a more effective instrument of trade integration. The CET was intended to serve as the most favored national tariff that ECOWAS member states could apply to third countries and also to non-preferential products traded within the ECOWAS region (Ajayi and Kwaako, 2008).

The CET proposes a four-band tariff structure as follows: 0 percent for products with social significance, such as medicines; 5 percent for necessities and raw materials; 10 percent for intermediates goods; and 20 percent for finished consumer goods (Grain del Sel, 2010). The fifth tariff band, at 35 percent, was adopted in principle by ECOWAS heads of states in 2009 after intense lobbying by Nigeria. While the CET was expected to reduce the rate of protection in protectionist countries, it was shown that it would also lead to a substantial loss of revenue and employment. It was generally recommended that the UEMOA's CET should be adopted and implemented in phases throughout the ECOWAS region.

The UEMOA's CET comprises of customs duties with four rates of 0 percent, 5 percent, 10 percent, and 20 percent; in addition to a statistics tax (1 percent) and a community solidarity levy at a rate of 1 percent. The temporary duties and taxes component consist of the Degressive Protection Tax (DPT), aimed at temporarily offsetting the sharp decline in tariff protection due to CET implementation. There is also a Special Import Tax (SIT), aimed at offsetting erratic changes in the world prices of some commodities and countering unfair import trade practices. Nigeria's participation in tariff harmonization was believed to be important in advancing any regional integration efforts. As the largest economy in ECOWAS, when Nigeria adopted the CET in 2005, an important milestone was laid in the process of deepening economic integration in the region.

As expected, the adoption of the CET by ECOWAS has boosted intra-regional trade in agricultural commodities, especially through formal and legal channels. It has also helped to reduce informal and illegal trade flows. Since the tariff has been reduced and streamlined,

commodities previously traded in informal channels have now been traded and accounted for in the formal or legal trading channels. The CET has also helped to boost domestic production of agricultural commodities in the region and to prevent imports from crowding out domestic production.

Apart from allowing the free flow of goods and services within the sub-region, the ECOWAS CET can improve the international and outward orientation of ECOWAS member state economies. Deepening regional integration would offer tremendous opportunities for reaping benefits from Economic Partnership Agreements (EPAs) with the EU, which came to effect in 2008. Based on harmonized and common policy frameworks, ECOWAS can become a regional bloc to stimulate economic growth and competitiveness. Nigeria, which is a regional leader in agricultural production and marketing, can take advantage of the resulting regional competitiveness to expand its share of intra- and inter-regional agricultural trade. With the scale of tariff reduction, especially in countries like Nigeria, which formerly had a higher tariff regime, it is important to institute medium-term reforms to be complemented with productivity-enhancing measures. These reforms could help to reduce the loss in revenue to the barest minimum. Such measures could include exchange rate reforms, as well as institutional and structural changes to reduce costs, especially those related to energy, ports, and the transport sectors (Jones et al, 2004).

4.0 Utilization of agricultural commodities and food balances in the region

Food utilization, the fourth pillar of food security, varies according to the socio-economic and cultural conditions of the people. West African countries are experiencing rapid changes in social and economic environment, and these have brought about changes in food consumption patterns over the years (Lopriore and Muehlhoff, 2004). Specifically, increased food availability and diversity in urban areas has affected the quality of diets and nutrition of West African people. In 1998, the daily calorie supply per capita varied between 1,966 kcal in Niger and 2,288 Kcal in Nigeria, and the per capita daily supply of protein varied between 35 kcal in Liberia and 64 kcal in Nigeria (Adejuwon, 2006). However, there was a general improvement in food consumption per capita in most West African countries during the period of 1970-1998. The notable exceptions to this trend were Liberia, Sierra Leone, and Senegal.

The recent improvements in food output in the ECOWAS region have led to an increase in DES. The average DES in West Africa has continued to grow since the 1990s. It increased from 2,261 kcal per capita per day in 1996 to 2,473 kcal per capita per day in 2007 (FAOSTAT, 2009). The difference in food consumption and utilization among ECOWAS countries is also partly due to disparities in food availability between the Sahelian and the coastal countries, with the dryer Sahelian countries being more prone to food shortages and starvation than the coastal ones (Hofonga and Van den Boom, 2001). For instance, while daily per capital DES is around 2,500 kcal in the coastal zone, it is less than 2,200 kcal in the Sahel (Lopriore and Muehlhoff, 2004). In contrast, protein consumption is higher in Sahelian countries than in coastal ones: A typical diet in the Sahel contains 60g of protein per capita, as opposed to 45g in the coastal zone (Hofonga and van den Boom, 2003).

In general terms, the food consumed in ECOWAS countries consists of 80 percent staples and 20 percent non-staples (Lopriore and Muehlhoff, 2004). In the staple food category, cereals account for 50 percent, while roots and tubers account for some 30 percent (Lopriore and Muehlhoff, 2004). However, sharp differences exist between the Sahel and the coastal zones in terms of this food consumption patterns. The Sahelian zones consume more cereals, while the coastal regions consume a mixture of cereals, roots, and tubers. Sahelian countries consume an average of 189 kg of cereals per person per year and produce 79 percent of their requirement (Lopriore and Muehlhoff, 2004). Coastal countries, on the other hand, consume about 114 kg per person per year and produce about 71 percent of their

requirement (Lopriore and Muehlhoff, 2004). The remaining balance of cereals comes from both imports and food aid. Most countries in West Africa, not including Nigeria, received food aid from international donors in 1999 (Adejuwon, 2006). Cereals contribute about 70 percent on average to daily food intake (DES) in the Sahelian zone, while in the coastal zone cereals contribute 35 percent, and roots and tubers contribute 35 percent to daily DES (Lopriore and Muehlhoff, 2004).

Studies have shown that cereals are becoming increasingly important sources of dietary protein, compared with legumes and animal products, in the coastal zone of West Africa. Animal protein, from sources such as meat and eggs, contributes 16 percent of daily protein in the coastal zone (Lopriore and Muehlhoff, 2004). In the Sahelian zone, the largest proportion of the protein is derived from cereals, despite the potential animal resources in the zone. According to Hofonga and van den Boom (2003), the high prevalence of protein deficiency in the coastal countries is related to the role of root crops in the southern diets and their relative absence in those of the north. A notable change in West African diets over the past two decades is the shift towards a higher consumption of imported cereals, mainly wheat and rice. This has contributed greatly to improved energy supply in the region. The role of cereals in West African food security is highlighted with cereal imports constituting 25 percent of total supplies in coastal zone and 5 percent in the Sahelian countries, where traditional coarse grains (sorghum, millet, etc.) are the main staple food crops (Lopriore and Muehlhoff, 2004).

West African countries also rely on fruits and vegetables as the main source of vitamin A and other essential micronutrients, like iron and zinc. Insufficient consumption of fruits and vegetables, breast feeding, and other socioeconomic and health factors are determinants of vitamin A deficiency in West African countries. Consumption of fruits and vegetables is negligible in the Sahelian zone, their availability is highly seasonal (Lopriore and Muehlhoff, 2004). In contrast, coastal countries in West Africa consume a wider variety of vitamin A rich foods, including red oil, yellow fleshed tubers and a variety of fruits (such as pawpaw, mango, orange, pumpkin), which contribute to higher vitamin A level in the zone. With increasing urbanization, higher income levels and access to markets, food consumption patterns in West Africa are becoming more diverse and relying heavily on processed and pre-prepared foods. Reasons for the shift toward these foods include convenience, availability and price. There has also been increase in consumption of street food in urban centers in West Africa. In cities such as Bamako, Dakar and Accra, almost all individuals, regardless of age or status, consume street food in addition to home-prepared food (IFPRI, 2000).

4.1 Food Utilization in Nigeria

Analysis of food utilization in Nigeria shows that DES increased from 2,430 kcal in 1989-1991 to about 2,710 kcal in 2005-2007 (FAOSTAT, 2009). Consequently, the proportion of undernourished people in the population fell from 13 percent in 1989-1991 to 6 percent in 2005-2007. Compared with other countries in West Africa, DES is high in Nigeria. For instance, in 2007 the average DES in Nigeria was second only to that of Ghana with 2,850 kcal, and it was larger than the 2,500 kcal recorded for West Africa (FAOSTAT, 2009). Presently, at 2,741 kcal capita per day, the average DES in Nigeria is about 11 percent larger than the regional average (FAOSTAT, 2009). The increase in DES in Nigeria is probably due to the expansion of root and tuber production, for which Nigeria has a comparative advantage. This occurred in the 1990s and up to the early 2000s. The rapid production and multiplication of roots and tubers, however, means an increase in the share of these food groups in the diet. For instance, the share of roots and tubers in the Nigerian diet increased from 64 percent in the 1980s to 65.3 percent in the 2000s (FAO, 2004). Increased urbanization has also led to the consumption of more street and fast food in Nigeria. For instance, in 1996 two-thirds of Nigerians' daily meals were bought from street food vendors and fast food chains, (Akinyele, 1998). The number of registered fast food vendors increased from 1,342 in 1998 to 5,437 in 2003 (Olayiwola et al., 2003).

5.0 Regional research and development and the role of CAADP

Agricultural R&D has been identified as one sure way to increase the productivity of crop and livestock activities (Ehui and Tsigas, 2006). However, funding for agricultural R&D has been declining in Sub-Saharan African countries (Masters, 2005). Consequently, while agricultural output is growing in the region, productivity is not (World Bank, 2002). Cereal yields have doubled in other regions of the developing world, yet they have remained largely stagnant in Sub-Saharan Africa since the mid-1970s. Yields of other food crops and livestock have also declined since the 1970s (World Bank, 2000). While agriculture-led growth played an important role in reducing food insecurity and poverty in many Asian and Latin American countries, the strategy has not worked in Sub-Saharan Africa. The lessons from Asia and elsewhere are clearer: there is a need for more investment in R&D in agriculture (Ehui and Tsigas, 2006).

In West Africa, investment in agricultural R&D is very low compared to total government expenditure. Yet potential returns to agricultural R&D investment are high—about 46 percent on average (World Bank, 2011). Apart from the low level of public investment in agricultural R&D in West Africa, the link between research systems, extension services, farmers, and agribusinesses is weak. When technologies are generated, dissemination and adoption mechanisms are inefficient and ineffective. In many countries in West Africa, national regulatory frameworks for dissemination of technologies across borders are lacking or not in line with the ECOWAS common regulations for genetics materials, pesticides and agrochemicals (World Bank, 2011).

Considering individual countries in West Africa, agricultural R&D expenditures increased gradually since 2000 in Benin, though the country faces a declining number of experienced researchers due to retirement. In contrast, agricultural R&D investment has fallen gradually in Niger, Guinea and Senegal. This is due to reduced donor support and cuts in government funding. In Guinea and Niger, agricultural R&D spending as a share of agricultural GDP is one of the lowest in West Africa. During the past decades, investment in agricultural R&D has been very unstable in Togo, Gambia and Mali. Aging agricultural research staffs, decreased donor support, and highly centralized research systems, especially in Mali, are some of the causes of declining investment in R&D. However, funding for R&D in these countries is expected to increase soon with the launch of the West Africa Agricultural Productivity Program (WAAPP) (World Bank, 2011).

Though agricultural research staffs in Burkina Faso are among the most qualified in West Africa, agricultural R&D spending has followed a pattern of booms and bursts there. In 2004, for example, agricultural R&D expenditure plummeted following the conclusion of a World Bank-funded project. Agricultural R&D expenses fell around 2000 in Cote d'Ivoire, but remained relatively stable during the 2002-2008 period. Civil war and sociopolitical turmoil have negatively impacted R&D investment in the country. Unlike in many countries in West Africa, the government and donors play a minimal role in financing agricultural R&D in Cote d'Ivoire. It is mainly funded by the private sector. In Ghana, agricultural R&D spending more than doubled during 2000-2008 period. It increased from about \$41 million in 2002 to \$95 million in 2008 (Flaherty et al, 2010a). During the 2000-2008 period, R&D was primarily funded by governments, donors and development banks, while the higher education sector played an increasingly important role in the research process.

5.1 Role of Nigeria in agricultural research and development

Nigeria has the largest agricultural R&D in West Africa in terms of investment and number of researchers. Investment in agricultural R&D doubled from NGN12 million in 2000 to NGN24 million in 2008 (Flaherty et. al., 2010b). This increase is due largely to rising salaries and investment to rehabilitate research infrastructure and equipment. In terms of the research

intensity ratio, however, the level of investment in R&D is low in Nigeria.⁸ Flaherty et al. (2010b) showed that, in 2008, for every \$100 of agricultural output, \$0.42 was invested in R&D. The ratio was \$0.94 in Ghana during the same year. Similarly, commercialization of research outputs is very low in Nigeria. Along with increased investment, Nigeria's agricultural R&D capacity also increased between 2000 and 2008, resulting in growth in the growth of full-time equivalent (FTE) researchers from about 1,300 to more than 2,000. During this period, the composition of research staffs shifted toward those with undergraduate degrees, as opposed to those with master's and doctoral degrees. Though their presence varied across government and higher education agencies, female researchers constituted 23 percent of total agricultural research staff in Nigeria in 2008.

A large number of different government and higher education agencies are involved in agricultural research in Nigeria. One of these is the National Agricultural Research Institute (NARI), which is being coordinated by the Agricultural Research Council of Nigeria (ARCN), higher education agencies, and other specialized government agencies. While the higher education sector continues to play an increasingly important role in agricultural R&D, the role of non-profit and private organizations remains very small. Donor funding is minimal in Nigeria, as compared with many other West African countries, and investment in agricultural R&D is primarily funded by government, supplemented by contributions from donors and internally generated revenues. The focus of agricultural R&D in Nigeria has predominantly been crops and livestock and, in 2008, 38 percent and 23 percent of all researchers were involved in crop and livestock research, respectively. Within the crop sub-sector of agricultural R&D, cassava was the most heavily researched crop with a share of 7 percent of total overall researchers. In the livestock sub-sector, poultry was the most heavily researched component (Flaherty et. al., 2010b). In 2008, the largest share of researchers, 11 percent of the total, in Nigeria's agricultural R&D worked on crop improvement.. Agricultural R&D is one of the focal points in the five-point agriculture agenda of the present government (Ruma, 2009). R&D is expected to generate improved seeds, breeding stocks and fingerlings, and enterprise development in the agricultural sector. Apart from sustaining and increasing the level of funding for research institutes in Nigeria, the linkage between research institutes, extension services and the farmers should be strengthened. This would help the country to reap the benefits of agricultural R&D.

5.2 The role of CAADP in strengthening agricultural research and development

CAADP was established in 2003 as the agriculture segment of the New Partnership for Africa's Development (NEPAD).⁹ To achieve the targeted 6 percent annual growth in agricultural productivity, CAADP seeks to improve agricultural R&D programs in order to develop and disseminate appropriate technologies. The R&D segment of CAADP is being coordinated by the Forum for Agricultural Research in Africa (FARA), which has developed the Framework for African Agricultural Productivity (FAAP). The FAAP is aimed at achieving a strengthened agricultural knowledge system and delivering profitable and sustainable technologies that can be widely adopted by farmers in the region. In its determination for improved R&D in Africa, FARA also launched the Multi-country Agricultural Productivity Program (MAPP). This program is focused on identifying and making available the resources required to implement CAADP's R&D component.

⁸ Research Intensity Ratio is the total agricultural R&D spending as a percentage of agricultural output.

⁹ NEPAD is a comprehensive development policy of the African Union (AU), which was adopted by African countries to close the gap between Africa and the rest of the world (Douillet, 2010). CAADP focuses on improving food security and nutrition and increasing the incomes of millions of Africa's small holder farmers (AU-NEPAD, 2004). In West Africa, CAADP activities are integrated into ECOWAP, which provides the framework for effective implementation of the CAADP agenda (World Bank, 2011). To achieve these objectives, CAADP set a target of raising agricultural productivity by at least 6 percent annually and increasing public investment in agriculture to 10 percent of the national budgets in member countries (FAO, 2004). CAADP has four pillars, which are key focus areas for agricultural improvement and investment. The fourth pillar is agricultural research, technology dissemination and technology adoption (AU-NEPAD, 2003).

The role of CAADP in R&D is to stimulate research that would focus on smallholder farmers, who are the majority, with a view to improving their productivity and efficiency. This strategy includes improving agricultural R&D systems in member countries in order to disseminate appropriate technologies and provide support to help farmers adopt them (CAADP, 2009). CAADP aims at doubling current annual spending on agricultural R&D in Africa within the next 10 years by promoting demand-driven research and extension, and by facilitating the involvement of the private sector in agricultural R&D. CAADP is also building the capacity of African research institutes to advance agricultural research and develop homegrown evidence-based agricultural policies.

An assessment of CAADP has shown a remarkable contribution and potential to drive agricultural R&D in the region. For instance, the Food and Agriculture Organization's (FAO) agricultural expenditure tracking system has revealed that 16 percent of African countries allocated more than 10 percent of their national budgets to agriculture in 2006 (CAADP, 2009). About 21 percent of African countries allocate between 5 percent and 10 percent. Of course, R&D make up a small percentage of agricultural spending in most countries, but the increased total spending on agriculture has led to increased investment in R&D on the continent. In addition, the implementation of CAADP's R&D mandate has motivated development partners to increase support for agricultural R&D. An example of this increase is the case of Ghana (Flaherty et al, 2010b).

6.0 Key policy issues affecting regional agriculture and food security and Nigeria's roles and influence

6.1 Key policy issues affecting regional agriculture and food security

From the previous sections, two broad policy issues are identified as important to the achievement of food security in the ECOWAS sub-region. These are the adoption of common agricultural policies and the integration of regional trade. With regard to a common agricultural policy, the desire to achieve self-sufficiency in food production and guarantee food security, led to the establishment and adoption of ECOWAP in 2005 (Grain de Sel, 2010). ECOWAP was adopted as a regional framework for agricultural development and it serves as an instrument for harmonizing and integrating targeted objectives, through diverse strategies and programs of the countries and inter-governmental organizations of the sub-region (ECOWAS, 2005). The basic goals of ECOWAP are to achieve sustainable food security in member states, secure decent incomes for agricultural workers, and expand sustainable trade both within the region and with the rest of the world (ECOWAS, 2005). The policy set out to cover all agricultural production; including crops, livestock, fisheries, forestry, and natural resource management.

Based on the principles and priorities of CAADP, ECOWAS member states are expected to incorporate the regional agricultural programs into their annual agendas (Ayoola, 2009). Thus, the Regional Action Plan (2006-2010) was established in 2005 (Ayoola, 2009). The plan calls for the formulation of National Agricultural Investment Programs (NAIPs) in each country and creation of Regional Agricultural Investment Programs (RAIPs) to implement ECOWAP and CAADP programs in ECOWAS countries (Ayoola, 2009).

ECOWAP was born out of the conviction that:

1. Common resources that span national borders must be managed across those borders (Ayoola, 2009).
2. Complementarities exist between different countries and production areas in the agricultural sector and this can serve as driver of integration of economies across the region (Ayoola, 2009).
3. Certain problems can be addressed more effectively at the regional level than by individual government, such as the opening of markets for agricultural produce and

the formulation of an effective cross-border trade policy (Gesellschaft für Technische Zusammenarbeit, 2010).

4. Because of spillover effects across national boundaries, a number of interventions will be much more effective if undertaken regionally. Examples of this are agricultural research, market information systems, and advanced agricultural education and training (Ayoola, 2009).
5. There are significant economies of scale involved in participating in international negotiations as a region rather than at the country-level (Ayoola, 2009).

ECOWAP focuses on three major axes of interventions, which include:

1. Increasing productivity and competitiveness of West African agriculture through modernization of farming, development of agro-food value chains, management of shared resources, and prevention and management of famine and natural disasters (ECOWAS, 2005).
2. Implementation of trade regimes within the region through harmonization of internal tax policies, promotion of regional markets, removal of non-tariff barriers, harmonization of customs administration, and facilitation of trade through the improvement of rural infrastructures (ECOWAS, 2005).
3. Adapting the trade regime vis-a-vis countries outside the region through the establishment of customs unions for differential protection for agricultural produce and harmonization of negotiating positions.

In terms of integration of regional trade, the overall objective of ECOWAS is to achieve full economic union of its 15 member countries through the creation of FTAs (ECOWAS, 2005). A number of measures were put in place to enhance regional trade, especially in agricultural commodities. This was driven by the belief that intra-regional trade could potentially contribute to the achievement of food security, improve socioeconomic development, and enhance global market integration (Gesellschaft für Technische Zusammenarbeit, 2010). Though more careful research is needed to validate the claim, trade liberalization in the context of regional integration could have the potential to lead to an optimal allocation of production resources and attract more investment, particularly in the agricultural sector (Gesellschaft für Technische Zusammenarbeit, 2010). For these reasons, regional agricultural trade becomes a key issue for food security in the ECOWAS region.

Some of the components of the ECOWAS regional trade integration policy include:

1. Creation of FTAs in the ECOWAS region.
2. Creation of a West African common market.
3. Establishment of an ECOWAS customs union.
4. Elimination of all tariffs and non-tariff barriers to intra-regional trade.
5. Harmonization of economic and financial policies of ECOWAS member countries.
6. Establishment of a CET to be applied to trade with countries outside the region.

Apart from common agricultural and trade policies, other issues on which the ECOWAS region could benefit from common policies include biotechnology and genetically modified organisms, seed and fertilizer subsidies, and sanitary and phytosanitary norms.

6.2 Nigeria's roles and influence on the key policy issues for regional agriculture and food security

Nigeria has been playing leadership roles in the implementation and strengthening of institutional frameworks that are important for the achievement of food security in the ECOWAS region. For instance, as a leading member of ECOWAS, Nigeria played a notable role in the adoption of ECOWAP in 2005. In fact, the ECOWAP/CAADP compact was signed

in Nigeria in 2009, when Nigeria was the chairman of ECOWAS¹⁰. In addition, Nigeria also played an important role in the decision by ECOWAS to establish a Regional Programme for Food Security (RPFS) as a component of ECOWAP. The RPFS aims at strengthening the national food security programs of ECOWAS member countries and facilitating trade in agricultural commodities among ECOWAS countries and between the sub-region and the rest of the world (FAO, 2002). The establishment of the RPFS was based on the success of the Special Programme for Food Security (SPFS) which was implemented by all member countries of ECOWAS through the support of FAO (FAO, 2002). The SPFS was particularly successful in Nigeria and this served as motivation for other countries in the region (Ruma, 2009).

In the area of R&D for the achievement of increased productivity of regional agriculture, Nigeria has a larger comparative advantage, which it has fully deployed. Compared to other countries in West Africa, Nigeria is ranked best in terms of number of universities and research institutes which are notable for agricultural training and research (Ruma, 2009).¹¹ The deployment of this R&D potential could boost agricultural productivity, which is a prerequisite for increased food production.

In terms of trade integration, Nigeria has also been playing a leading role in issues that concern the ECOWAS region. For instance, Nigeria was instrumental in the refusal of ECOWAS to sign the EPA with the EU according to the planned timetable in 2007, when it was obvious that the terms were not favorable to ECOWAS (Grain de Sel, 2010). Nigeria has been exerting a strong impact on the implementation of the EPA. To promote regional integration, Nigeria has reduced its protectionism policy and adopted the ECOWAS CET, though it is losing much revenue as a result of the decision. The leadership influence of Nigeria is also demonstrated through its financial institutions, which established banks in other ECOWAS member countries. For instance, Nigerian banks are currently in operation and providing financial services in Ghana and Liberia (Grain de Sel, 2010). Similarly, Nigeria would be a major actor in the ECOWAS goal of establishing a common currency by 2020. According to Grain de Sel (2010), Nigeria is the only ECOWAS country that has the capacity to support the common currency, given its economic and financial weight in the region and its central bank's experience in managing an independent currency. It is worth noting also that Nigeria has signed a number of bilateral agreements which are geared towards strengthening regional integration and cooperation. An example of this is the maritime security and monitoring agreement with Benin for joint patrol of the regional water ways.

Apart from the roles mentioned above, Nigeria has played leading roles in other regional institutions such as the ECOWAS Monitoring Group (ECOMOG). ECOMOG is an intervention force established by ECOWAS to monitor ceasefires in conflict-stricken countries (Grain de Sel, 2010). Nigeria has taken great initiative to resolve the conflicts in Liberia and Sierra Leone through its participation in ECOMOG. Nigeria has also conducted mediation and facilitation sessions in Sudan, Congo, Zimbabwe, and recently Cote d'Ivoire (Grain de Sel, 2010). It has also participated in many peacekeeping operations under the United Nations (UN). The eradication of conflicts in these war-torn countries has given a new prospect of improved food security which was deteriorating as a result of the conflicts (Flores, 2004). The way forward for regional food security lies in the full implementation and strengthening of the regional policies on agriculture and trade so that the full benefit of integration can be reaped.

¹⁰ Nigeria held the position of ECOWAS chairman till February 2012 when it relinquished the position to Cote d'Ivoire.

¹¹ Nigeria has 117 universities and 22 research institutes with about 30 percent of them providing some kind of agricultural training and research (Ruma, 2009). Some of Nigeria's universities are among the top 20 in Africa and a few of them; like the University of Ibadan, Ahmadu Bello University, Obafemi Awolowo University, and the University of Nigeria-Nsukka; are notable for agricultural instruction and research.

6.3 Nigeria's roles and influence on West African food security through the African Union (AU) and the Permanent Interstate Committee for Drought Control in the Sahel (CILSS¹²)

As Africa's most populous and one of its most resource-endowed countries, Nigeria is expected to be a natural leader in the continent. This leadership role is expected to span from regional to continental and from economic to non-economic matters. However, Nigeria's potential continues to be limited by its own numerous domestic challenges (Obi, 2004). Notwithstanding these challenges, the country has been playing a remarkable role in supporting regional and continental institutions for achieving food security on the continent. As mentioned in the earlier sections of this report, Nigeria has played an important role in the establishment and sustenance of regional institutions such as ECOWAS, including ECOMOG, the ECOWAS Parliament and the ECOWAS Court of Justice. The country has also been actively involved in the establishment of a regional policy framework for agriculture and food security, such as ECOWAP, the Regional Food Security and Information System (RFIS), the ECOWAS Trade Liberalization Scheme (TLS), the ECOWAS CET, ECOWAS FTAs, the ECOWAS Common Passport, the West African Monetary Zone (WAMZ), and West African Common Market (WACM). It is believed that these institutions are necessary as a step to create the conditions for increased trade and economic integration among the ECOWAS member states.

In addition to its roles in ECOWAS, Nigeria has also been playing supportive roles in other sub-regional bodies such as the CILSS. In the area of trade for agricultural commodities, some of the countries in the CILSS have benefitted from Nigeria's large produce market. For instance, trans-border trade in agricultural commodities between Nigeria and Niger and between Nigeria and Chad may have contributed to improved food availability in the two countries (Diao, 2010). There are present efforts to harmonize the agriculture and food security policies of ECOWAS and CILSS, and Nigeria has been one of the most supportive of this efforts.

In the AU, Nigeria continues to play a supportive role, especially in the establishment of policy and institutional frameworks for agriculture and food security across the continent. For instance, the country continues to chair the Head of State and Government Implementation Committee of NEPAD, and it played an influential role in moving the NEPAD agenda forward. The country was actively involved in the establishment of CAADP, which is the agricultural initiative of NEPAD. Nigeria was among the first countries to sign the CAADP agricultural investment treaty. The country has played a proactive role in the AU to vigorously articulate and defend Africa's position and interest in various international organizations, such as the World Trade Organization (WTO) and the United Nations (UN).

Nigeria has been involved in the establishment of several Pan-African initiatives to promote agriculture and food security on the continent. For example, Nigeria supported a proposal in 2001 for the creation of the AU's Common Market for Agricultural Products (CMAP). CMAP implies the creation of FTAs for agricultural products across the continent (Dijk, 2011). CMAP is designed to exploit economies of scale across regions and boost investment in regional value chains. It is also expected to discourage further fragmentation of African food and agricultural markets along regional, national, and territorial lines (Dijk, 2011). In terms of institutions for maintaining peace and security on the continent, Nigeria's role is remarkable. The country provided support for the establishment of the African Parliament, as well as the AU's Court of Justice and Peace and Security Council. Nigeria has been very supportive of these arms of the AU in the area of conflict resolution. Nigeria's contribution towards peace and stability in Africa are unparalleled (Okunnu, 2010). Beyond ECOWAS, the country has participated in peacekeeping operations in Chad, the Democratic Republic of Congo,

¹² The CILSS consists of nine countries in the Sahel region of Africa. It is an inter-governmental organization created in 1973 to invest in research for food security and the fight against the effects of drought and desertification for a new ecological balance in the Sahel (Wikipedia, 2012).

Angola, Somalia, and Sudan (Okunnu, 2010). The country has also contributed to agricultural training and man-power development in the AU through the deployment of its Technical Aid Corps (TAC). The operation of the TAC ensures the promotion of cooperation with other African countries through economic exchanges and regional integration of member states (Okunnu, 2010).

7.0 Conclusion and recommendations for strengthening regional cooperation for food security

Food security remains a major challenge confronting West African countries. Though food production has increased in the recent past, the region as a whole is not likely to meet the first MDG of halving the number of malnourished people by 2015. Nigeria is the food basket of the region, being the largest producer of almost every major agricultural product, and also the largest economy and market for agricultural commodities in West Africa. Against this backdrop, this paper examined the role of Nigerian agriculture in West African food security. Specifically, the paper discussed the implications of Nigeria's increased agricultural production and the potential of Nigeria's agricultural exports to enhance regional food security. It also examined the potentials of Nigerian agriculture and its comparative advantage in the region.

It was shown that agriculture and trade are the two main drivers of food security and that in these two sectors, Nigeria is the leading country with the greatest potentials in West Africa. The study showed that, with increased regional integration, Nigerian agriculture possesses immense potentials to improve food security in West Africa. With regards to the research questions raised, it was shown that increased agricultural production in Nigeria has a potential to enhance food security in West Africa. This would be possible when barriers to cross-border trade, such as multiple national currencies, are removed. Similarly, the study also showed that Nigeria's agricultural exports can play an important role in helping to meet the food deficit in many of the West African countries. This is particularly true for cereals and tubers, where Nigeria has a comparative advantage in production. Presently, Nigeria alone grows about 50 percent of the grain produced in West Africa, and it is believed that a substantial portion of this grain output is traded to neighboring West African countries, like Niger and Benin. The implication is that removal of barriers to cross-border trade could significantly improve how food production in Nigeria affects regional food security. Removal of the barriers could also guarantee increased food accessibility and affordability in the region. It was also shown in this study that CAADP can help to increase food output per unit area – a necessary condition for food security in the region – through improved R&D. It could also help in ensuring an increase in R&D spending by member states.

In light of this, a framework for strengthening regional integration and cooperation in the areas of food production, trade and investment should be pursued, though cooperation in trade could have wider effects on regional food security. In the area of agricultural policy, ECOWAP should define principles and objectives related to the region's agricultural sector, the orientation of agricultural development and the areas of intervention through which the sub-region will exploit its potentials to assure food security in the member states. ECOWAP should focus on harmonizing and integrating targeted objectives through diverse strategies and programs of the countries and inter-governmental organizations of the sub-region. In particular, these should include the agricultural policy of UEMOA, the strategic framework for sustainable food security in the Sahel, and the sub-regional program of action against desertification. The integration of these and other programs will make it possible to avoid duplication of efforts in the pursuit of food security objectives. In terms of funding for agriculture, CAADP's target of not less than 10 percent of national budgetary allocation to the agricultural sector should be pursued and member countries should be monitored for compliance. Currently, countries like Nigeria and Ghana, which have devoted large sums to agriculture, are witnessing improved food security.

Increased regional trade integration can improve food security in West Africa. Increasing trade in agricultural commodities, as well as closer cooperation between the countries to facilitate regional value chains, has the potential to reduce prices and ensure the availability of food. Strengthening regional cooperation should be combined with measures to increase the capacity of Nigeria, as a regional leader and contributor to food security, to increase production of key agricultural commodities; such as cereals, root, and tubers; which are important for the achievement of food security in the region. International donor agencies and development partners should focus on supporting Nigeria's efforts in this regard. In particular, donors should increase their support for Nigeria's agricultural R&D, in addition to assisting the country to attract foreign direct investment to the agricultural sector to boost food production. The proposal for promoting country specialization in the production and marketing of specific commodities could also be a good step to boost food availability in West Africa. This should take advantage of the country's available resources.

Similarly, strengthening regional cooperation in agricultural R&D is essential for supporting research on and transfer of new technologies for increased food production. By participating in regional agricultural R&D programs, countries can capture economies of scale that are unavailable to them individually due to limited access to finance, human capital, and knowledge. The overall effect of a strengthened regional agricultural R&D system is an increase in agricultural productivity that could deliver improved yields and output in the region. The region as a whole could attract funds and qualified personnel to undertake R&D at the regional level. Agricultural R&D should be promoted at the regional level, while existing initiatives for regional coordination in R&D, such as the West and Central African Council for Agricultural Research and Development (CORAF) and the Sahel Institute, should be strengthened for specialization and cooperation with national and international centers of research. ECOWAS countries should also pursue regional cooperation in building human capacity for agricultural R&D. This will entail, among other things, the sharing of practical experience and joint training of researchers. It will also include streamlining the curriculum and programs of research, as well as training institutes to meet regional agricultural R&D aspirations. Common policies of research staff hiring and remunerations will also help to strengthen regional agricultural R&D.

In the area of trade, strengthening regional integration has great potential for guaranteeing regional food security. In specific terms, the free movement of goods and people should be enforced among member countries. FTAs and customs unions will provide a larger variety of products from which consumers can choose. Free trade will also lead to optimal allocations of production resources that can increase food production eventually. Regional integration in terms of free trade will also attract more agricultural investment, as farmers and related industries are able to specialize by becoming part of a regional value chain. This will increase domestic food supply and improve food security. The ECOWAS CET regime should be allowed to operate in all countries, while the non-tariff barriers currently operating in some countries should be removed or reduced to the barest minimum. Studies have shown that the rate of protection has dropped significantly in the region following the adoption of the CET. The idea of introducing a single currency in ECOWAS countries by 2020 is one of the ways of cementing regional integration. Adopting a single currency would improve trade between countries in the region, as it would reduce transaction costs caused by differing exchange rates. To make the common currency work, countries in the region must first align their economic policies and remove all trade and economic barriers. Given that about 20 percent of the food needs of the region are obtained through imports, expanding intra- and extra-regional trade in agricultural commodities will increase food availability and security. What is required, however, is to remove the bottlenecks for the implementation of the ECOWAS single currency, so that it would not hurt any of the member countries.

Tables

Table 1—Dietary energy supply and prevalence of undernourishment in West Africa

Countries	2004 – 2005 period		2006 – 2007 period		Change (percent)
	Dietary energy supply (kcal/capita/day)	Prevalence of undernourishment (percent)	Dietary energy supply (kcal/capita/day)	Prevalence of undernourishment (percent)	
Benin	2300	19	2510	12	9.1
B. Faso	2640	9	2670	9	1.1
C. Verde	NA	NA	NA	NA	NA
Cote D'Ivoire	2530	14	2510	14	-0.8
Gambia	2140	29	2350	19	9.3
Ghana	2740	8	2850	5	4.0
Guinea	2550	16	2530	17	-0.8
G. Bissau	NA	NA	NA	NA	NA
Liberia	2040	38	2160	33	5.4
Mali	2580	10	2580	12	0
Niger	2140	28	2310	20	7.9
Nigeria	2650	8	2710	6	2.3
Senegal	2180	25	2320	17	6.4
S. Leone	1930	46	2130	35	10.4
Togo	2030	37	2150	30	5.9

Source: FAOSTAT, NA = not available

Table 2—Output of major staple agricultural commodities in Nigeria (1000 tons), 1970-2006

Year	Maize	Millet	Sorghum	Rice	Wheat	Acha	Beans	Potato
1970	1443	3106	4053	280	19	18	884	24
1971	1274	2834	3794	279	20	18	801	26
1972	639	2391	2298	447	20	14	408	27
1973	808	3794	3125	487	15	14	530	27
1974	528	5554	4738	525	18	17	1097	27
1975	1332	2550	2920	504	18	16	858	28
1976	1068	2893	2950	218	18	14	727	30
1977	650	2579	3286	410	20	14	408	32
1978	658	2386	2409	280	20	16	498	34
1979	488	2366	2604	160	22	16	624	38
1980	612	2354	3346	105	24	18	510	40
1981	720	2682	3364	158	26	20	560	38
1982	766	2666	3470	212	26	20	616	40
1983	594	2783	3292	145	26	18	583	38
1984	2058	3349	4608	157	27	23	477	42
1985	1190	3684	4911	196	113	25	611	43
1986	1336	4111	5455	283	132	27	732	46
1987	4612	3905	5455	808	139	26	688	45
1988	5268	5136	5182	2081	565	30	887	44
1989	5008	4770	7285	3303	554	35	1232	50
1990	5768	5136	4185	2500	554	39	1354	54
1991	5810	4109	5367	3226	455	43	1352	66
1992	5840	4501	5909	3260	515	47	1411	73
1993	6290	4602	6051	3065	33	50	1576	80
1994	6902	4757	6197	2427	35	55	1545	90
1995	6931	5563	6997	3203	44	58	1751	95
1996	6217	5803	7514	3122	47	64	1847	99
1997	6285	5997	7954	3230	49	67	1957	101
1998	6435	6328	8401	3486	51	70	2054	105
1999	6515	6423	8504	3522	53	73	2100	110
2000	6491	6743	8824	3841	55	75	2261	118
2001	8189	5839	8365	3103	47	80	3524	128
2002	8528	6081	8712	3232	49	83	3670	138
2003	8685	6561	9461	3520	52	89	4211	143
2004	9503	6963	9994	3714	56	96	4328	146
2005	10370	7395	10594	3929	59	101	4462	164
2006	11005	7845	11239	4169	15	148	4739	173

Source: CBN Statistical Bulletin, 2007

Table 2 continued:

Year	Cassava	Yams	Coco-yams	Plantain	Vegetable
1970	5224	12033	1381	985	1098
1971	4516	9766	880	1008	1136
1972	2573	6900	1357	994	1175
1973	1912	6936	1106	996	1211
1974	3582	7160	480	1018	1259
1975	2324	8620	504	1016	1303
1976	1786	6470	532	1022	1134
1977	1656	6376	346	1026	1025
1978	1620	5866	182	1032	976
1979	1446	5256	132	1038	931
1980	942	5248	208	1042	972
1981	620	5212	270	1048	986
1982	592	5385	280	1054	1048
1983	513	4047	224	1068	909
1984	11800	4600	205	1086	1120
1985	13500	4738	223	1113	1254
1986	12388	5209	373	1127	1293
1987	13876	4886	354	1071	1241
1988	15540	9132	693	1103	1354
1989	17404	9609	649	1413	1480
1990	19043	13624	731	1215	1761
1991	26004	16956	829	1339	2025
1992	29148	19781	940	1417	2243
1993	30128	21633	1066	1623	2494
1994	31005	23153	1128	1665	2843
1995	31404	22818	1182	1632	2608
1996	32950	23928	1295	1688	3506
1997	33510	24713	1380	1758	3816
1998	34092	25102	1450	1809	4018
1999	35980	26007	1491	1841	4151
2000	36750	26421	1592	1995	4480
2001	28473	22523	1958	984	3889
2002	29654	23456	2039	1025	4050
2003	31698	25073	2351	1096	4329
2004	33393	26700	2407	1162	4850
2005	36058	28522	2479	1247	4925
2006	38254	30188	2633	1317	2488

Source: CBN Statistical Bulletin 2007

Table 3—Total food output and Nigeria share in West Africa total, 1970-2007¹³

Year	Total food output (1,000 tons)		Nigerian share in West African total (percent)
	Nigeria	West Africa	
1970	57528	101957	56.4
1971	54382	99590	54.6
1972	51197	96115	53.2
1973	54786	101844	53.7
1974	56991	105734	53.9
1975	60277	110191	54.7
1976	59475	110139	54.0
1977	61329	110632	55.4
1978	62971	114321	55.1
1979	64239	118373	54.2
1980	67400	121770	55.3
1981	68988	124717	55.3
1982	70820	128035	55.3
1983	67300	124384	54.1
1984	70868	133697	53.0
1985	74738	139391	53.6
1986	79478	147465	53.8
1987	82075	151494	54.1
1988	87189	159454	54.7
1989	94899	170146	55.7
1990	101032	176227	57.3
1991	116563	197520	59.0
1992	125954	208822	60.3
1993	132801	219138	60.6
1994	135597	225633	60.1

¹³ Food output referred to here is the total output of major staple agricultural commodities expressed in thousand tons.

1995	140326	234073	59.9
1996	145190	243898	59.5
1997	151706	254079	59.7
1998	157937	263012	60.0
1999	164046	272578	60.2
2000	165328	276476	59.8
2001	167431	282201	59.3
2002	162921	282015	57.7
2003	168906	292034	57.8
2004	176045	302781	58.1
2005	183278	314130	58.3
2006	191266	327128	58.4
2007	193779	336135	57.6

Source: FAOSTAT

Table 4—Profile of selected agricultural commodities and forest product in recent years

Selected crop	Production (2007)		Trade (2005)	
	Yield	Output (1000 tons)	Imports (tons)	Export (tons)
Food crops (Kg/ha)				
Maize	1659.5	7800	17668	2226
Rice	1559.1	4677.4	1040322	4367
Cassava	11883.1	45750	-	-
Wheat	875	70	3714683	168355
Beans	-	-	1701	-
Millet	1316.2	7700	0	504
Cash crops (Kg/ha)				
Cocoa	450.4	500	0	267900
Rubber	-	-	84	25000
Groundnut	1720	3835	7100	87
Cashew	2000	660	0	17277
Sesame seed	510.2	100	59600	117
Livestock (carcass weight, tons)				
Chicken	1000	233.1	39	-
Pig meat	-	6730	33	-
Cattle	-	16258	47	3
Sheep meat	110	105.5	9	-
Goat meat	127	148.8	-	-

Source: Ayoola, 2009.

Table 5—Comparison of food production, demand and shortfall in Nigeria, 1994-2001 (million tonnes)

Description	1994	1995	1996	1997	1998	1999	2000	2001
Production	86.70	89.25	93.35	95.64	98.74	100.41	102.12	103.86
Food demand	87.23	89.55	96.26	99.03	101.87	104.63	107.46	110.37
Shortfall	(0.53)	(0.30)	(2.91)	(3.43)	(3.13)	(4.22)	(5.34)	(6.51)
Food import	0.67	0.58	2.95	3.47	3.24	4.48	5.59	6.91

Source: NBS (2004)

Table 6—ECOWAS major food imports

Country	Agric share of exports (percent)	Agric share of imports (percent)	Agric trade balance (US\$ million)	Main agric imports
Benin	42.56	23.64	39.42	Chicken meat, rice, Turkey meat
B. Faso	60.7	26.8	-31.3	Rice, tobacco leaves, Nuts
C. Verde	8.02	32.12	-71.0	Cow milk, rice, beer of barley
C. d'Ivoire	52.78	16.46	1506.6	Rice milled, broken rice
Ghana	31.36	12.53	165.2	Sugar, cigarette, broken rice
Guinea	3.10	17.42	-130.9	Milled rice, cigarette, sugar
G. Bissau	88.24	41.0	16.82	Rice, beer of barley, soybean oil
Liberia	13.46	21.28	-10.66	Rice, vegetable oil, maize
Mali	46.82	16.78	112.1	Prepared food, cow milk, tea
Niger	24.18	35.44	-67.0	Rice, palm oil, sugar
Nigeria	2.58	13.66	-858.6	Wheat, rice, palm oil
Senegal	16.04	30.4	-319.66	Rice, wheat, soybean oil
S. Leone	36.18	51.58	-116.76	Rice, wheat flour, prepared food
Togo	35.88	15.1	31.36	Wheat, cigarette, palm oil

Source: Eboh et al, 2004

Table 7—ECOWAS countries that rank first with regards to average yield, output and cultivated areas of selected crops, 1980-2002.

Crops	Average yield	Production output	Cultivated area
Beans	Mauritania	Cote d'Ivoire	Guinea
Banana	Cape Verde	Benin	Togo
Cocoa beans	Cote d'Ivoire	Cote d'Ivoire	Cote d'Ivoire
Cassava	Nigeria	Nigeria	Nigeria
Rubber	Cote d'Ivoire	Nigeria	Nigeria
Rice	Nigeria	Nigeria	Nigeria
Yam	Nigeria	Benin	Nigeria
Oil palm	Cote d'Ivoire	Nigeria	Nigeria
Millet	Nigeria	Nigeria	Niger
Maize	Gambia	Nigeria	Nigeria
Groundnut	Gambia	Nigeria	Nigeria
Sorghum	Nigeria	Nigeria	Nigeria
Sesame	Sierra Leone	Nigeria	Nigeria
Cotton	Niger	Mali	Nigeria
Coffee	Sierra Leone	Cote d'Ivoire	Cote d'Ivoire
Plantain	Ghana	Nigeria	Cote d'Ivoire

Source: Computed from FAOSTAT

Table 8—ECOWAS intra-regional trade, 1996-2001

Country	1996	1997	1998	1999	2000	2001
Exports to ECOWAS (as percentage of total export value)						
Benin	4.98	2.70	4.74	5.29	9.57	16.19
Burkina Faso	24.14	19.64	18.32	24.81	20.12	21.51
Cape Verde	-	21.43	18.18	16.67	-	3.70
Cote d'Ivoire	19.09	20.33	22.46	21.04	25.89	24.61
Gambia	14.81	6.67	7.41	7.41	9.52	14.29
Ghana	3.61	6.67	6.96	7.94	8.27	5.31
Guinea	0.91	1.84	1.04	0.65	0.31	0.39
Guinea Bissau	37.50	33.33	18.37	21.15	17.74	17.46
Liberia	3.13	4.50	4.08	4.95	5.00	5.51
Mali	63.13	74.45	67.85	19.26	20.74	20.30
Niger	33.79	28.65	31.55	34.52	46.56	51.30
Nigeria	6.28	7.25	7.06	6.49	5.09	4.60
Senegal	22.86	23.91	24.14	21.49	24.39	25.26
Sierra Leone	47.37	42.86	33.33	33.33	50.00	47.60
Togo	7.95	8.05	9.85	16.39	34.90	58.18
ECOWAS total	10.86	12.66	14.59	10.08	8.40	9.25
Imports from ECOWAS (as percentage of total import value)						
Benin	13.08	12.13	11.25	23.50	20.85	23.46
Burkina Faso	26.41	26.07	24.80	25.00	29.49	27.54
Cape Verde	2.14	3.00	3.45	3.46	1.29	1.33
Cote d'Ivoire	21.20	17.34	12.60	15.98	28.67	20.67
Gambia	11.20	9.77	7.94	7.81	6.67	11.03
Ghana	5.07	11.08	12.13	15.12	17.79	17.81
Guinea	19.93	8.73	7.42	8.99	19.93	19.60
Guinea Bissau	20.00	22.58	16.09	16.84	15.25	14.52
Liberia	5.93	6.18	6.52	6.25	4.50	3.31
Mali	34.47	37.33	34.24	28.17	35.11	28.21
Niger	25.26	26.53	26.24	30.70	35.23	34.26
Nigeria	2.13	2.19	1.99	2.04	2.22	5.09
Senegal	8.47	9.93	8.73	10.42	21.89	13.43
Sierra Leone	10.45	18.92	15.31	25.40	26.98	24.23
Togo	15.56	20.32	17.91	17.84	57.65	10.14
ECOWAS total	11.25	10.93	10.54	12.44	16.79	13.61

Source: ECOWAS handbook of international Trade

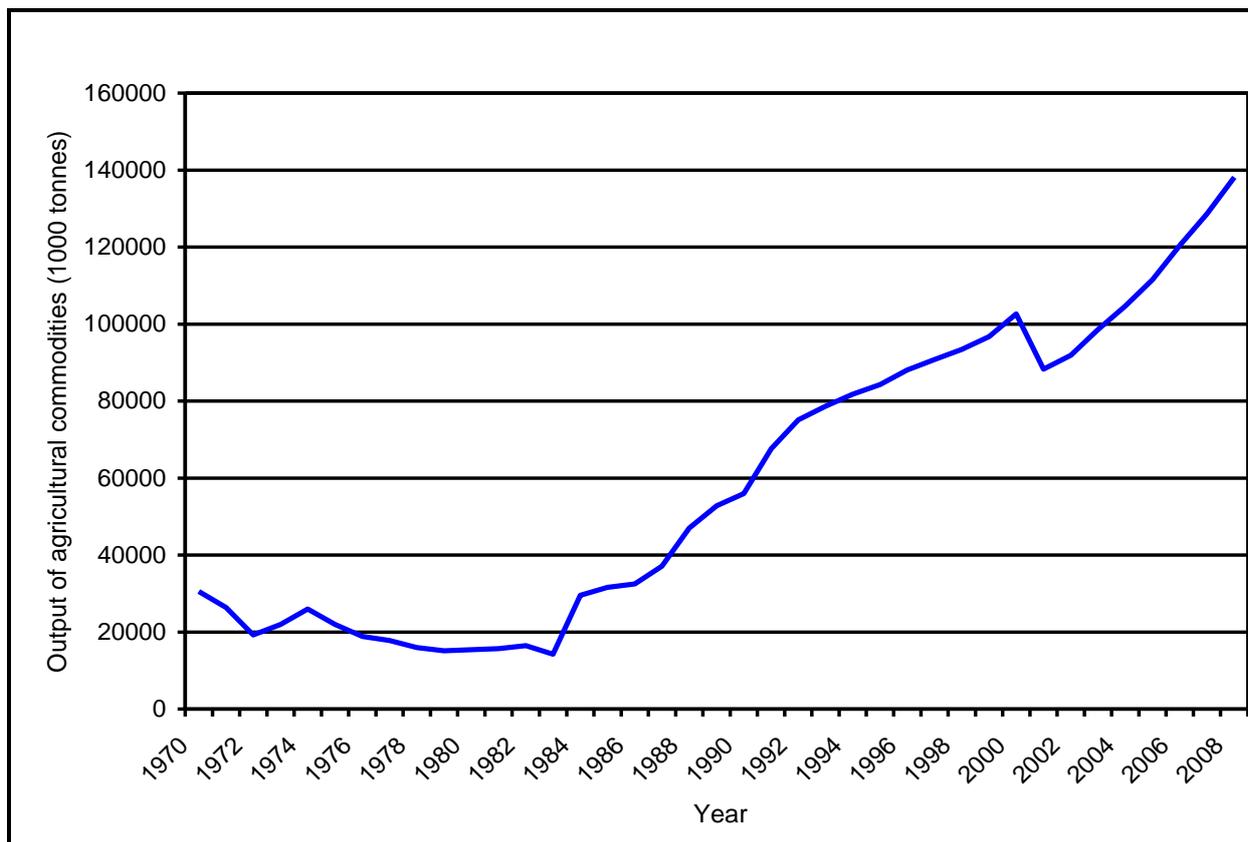
Table 9—ECOWAS trade balances for goods and services, 1996.

Country	Exports of goods and services (thousand USD)	Import of goods and services (thousand USD)	Trade balance
Benin	638,372	762,604	-124,232
Burkina Faso	272,000	284,500	-160,500
Cape Verde	124,500	284,500	-160,500
Cote d'Ivoire	5,031,047	3,926,908	1,104,139
Gambia	123,000	349,000	-226,000
Ghana	1,954,299	2,395,492	-441,193
Guinea	781,045	862,393	-81,348
Guinea Bissau	56,000	128,000	-72,000
Liberia	NA	NA	NA
Mali	355,000	1,483,000	-1,128,000
Niger	112,000	719,000	-607,000
Nigeria	13,912,784	12,946,744	966,040
Senegal	1,211,000	2,250,000	-1,039,000
Sierra Leone	127,973	237,012	-109,039
Togo	466,267	607,174	-140,907
ECOWAS Total	25,165,287	27,872,827	-3,169,540

Source: ECOWAS handbook of international Trade. NA = not available

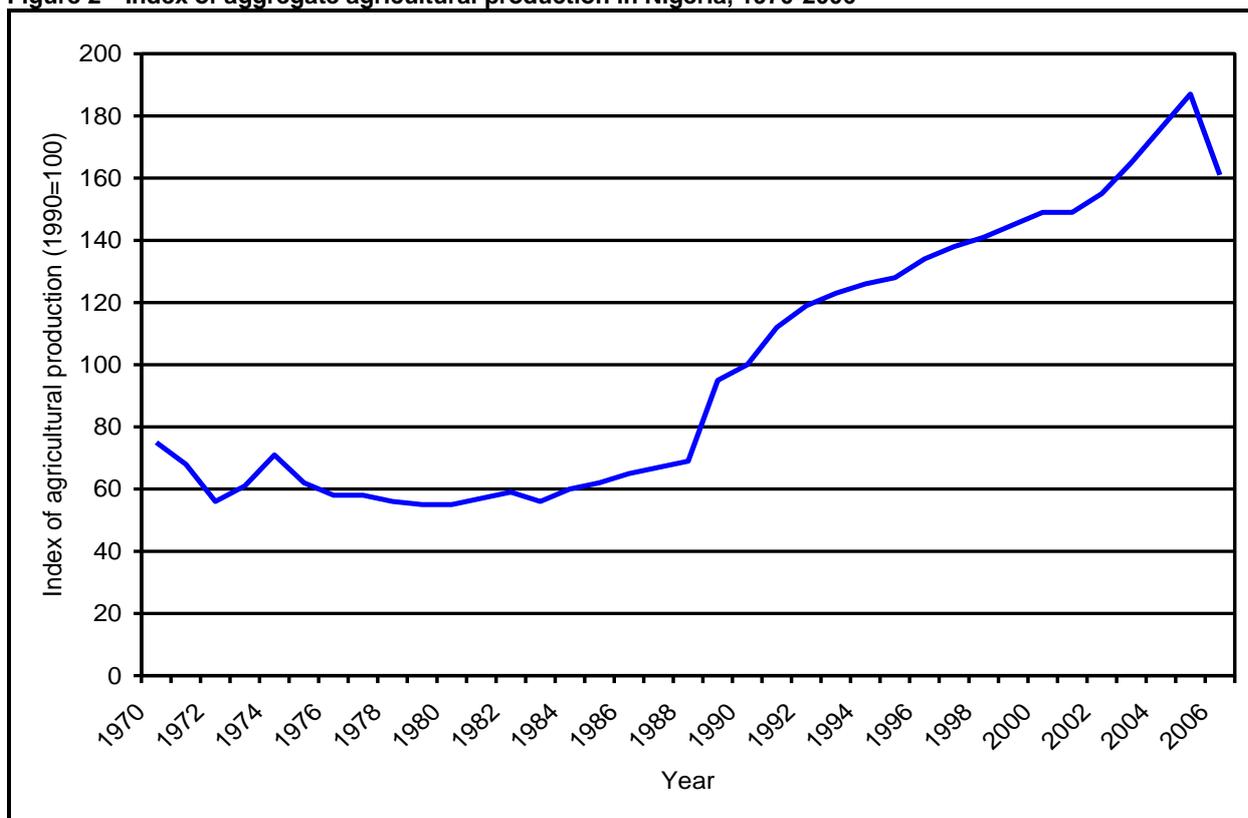
Figures

Figure 1—Total output of major staple agricultural commodities in Nigeria, 1970-2006



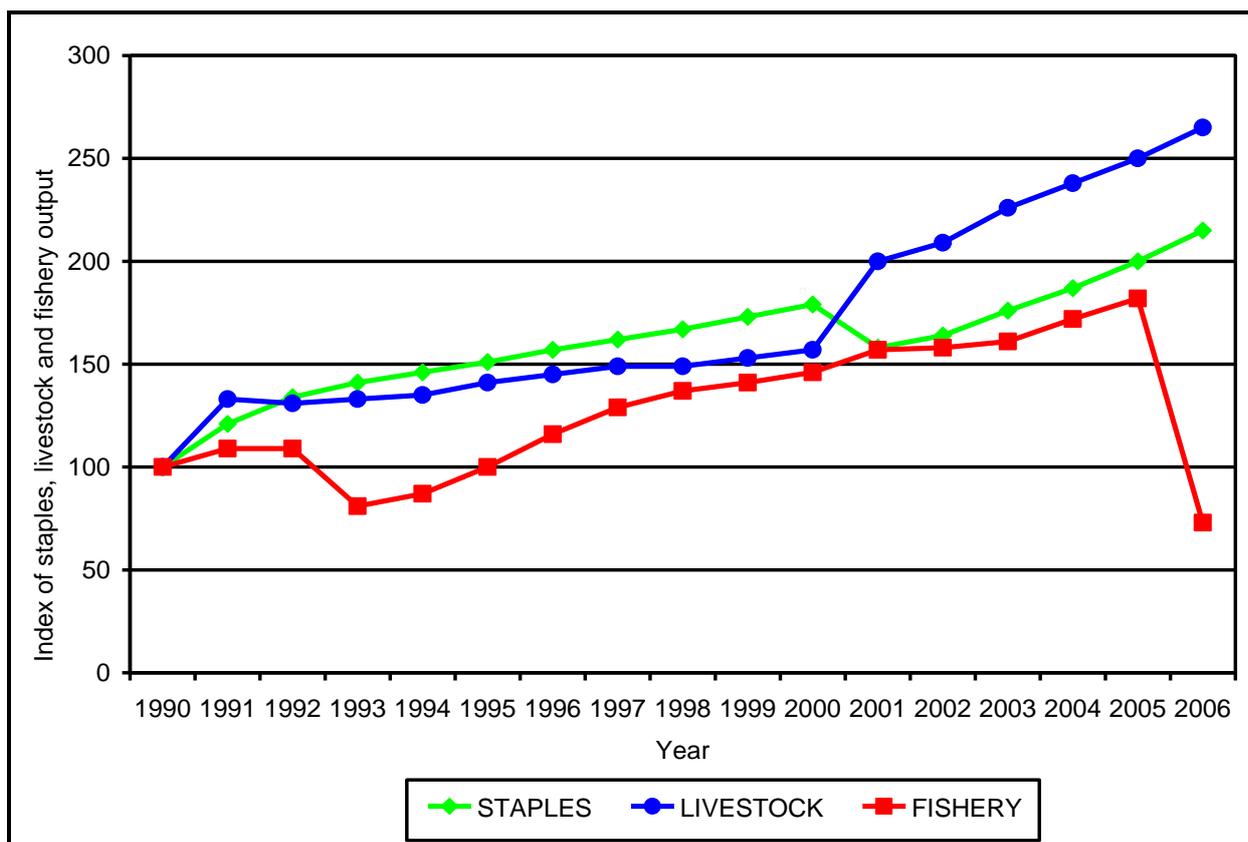
Source: FAOSTAT

Figure 2—Index of aggregate agricultural production in Nigeria, 1970-2006



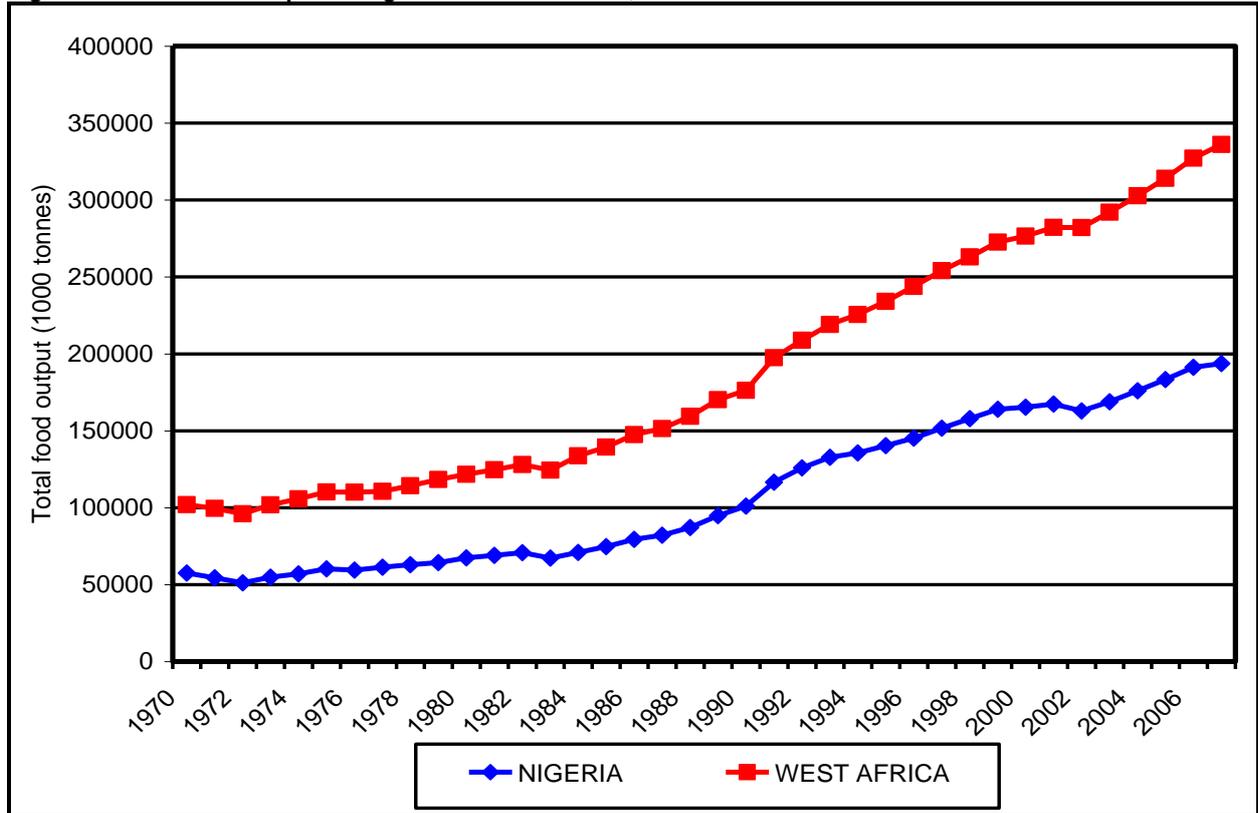
Source: FAOSTAT

Figure 3—Index of production of staples, livestock and fishery in Nigeria (1990 = 100)



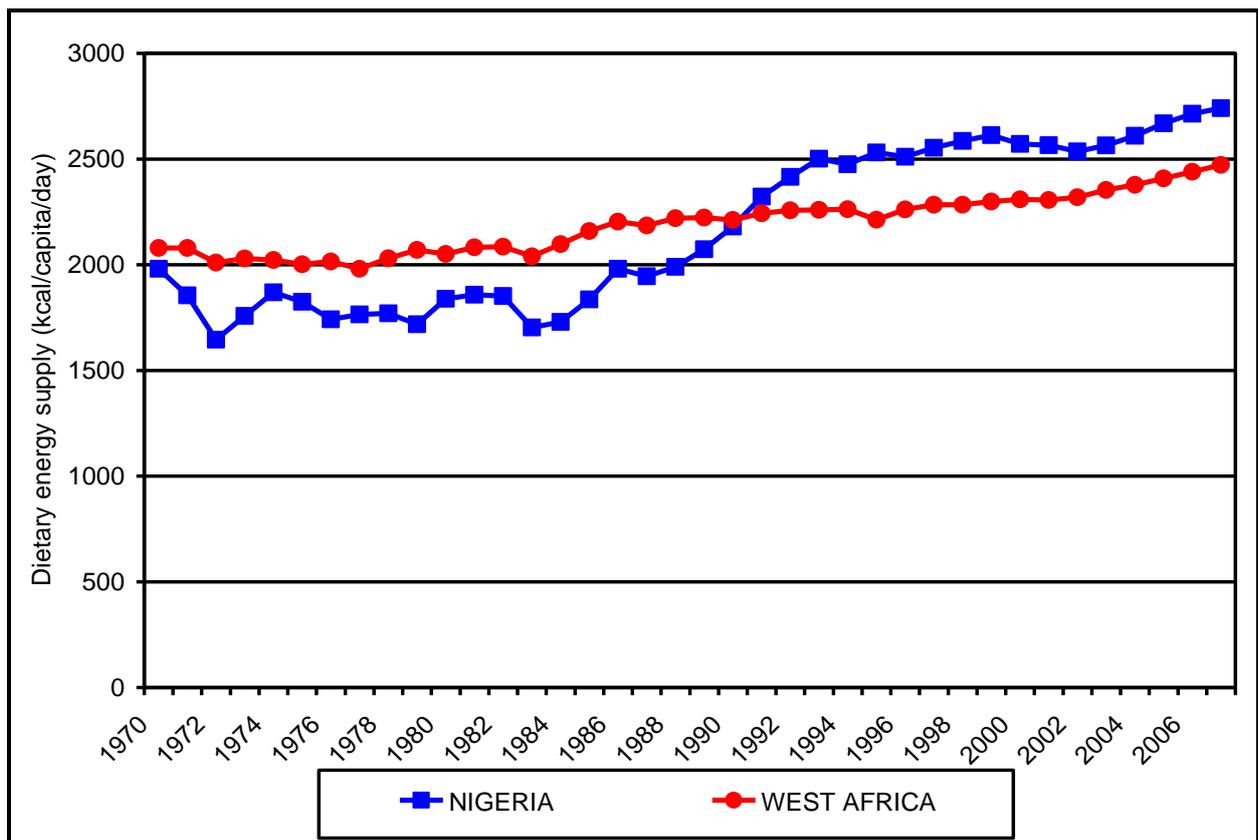
Source: FAOSTAT

Figure 4—Total food output in Nigeria and West Africa, 1970-2007



Source: FAOSTAT

Figure 5—Dietary energy supply in Nigeria and West Africa, 1970-2007



Source: FAOSTAT

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