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Food Reserves

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Efficiency of Food Reserves in Enhancing Food Security in Developing Countries: The Nigerian Experience

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About this working paper

This working paper is one of the products of a study conducted by DAI at the request of the European Commission as part of the advisory service ASiST managed by the unit in charge of rural development, food security and nutrition (C1) within the Directorate General for International Cooperation and Development (DEVCO).

The study has aimed at clarifying the potential role of food reserves in enhancing food and nutrition security in developing countries, and at making recommendations on how to use food reserves (in complement to other tools), taking into account the specificities on the context and the constraints of World Trade Organisation (WTO) disciplines.

The study was conducted based on i) an extensive review of the existing literature (both theoretical and empirical) and ii) 10 case studies analysing national or regional experiences in Africa, Asia and South America.

All the products of the study (including other working papers, a compilation of case study summaries, and a synthesis report) are available at: https://europa.eu/capacity4dev/hunger-foodsecurity-nutrition/discussions/how-can-food-reserves-best-enhance-food-and-nutrition-security-developing-countries.

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List of Abbreviations and Acronyms

Federal Ministry of Agriculture and Rural Development (FMARD)
Food and Agriculture Organisation (FAO)
Guaranteed Minimum Price (GMP)
Internally Displaced Person (IDP)
Licensed Buying Agent (LBA)
Metric tonne (MT)
National Emergency Management Agency (NEMA)
Nigerian Stored Products Research Institute (NSPRI)
Operation Feed the Nation (OFN)
Strategic Grain Reserve Department (SGRD)
World Trade Organisation (WTO)

1. Introduction

As a policy objective, the attainment of food security in Nigeria began facing challenges prior to independence when oil exportation began in 1958. But the challenges became pronounced and persistent after the commencement of large-scale oil exports in the early 1970s, when the country nearly abandoned agriculture in pursuit of newfound oil wealth. Self-sufficiency in food production and agricultural export earnings, aided by widespread cultivation of food crops and regional specialisation in cash crops – the cocoa mountains in the west, the oil palm and kernel heaps in the east, and groundnut pyramids in the north – began to diminish and disappear respectively. Within a few years after independence in 1960, the agricultural sector transitioned from a net foreign exchange earner to net foreign exchange drain.

Food insecurity gained national attention by the early 1970s, but the policy response was food importation rather than a return to self-sufficiency in domestic production. This began with the importation strategy of General Yakubu Gowon in response to rice shortages in the 1970s – an episode that earned the nickname "Rice Amada" in reference to the port congestion that ensued as the Nigerian ports did not possess the capacity to handle the "gargantuan" rice import (Ojo & Adebayo, 2012).

Subsequent governments have attempted to tackle the challenges of food security through domestic production initiatives under various programmes. The first attempt in 1976 under General Obasanjo, nicknamed Operation Feed the Nation (OFN), encouraged everyone to be involved in farming everywhere possible, including farms, gardens and flower pots. The programme failed to achieve its objectives and was referred to by Nigerians as Operation Fool the Nation.

A second attempt in 1979 under President Shehu Shagari, codenamed Green Revolution, had similar intent and modalities as the OFN, but failed to achieve any tangible outcomes. The third attempt in 1985 under General Ibrahim Babangida, incorporated into the Directorate of Food, Roads and Rural Infrastructure, was good on paper but practically ineffective as it became riddled with corruption.

In 1999, the civilian government developed the first national agricultural policy that had self-sufficiency in basic food supply and attainment of food security as its foremost objectives, and launched a series of food security initiatives. These included:

1. The Special Programme for Food Security, which focused on technology transfer to farmers;
2. The root and tuber expansion programme that focused on technology transfer to cassava farming and processing;
3. The Fadama development project, a large-scale irrigation program for all-year farming of some crops, fruits, and vegetables; and
4. Community-based agricultural and rural development schemes.

Efforts to raise the level of food production achieved some success, evident in the expansion of area cultivated and harvested from 34 million hectares in 1990 to 100 million hectares in 2014. Nonetheless, the country grew more dependent on food imports owing to a growing population and insufficient local production, making food security increasingly vulnerable to international market volatility. While the value of food production grew by 138% between 1990 and 2014, the value of net

food import grew more rapidly, by 1,510% during the period, signalling overt dependence on imports to feed the population. Given the importance of cereals to food security, both as staples and sources of basic nutritional requirements, the increase in net import of cereals by 2,600% and in cereal import dependency from 6.4% in 1990 to 21.7% in 2014 makes external markets more salient for food security in Nigeria (Table 1).

Table 1: Nigeria Agriculture and Food Statistics

	1990	2000	2014
Setting			
Population (million)	95.6	122.9	178.5
Population, rural (million)	61.9	70.8	86.6
Urbanisation (%)	35.3	42.4	51.5
Area harvested (million hectares)	34.0	65.0	100.0
Hunger Dimension			
Cereal import dependency ratio (%)	6.4	13.6	21.7
Food Supply			
Food production value, (2004-2006 million I$)	15,138	25,335	36,075
Agriculture, value added (% GDP)	32	26	20
Food exports (million US$)	158	262	1,219
Food imports (million US$)	480	1,017	6,402
Net Trade (million US$)			
Cereals	(119)	(493)	(3,211)
Fruit and vegetables	(2)	(17)	159
Meat	-	(1)	(11)
Dairy Products	(73)	(134)	(519)
Fish	(166)	(169)	(1,142)

Source: FAO Statistical Pocketbook 2015

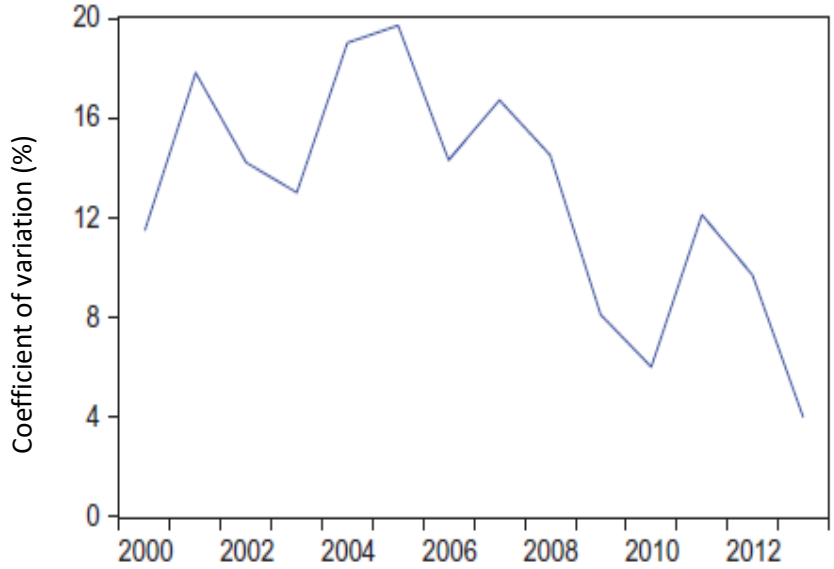
Increasing dependence on food imports raises concerns about transmission of price volatility in international commodity markets into domestic markets and consumption. Measured by coefficient of variation, the degree of volatility increased for aggregate food prices from 11.5% from 1999-2002 to 30.3% from 2002-2014, at a time when the country became more dependent on food imports.

Table 2: Estimated Coefficient of Variation (%) for Agricultural Commodities Prices in Nigeria

	1990/01-2014/02	1990/01-2002/01	2002/02-2014/02
Aggregate Food	32.7	11.5	30.3
Cereals	39.9	15.6	35.6
Meat	21.4	11.6	23.1
Dairy	43.1	13.7	34.5
Sugar	43.9	23.5	45.2

Source: Adapted from Ojogho and Egware (2015), Computed from 1990-2014 FAO (2014), World Bank Commodity Price Data (2014), and World Trade Organisation (WTO) price series

Figure 1: Trend of food price volatility in Nigeria



Source: Nwoko et al (2016): The study used annual food price volatility index from FAO from 2000 to 2013

As shown in Table 2, all components of the aggregate food index experienced increased volatility during the later period. Figure 1 provides a periodic measure of volatility of food prices in the country from 2000-2013 using data from the Food and Agriculture Organisation (FAO). Nwoko et al (2016) conclude that the volatility partially reflects/mirrors volatility of international food prices.

The volatility of food prices has non-trivial welfare consequences for the consuming population and constitutes a major focus of food security policies and programmes. Indeed, the goals of self-sufficiency in food production and food security aim to protect domestic food consumption from external food supply shocks by expanding domestic food production and distribution, thus minimising intertemporal variations in domestic food consumption.

Across both developed and developing countries, the objective of food security is typically pursued by establishing and maintaining adequate food reserve levels and efficiently releasing stored food during periods of relative scarcity and rising prices. Through the 1960s and 1970s, public food reserves were considered salient to food security, and construction and maintenance of reserves were active components of food security policies and reforms. However, maintaining public food reserve infrastructure is costly, and met with difficulties. In many countries, public food reserve programmes became cost centres with limited effectiveness, to the point that they were considered inefficient ways of ensuring food security during the 1980s.

The objective of this study is to examine the role of food reserves in enhancing food security in Nigeria and to assess their effectiveness. The aims are 1) to explain the organisation of the food reserve system, enumerate the policies guiding participation and investments in the sector, and identify the set of actors and measure their roles in food security, 2) to analyse the operational efficiency of the food reserve system and examine its effectiveness in public consumption smoothing.

The study was implemented in two phases. The first phase involved a desk review of the food security and food reserve system in Nigeria. This turned up very limited information due to the paucity of

official reports and studies that dominantly provided low quality data. In particular, there was a lack of data and information about subnational reserves at the federal level and a lack of central coordination.

In the second phase, fieldwork was done in two states (Oyo and Plateau) to examine the organisation of the food reserve system. The fieldwork involved field visits to ministries, departments, agencies and research institutions, and documentation of responses to interview questions on the aims of the study. Where data or reports were available, these were collected for analysis. The study focused on grains/cereals as they are the crops commonly procured for storage globally.

2. Agricultural Performance

The key features of the National Agricultural Policy (2000) are:

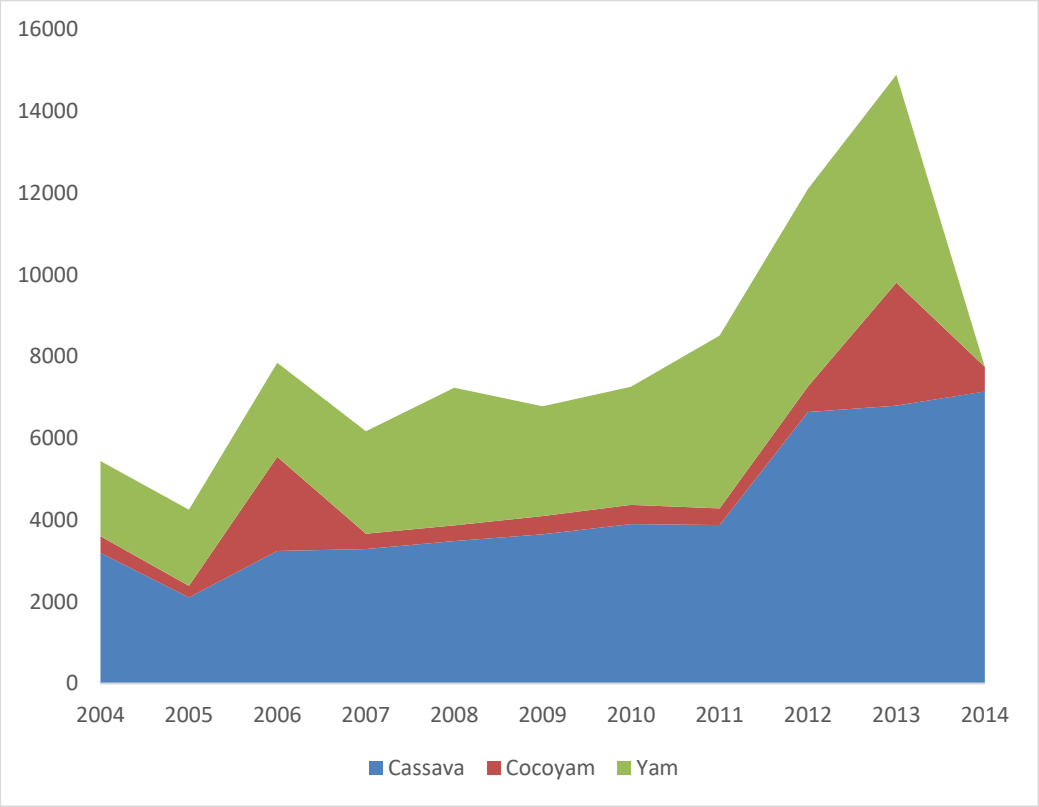
1. A focus on self-sufficiency in food production through continuous improvements in technical and economic efficiency, which entails adoption of improved seed varieties, adoption of improved machinery and equipment, encouragement of ecological specialisation, and emphasis on the potential of small-scale farmers, who are the major producers of food in the country.
2. Reduction of risks and uncertainties in agriculture through an agricultural insurance scheme to attract investment into the sector and actively promote agribusiness.
3. A unified, nationwide delivery of extension services through the Agricultural Development Programmes.
4. Development of rural infrastructure and socioeconomic amenities, including education, health, and financial services, to encourage youth participation in agriculture.

Several initiatives were implemented to support specific crops, including both grains and tubers, but the tuber initiatives, especially the cassava initiative implemented from 1999-2007, were more successful than the grain initiatives in significantly increasing output and exports.

2.1 Tubers

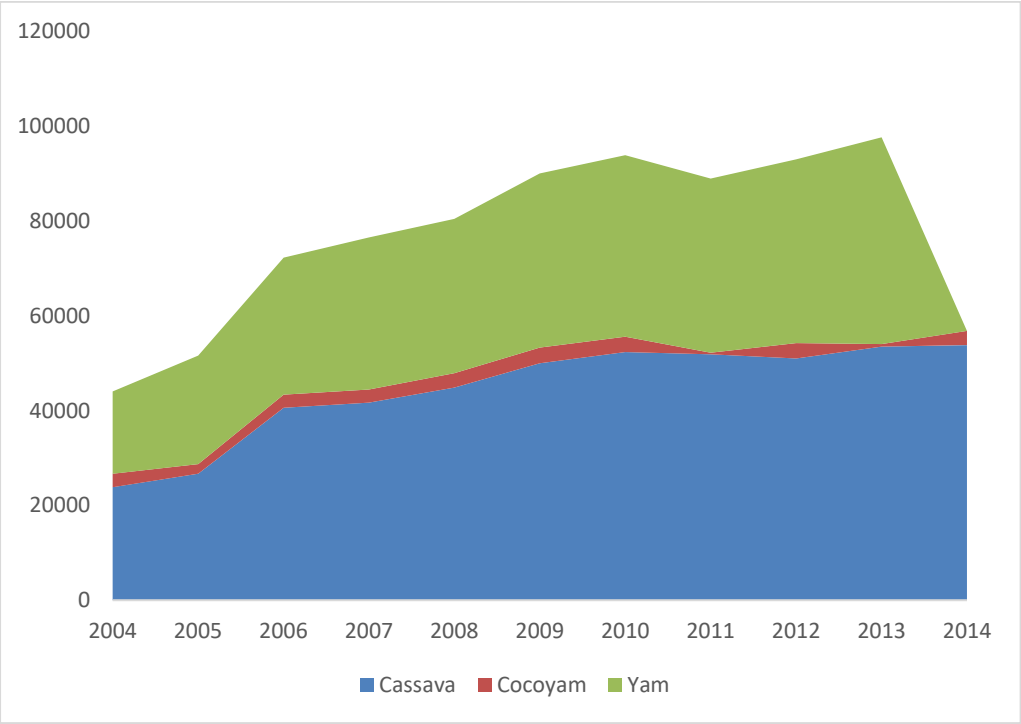
Figure 2 provides the estimated area devoted to tubers and output from 2004-2014. Total area devoted to cassava farming increased from 3.2 million hectares in 2004 to 7.1 million hectares in 2014, while yam cultivation spread from 1.8 million to 5.1 million hectares. Cocoyam farming did not attract sustained attention during the period, with area cultivated undulating and increasing only from 407,000 hectares to 596,000 hectares.

Figure 2: Estimated area, tubers ('000 Ha)



Source: Agricultural Performance Surveys (APS), produced by NAERLS, Zaria

Figure 3: Estimated output ('000 MT)

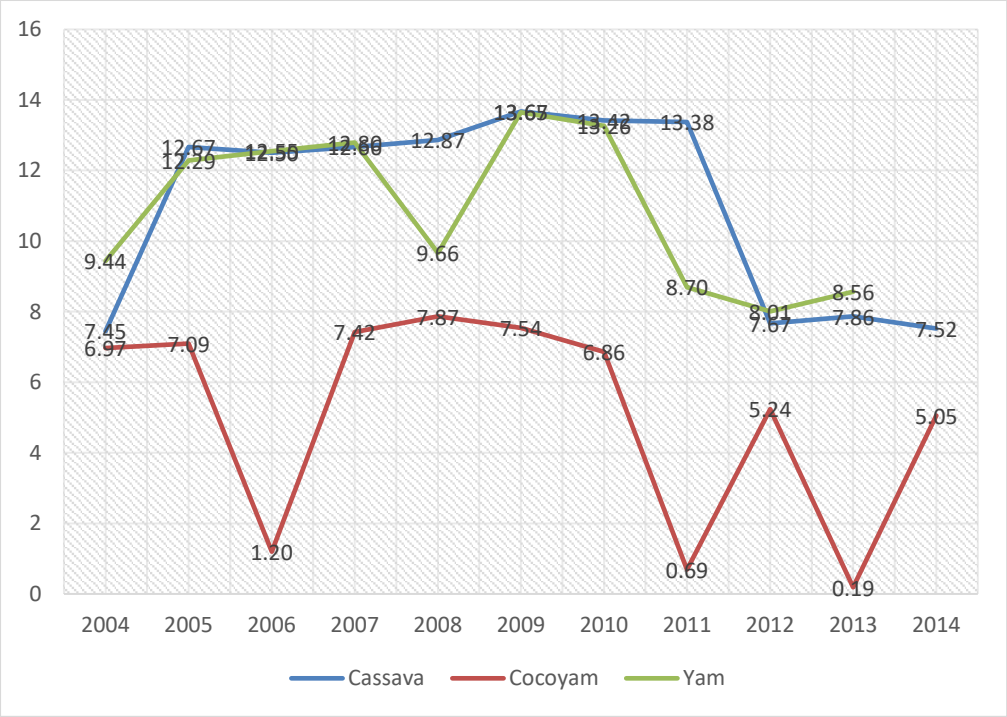


Source: Agricultural Performance Surveys (APS), produced by NAERLS, Zaria

Output of cassava rose from 24 to 54 million metric tonnes (MT) while yam output grew from 17 to 44 million MT. Output of cocoyam increased only slightly from 2.8 to 3.0 million MT (Figure 3).

The success achieved in raising outputs was aided by an accumulation of factors of production (expansion of hectares cultivated, agricultural labour, and capital) rather than improvements in production technologies and technical efficiency that would translate into yield growth. Cassava yield increased from 7.45 MT/Ha in 2004 to 13.67MT/Ha in 2009 but started falling thereafter, reaching 7.52 in 2014. Yam yield followed a similar trend of rising from 9.44 MT/Ha in 2004 to a high of 13.65 in 2009, but falling below its 2004 level to 8.56 in 2013. Cocoyam yield dropped significantly in 2006, 2011, and 2013, and overall decreased from 6.97 MT/Ha in 2004 to 5.05 MT/Ha in 2014.

Figure 4: Estimated crop yield, tubers (MT/ha)

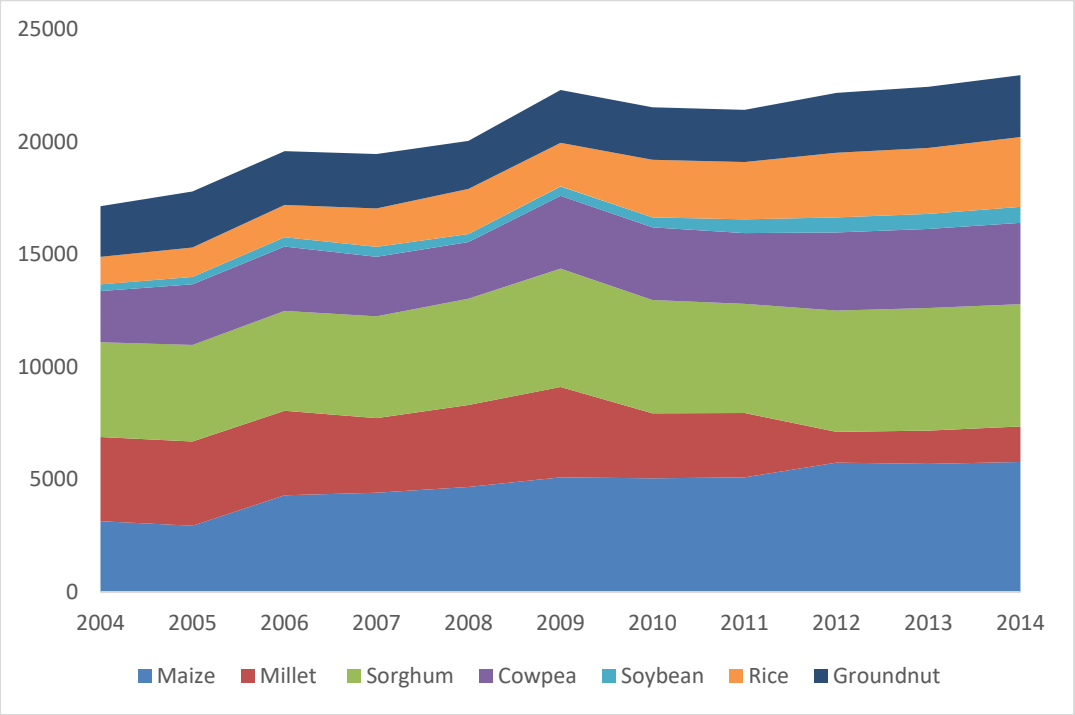


Source: Agricultural Performance Surveys (APS), produced by NAERLS, Zaria.

2.2 Grains

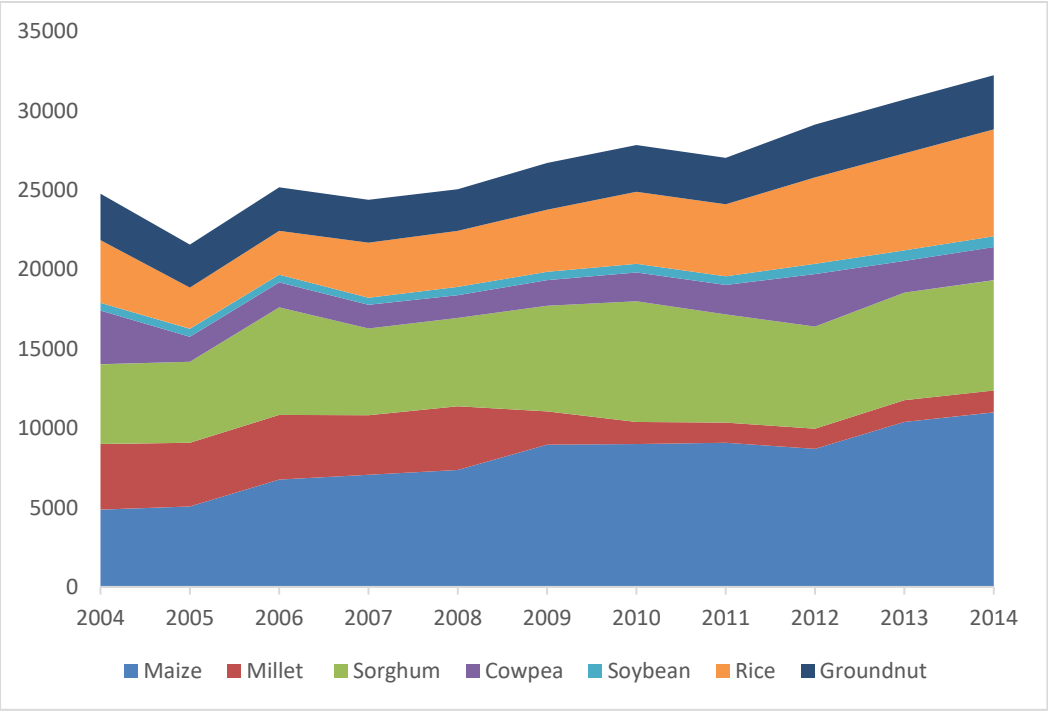
The national agricultural policy and initiatives on crop production were not as successful with grains as with tubers. Land area used for cultivation of grains increased for all the major crops (Figure 5) except millet, the cultivation of which dropped drastically from 4 million hectares in 2009 to 2.9 million hectares in 2010 and further to 1.6 million hectares in 2014. Total area used for cultivating the seven grains increased by 30% from 19 million to 25 million hectares between 2004 and 2014.

Figure 5: Estimated area cultivated, grains ('000 Ha)



Source: Agricultural Performance Surveys (APS), produced by NAERLS, Zaria.

Figure 6: Estimated production output, grains ('000 MT)

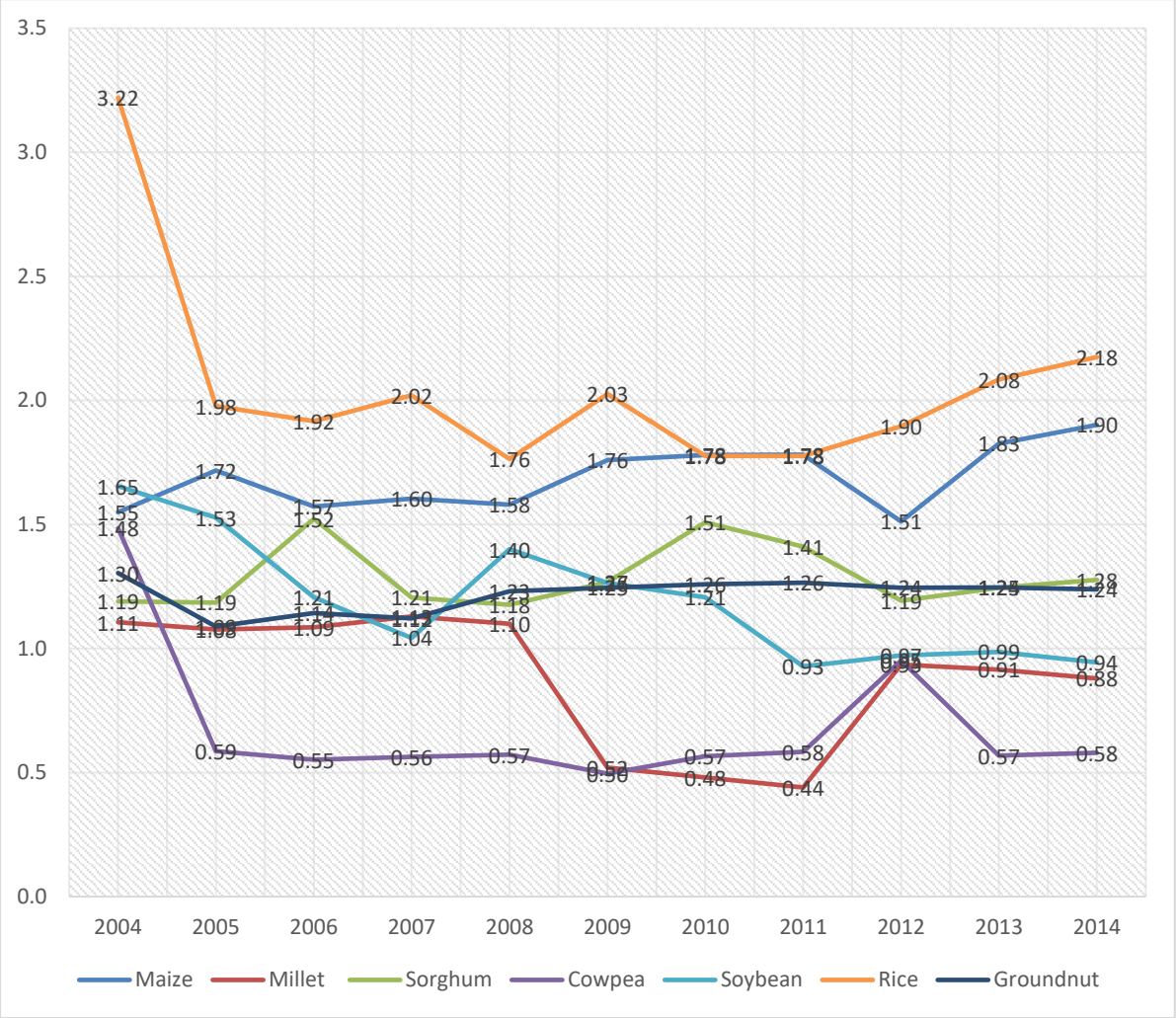


Source: Agricultural Performance Surveys (APS), produced by NAERLS, Zaria.

Following a pattern similar to tubers, output expanded for the major grains in line with area cultivated, with the exception of cowpea where area cultivated increased by 60% but output decreased by 38%. Total output of the grains included increased by 28% from 27 to 34 million MT. Estimates of crop yield

provided in Figure 7 show no improvement for all the crops, with the exception of rice (starting in 2012), after a substantial drop from 2004 to 2005, and maize (starting in 2013). All the remaining five crops had constant flat yield (groundnut), no clear improvement (sorghum) or decreased yields (soybean, millet and cowpea).

Figure 7: Estimated yield, grains (MT/Ha)



Source: Agricultural Performance Surveys (APS), produced by NAERLS, Zaria.

In addition to the lack of improvement in most grain yields, yield levels remain low in comparison with tubers produced in the country and with the global average of 3.9 Mt/Ha in 2014.[1]

Maize production more than doubled (126% increase) from 4.9 million MT in 2004 to 11.0 million MT in 2014, while total area increased by 84% from 3.1 million Ha to 5.8 million Ha. Yield remains quite low, below 2 MT/Ha, but rose slightly from 1.5 to 1.9 MT/Ha in 2014. The crop is grown across the country in different ecological and climatic zones, although most of the production comes from the north central zone.

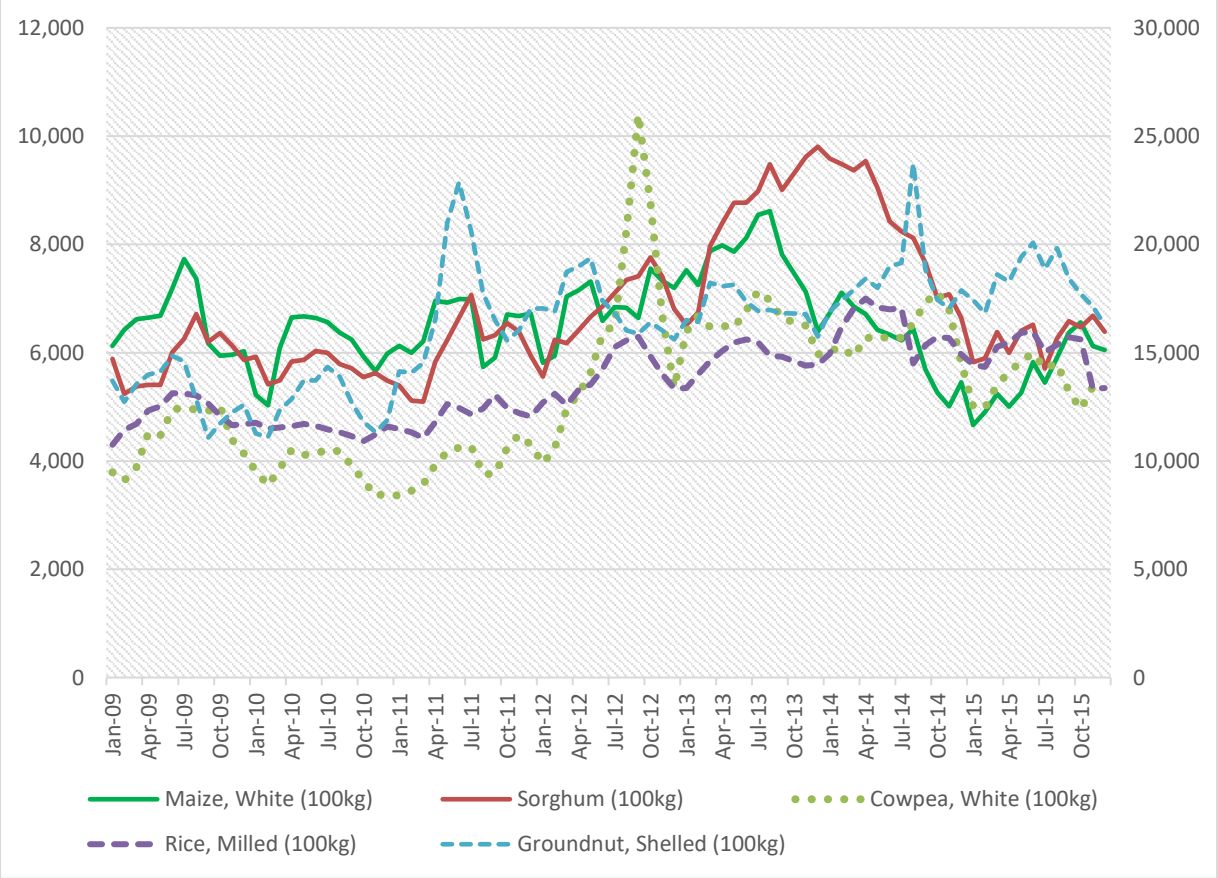
[1] Source: World Bank Development Indicators, http://data.worldbank.org/indicator/AG.YLD.CREL.KG

Rice production rose from 4.0 million MT on 1.2 million Ha of land in 2004 to 6.7 million MT on 3.1 million Ha of land in 2014. Its yield is highest among the grains, rising from 2.0 in 2005 to 2.2 Mt/Ha in 2014, after the steep drop in 2005. This is dependent on several efforts to raise productivity and achieve self-sufficiency in rice production. Although rice is cultivated in all the ecological zones in Nigeria, most of the output comes from lowland production and from the north-central and north-west regions. Rising urbanisation is driving rice consumption and, despite growth in domestic production, the rice import bill has risen dramatically over the years.

2.3 Prices

Food prices represent an important signal of food security programme effectiveness. Left to the private sector, food prices will be pro-cyclical: prices will be low during harvest seasons and high during the off-season period, barring technological changes facilitating dry season planting. Given that government interventions are partly aimed at smoothing prices, the effectiveness such interventions can be assessed from price series. Figure 8 presents national average prices for five of the seven grains presented in Figure 7, based on a standard 100kg bag of crop. Overall, grain prices exhibit high degrees of volatility both across seasonal cycles and across years covered in the surveys.

Figure 8: Monthly grain prices (in Naira)*



*Prices for dashed line series on right vertical axis, prices for solid line series on left vertical axis
Source: National Agricultural Extension and Research Liaison Services (NAERLS) Price Surveys

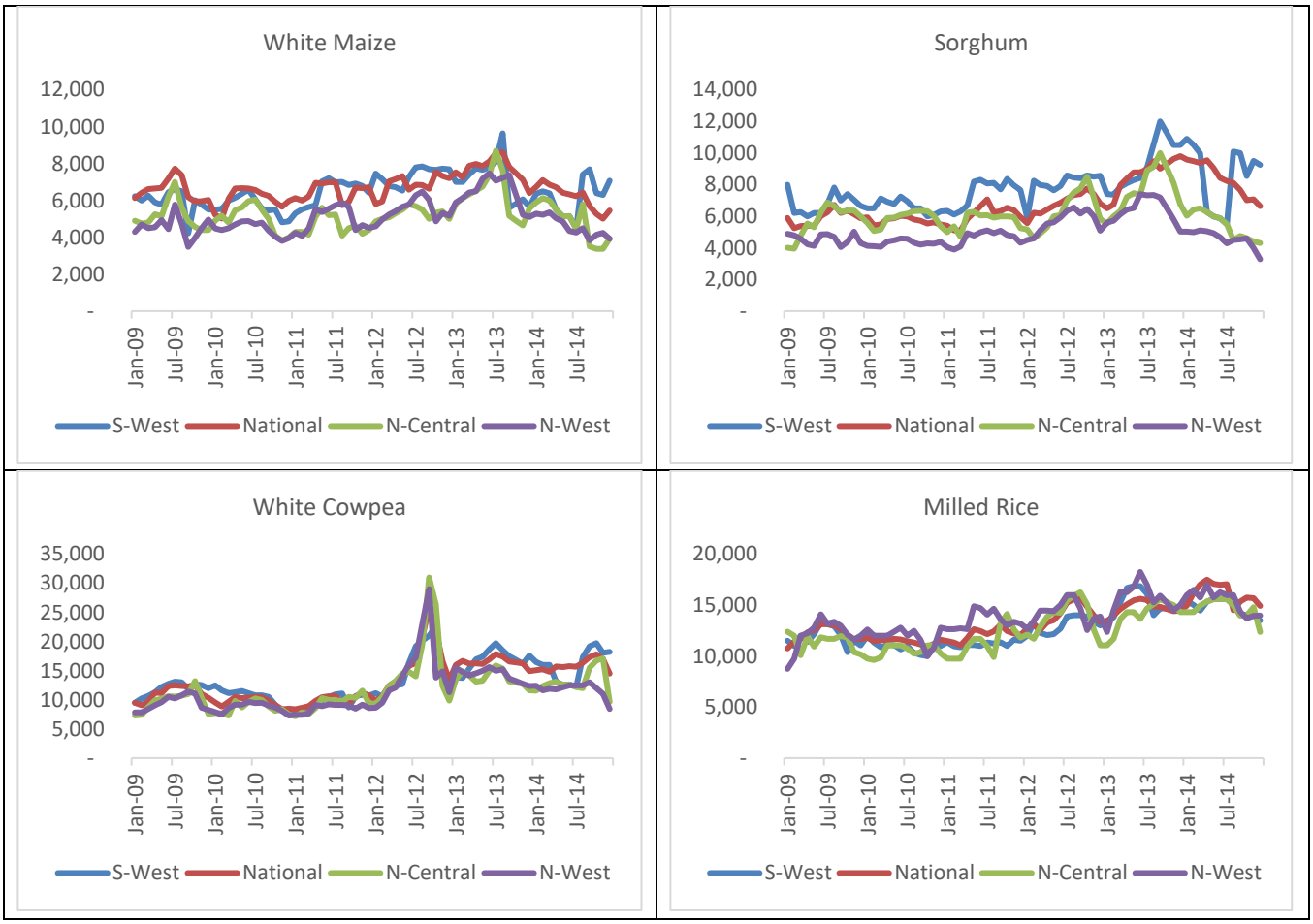
However, this aggregate price trend could mask regional trends that may arise from regional specialisation, due to regional ecological and climatic differences, and the extent to which internal

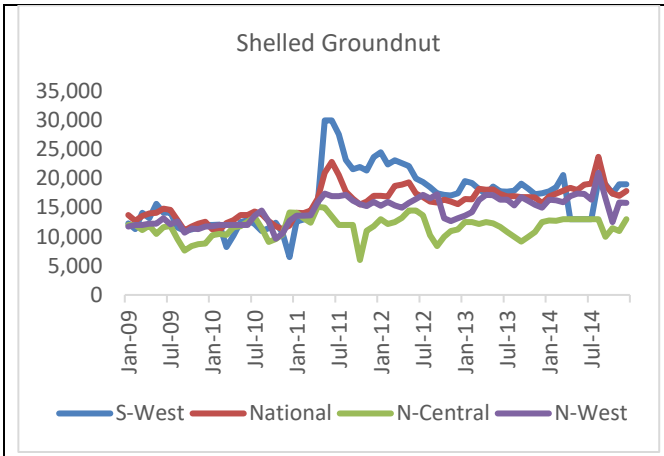
trade facilitates price moderation across regions. Therefore, the charts in Figure 9 for different crops compare price series in the north-west, north-central and south-west zones from January 2009 to December 2014.

Among the crops, white cowpea prices exhibit the least variance across the zones, followed by milled rice prices. Since these crops are consumed mostly in urban areas, and are consumed in most parts of the country, it thus seems that the near uniformity of prices reflects internal trade effects. At the other extreme, the price of sorghum is the most varied across regions: lowest in the north-west zone where it is most produced, and highest in the south-west where production is at best minimal. In addition, the crop is mostly consumed by the rural population and is not well traded across the country. White maize exhibits a similar pattern at a lesser degree.

However, despite the marked variability of prices, the price series exhibit co-movement over time. The co-movement of grain prices, especially those consumed in urban areas, across agro-ecological zones, is driven by private sector trading activities.

Figure 9: Zonal comparison of grain prices in Naira





Source: National Agricultural Extension and Research Liaison Services (NAERLS) Price Surveys

More importantly, the absence of price moderation across seasons and across years are outcomes of the interaction of production and consumption (and private reserving and sales to take advantage of the market), and suggests a limited role of public sector interventions, if any, in moderating prices in local grain markets.

3. Food Reserves in Nigeria: Policy Objectives

The food reserve silos programme was first introduced to Nigeria in 1957 by the government of the Western region as a form of support to farmers to enable them to store excess grains during the immediate post-harvest periods of low prices, and sell them back to the market during periods of rising prices.[2] Although public support is provided, the food reserves are owned and managed by the farmers. Subsequently, silos expanded in the region and elsewhere in the country; with 1,974 total silos, capacity exceeded 2,400 MT (Alonge, et al. 2011).

The national agricultural food storage programme was launched in 1987 in response to the need for greater capacity to respond to food security challenges during disasters. The public food reserve system is a 3-tier programme that includes the strategic grain reserves operated by the federal government, the buffer stock programme operated at the state level, and on-farm storage operated at the local government level. The strategic reserve programme started with six grain silos in regions where the reserved crops are mostly produced, and has gradually expanded to 33 silos already in operation. The states are expected to build and manage warehouses for reserving, but there are no hard facts about the extent of programme implementation. In addition to public reserves, private reserves are held by farmers, traders/middlemen, merchants, millers as well as private companies using grains as raw materials. It is estimated that grain merchants, traders and middlemen dominate private reserve holdings in the northern zones while private companies and marketers dominate in the southern zones.

In general, the main objectives of the food reserve system are:

[2] It is estimated that, on average, 70% of agricultural crops are retained by farmers for household consumption (See Talabi, 1989).

a) Prevention of post-harvest crop losses, estimated to be between 20% and 35% of annual production, arising principally from poor on-farm storage mechanisms adopted by poor farmers (Alonge et al 2011).
b) Making food available at all times at affordable prices by stabilising food prices, encouraging farmers to remain in production and make food available during the off-harvest seasons.
c) Provision for first line of response in times of internal disaster, including but not limited to floods, droughts, fires, and ethnic and social conflict leading to displacement of people from their domain of economic activities.
d) Giving assistance or "alms" to friendly countries in times of disaster.

Although public reserves play a role in objectives a) and b), through buying up and releasing crops, their impacts are generally difficult to estimate systematically owing to the large population and wide geographic spread of markets across the country. On the other hand, objectives c) and d) are purely social or humanitarian and are fulfilled through public food reserves.

4. Food Security Instruments

4.1 Market stabilisation

The government plays a very minimal role in the stabilisation effort as the private sector is dominant, and more visible and active, in the grain market. Individual farmers maintain storage to hold excess output to smooth consumption and income, while crop traders buy crops during the harvest season to sell when prices become more favourable. Although the government also participates through procurement and release of grains, it is the individuals, private companies, feed millers, poultry farmers, traders and other users of grains that play more important roles.

The public sector becomes important when the private market fails to stabilise. For example, the federal and state governments do not buy produce at farm gates at the start of the harvest season. Rather, it is when the private sector agents have made their purchases and farmers are still left with excess that the public sector intervenes.

4.2 Food transfers

Recent examples of transfers (types consistent with objective 3) include the ordered release of 24,000 MT of grain to provide relief for households in 24 states affected by the flooding that washed away croplands and damaged properties across the country in 2012. Release of grain to Internally Displaced Persons (IDPs) camps located in the North East region of the country affected by the Boko Haram insurgency is also currently in progress. In terms of objective 4, the World Food Programme procured the release of 50,000 MT of grains from the strategic grain reserves to assist Niger and Chad in 2012. This was followed in 2013 by an ordered release of grains from strategic reserves as a form of "almsgiving" to Namibia in response to food insecurity due to drought in almost a third of the country.[3]

[3] These accounts are gathered through interviews with staff of the SGRD at the FMARD headquarters and silo managers.

4.3 Input transfers

In addition to these standard tools, the Ministry of Agriculture provides free inputs and water pumps to farmers to speed up recovery from destruction of crops, the most visible and recent of which was implemented as part of the response to the 2012 flooding across the country. The effort, titled Flood Recovery Food Production Programme and funded to the tune of N9.7 billion, involved accelerated acquisition of improved seeds for farmers. Under the programme, the seeds acquired include 14,300 MT of rice seeds to plant 300,000 Ha of rice for flood recovery, 16,831 MT of rice seed for dry season cultivation on 336,000 Ha of rice land, 111 MT of 60-day maturing maize to plant 5,500 Ha, 170,000 bundles of cassava to plant 3,400 Ha, and 7.2 million yam cuttings to plant 120 Ha (FMARD, 2014).

These inputs are distributed to farmers on a differentiated basis. Farmers directly affected by the flood received the inputs for free, farmers in non-affected areas of affected states received the inputs at subsidised rates, and farmers in non-affected states received inputs at standard pre-flooding rates under accelerated delivery.

5. Federal Strategic Reserves

In its policy objective, the Strategic Grain Reserve Department (SGRD) of the Federal Ministry of Agriculture and Rural Development (FMARD) aims to procure and hold 5% of public food reserves[4], targeting grains such as maize, sorghum, millet, soybean, paddy rice, and garri. Market conditions are tracked through prices collected on a regular (monthly) basis by two different federal government agencies. Prices guiding procurement are collected by managers of the strategic reserve silos in the grain cultivation zones, while prices guiding releases are collected and disseminated by a central committee monitoring grains and other commodities' prices, at the Office of the Secretary to the Federal Government. These prices are shared with the SGRD monthly.

Grain procurement is done through Licensed Buying Agents (LBAs) after a committee of the SGRD completes a market survey and establishes a Guaranteed Minimum Price (GMP) at which LBAs are expected to buy from the farmers and deliver the grains to assigned silos. For example, if the market rate is N120/mudu, government would buy at N150/measure. The contracting cost takes into account the GMP, market location or source of grains, and destination of silos.[5] LBAs do not always meet the supply orders due to profitability issues. Grain release is also carried out by registered contractors (mainly truck companies).

In general, releases aimed at price stabilisation are ordered by the FMARD while transfer releases are ordered from the Presidency. However, grain releases for stabilisation purposes are expected to be ordered after the state buffer stock has been exhausted and the market fails to stabilise. Stabilisation releases are primarily made to the private sector on the understanding that the releases will affect

[4] Quoted from the policy objectives of the Food and Strategic Reserve Department, Federal Ministry of Agriculture and Natural Resources. https://fmard.gov.ng/food-and-strategic-reserve-department/

[5] There are variations in vegetation across the country, especially moving from South to North, yielding variation in areas of the country where specific grains are cultivated. While maize is cultivated in the guinea savannah, millet and sorghum are cultivated in the Sudan savannah.

the market as long as the grains are locally processed, used as inputs, or consumed.[6] As a matter of policy, grains that have been stored for three years are released to individuals and companies at the discretion of the SGRD.[7] Releases during emergencies and disasters are made to the National Emergency Management Agency (NEMA) for distribution in affected areas.

The strategic reserve programme is implemented through a network of silos located across the country. However, while the official policy is to locate the silos in grain cultivation areas, many of the silos are located on political basis to balance zonal interests. For example, the construction of 100,000 MT of silo was commissioned by the previous administration in Bayelsa (the home state of the President), a state with very little involvement in grain production.

Table 3: Current distribution of strategic reserve silos in Nigeria (MT)

	Operational	Completed	Total
North Central	136,000	150,000	**286,000**
North East	25,000	200,000	**225,000**
North West	25,000	275,000	**300,000**
South East	-	150,000	**150,000**
South South	50,000	125,000	**175,000**
South West	50,000	150,000	**200,000**
Total	**286,000**	**1,050,000**	**1,336,000**

Source: Strategic Grain Reserves Department, Delaporte et al (2014)

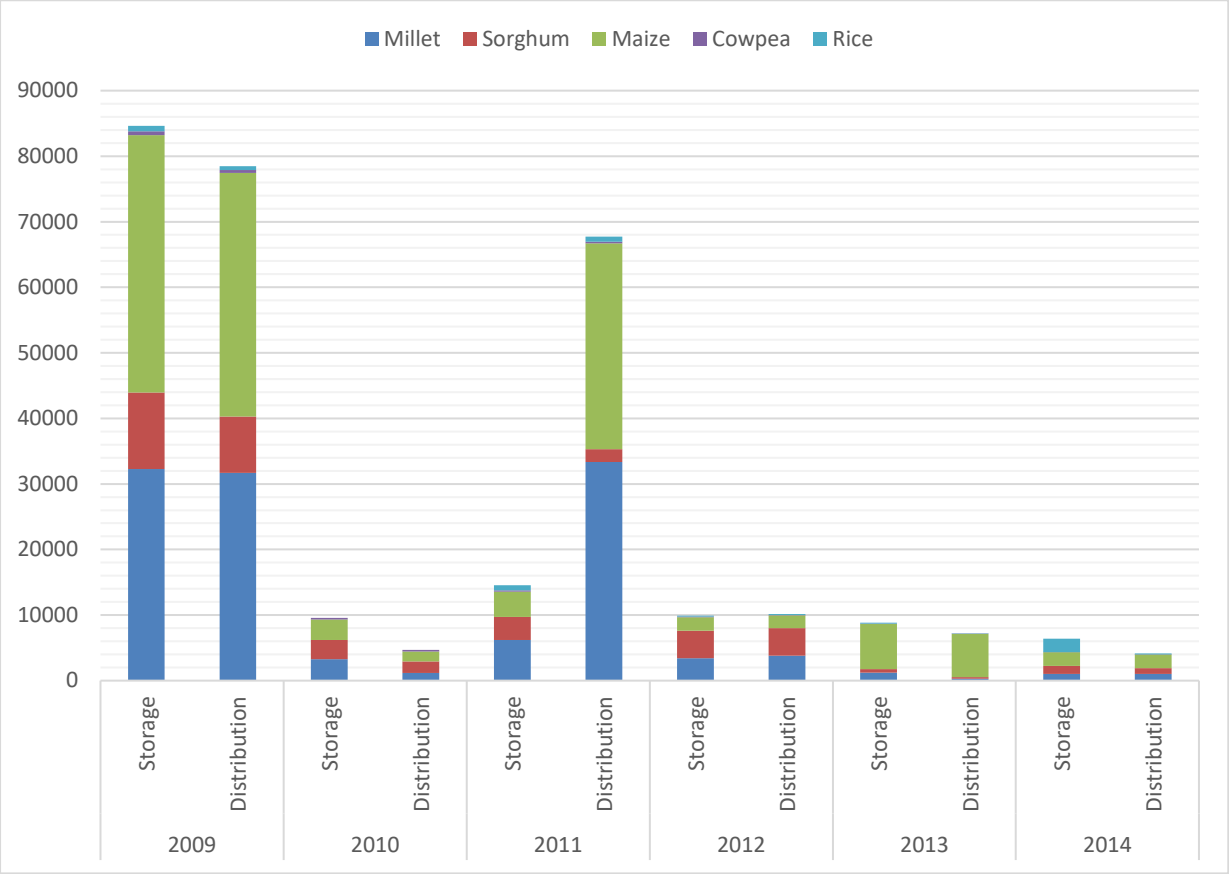
There is currently a total storage capacity of 1,136,000 MT, of which only 286,000 MT capacity is operational (table 3). The remaining facilities have been constructed and await commissioning. Figure 10 shows that the operational storage capacities are largely unutilised.

The surveys from which the data is derived typically record storage and distribution over the years, ignoring purchases. Thus, inconsistencies in the year-to-year movement of grains in the figure are due to purchase. Total storage of grains dropped from a peak of 85,000 MT in 2009 to a low of 6,000 MT in 2014. The graphs show that most of the silos have been empty for most of their existence. For example, out of 85,000 MT storage in 2009, a total of 78,000 MT of grains were distributed in the year, leaving only 6,000 MT in storage carried forward into 2010. At other times, for example in 2011, purchases were ordered to complement existing storage and the entire stock was distributed, leaving no grains in storage. In 2012, the entire stock of grains bought in the year was distributed.

[6] When grains are released to the non-government agents, recipients pay some token to cover transportation and handling. Once grains are released from the silos, the central agency has no control over the ultimate distribution; it is entirely based on the discretion of subnational authorities.

[7] The cost of keeping the reserves in the right condition is enormous and tends to increase with duration of storage. This seems to be a consideration for such releases.

Figure 10: Storage and distribution of grains from strategic reserves



Source: National Agricultural Extension and Research Liaison Services (NAERLS)

The foregoing shows the failure of the strategic reserves programme to systematically build up reserves against contingencies. The operational mode of the programme so far is to purchase grains when the need arises or nearly empty the storage every year.[8]

The distribution of food released from reserves during crisis is coordinated by the National Emergency Management Agency (NEMA) through its state level counterparts named SEMAs. Recent examples of its role include the response to the 2012 flooding and the displacement of people in the North East zone due to the Boko Haram insurgency. The silos issue supply vouchers to the contractors, which NEMA endorse before contractors are paid.

NEMA maintains an office in each zone of the country. The agency is presently distributing relief materials in the Maiduguri area, including to (displaced) victims of the Boko Haram insurgency and less privileged people, having also participated in relief distribution in response to the 2012 flood disaster. However, its operations are not immune to political influence. In 2015, the agency received grains for "safe-keeping" on behalf of the re-election campaigns of the last administration.

[8] However, there are many cases of non-response to the survey questionnaires, either because the silo managers had nothing to report or non-compliance with the survey among silos with grains. The degree of non-compliance, which is unknown to the author, will determine the degree to which this narrative holds.

6. Sub-National Food Reserves

6.1 State buffer stocks

The buffer stock programme is implemented and managed by the Produce Services Division of the State Ministries of Agriculture and Rural Development. The objective of the programme is to hold 10% of all public reserves as buffer stock.

However, the buffer stock differs from the strategic reserves in several ways:

a) The programme's primary objective is to reduce post-harvest losses by farmers. This is essential to encouraging farmers to recover their production costs and earn meaningful margins at times of glut, which is in turn essential to keeping farmers in production. Procurement orders are triggered by gluts; they are not made regularly at every harvest season. Because procurement is not regular, there is high likelihood that the states hold no buffer stocks for a long period of time. Indeed, most buffer stock warehouses, including those in Oyo state, were empty at the time of visit in June 2016.

b) State governments operate the programme as a commercial programme, except in times of disaster. While stocks from the federal strategic reserves are typically released for free (except tokens for transportation and handling), the state governments act as buyers and sellers of grains in the context of profit-making. In this sense, the buffer stock programme runs along similar lines as privately held reserves. The high likelihood of empty buffer stocks makes the strategic reserves more important in disasters and emergencies.

c) Unlike reserves held in silos, state buffer stocks are typically held in warehouses where conditions typically do not permit storing grains for a period of more than 6 months. This short turnover time limit on buffer stock renders it less useful as reliable storage for relief. However, State governments are turning to silos. The government of Oyo state is presently constructing buffer stock silos with the plan to locate a 10,000 MT silo in each of the three senatorial districts (Oyo North, Oyo Central and Oyo South).

The LGA programme is expected to store 85% of total public reserves. Some Local Government Councils participate in the food reserves system by engaging in the market for grains on both social and commercial terms. They plant crops, and at the time of harvest, sell, store and make transfers to indigent or vulnerable households. Local government councils in Osun and Ekiti states are reported to have engaged in the practice.

6.2 The on-farm storage programme

Apart from LGAs, on-farm storage by individual farmers is a crucial component of the food reserve system. Typically, farmers in grain sourcing area in Jos have mini storage facilities that are purchased at rates subsidised by the state through federal grants.

6.3 Private storage

The purchase of grains when prices are low and selling them when prices are escalating (buying low and selling high) is a normal commercial activity.

Individuals, including traders

In the National Food Security Programme of 2008, state governments offered silo construction support to individuals to increase storage capacity through the State Agricultural Development Programmes. However, the programme has been discontinued. State governments currently provide technical, non-material support to individuals interested in building silos.

Private companies

Private companies that use grains as input in their production processes maintain substantial warehousing of grains for their commercial activities. In their case, they stock the warehouses when prices are low, and continue to patronise the markets for inputs. When prices rise, they begin to use the grain reserve. These include poultries, manufacturing companies, breweries, and feed millers.

6.4 Public-private partnerships

Infrastructure provided by the public sector can be used by individuals and private companies for storage in exchange for a fee. Silos built and maintained by cereal research institutes can be offered for private storage of grains under the management of the research institutes. The reverse can also happen. For example, the Nigerian Stored Products Research Institute (NSPRI) in Ibadan built two silo tanks, each of 50 MT capacity. At present, the silos are holding grains for food merchants based on a management and maintenance contract with NSPRI.

6.5 Storage capacity

There is generally a lack of complete data on food reserve infrastructure at sub-national levels. Efforts to estimate the infrastructure nationwide that incorporates investments by all parties in the private and public sectors is incomplete. However, some data are presently available.

Table 4: Distribution of reserve infrastructure in Osun and Oyo States, Nigeria

Ownership	# of Establishments	# of Silos	Total Capacity (MT)	% of Silos	% of Capacity
OSUN STATE					
Individuals	6	48	70,000	52.2	61.9
Industries	2	20	17,100	21.7	15.1
Government	4	24	26,000	26.1	23.0
Total	**12**	**92**	**113,100**	**100.0**	**100.0**
OYO STATE**					
Individuals	N. a	N. a	N. a	N. a	N. a
Industries*	2	2	22,000	66.7	99.5
Government	1	1	100	33.3	0.5
Total	**3**	**3**	**22,100**	**100.0**	**100.0**

Source: Alonge, A. F., T. E. Omoniyi and B. A. Owolabi. (2011) for Osun State and recent fieldwork in Oyo State. *Two companies, Nigerian Breweries and Shina Farms are reported among companies that own silos. Shina farms silo has capacity of 11,000MT while the capacity of Nigerian Breweries' silo is unknown but assumed to be of equal size as Shina Farms'. The University of Ibadan is also reported to operate a silo but its capacity and functioning status are unknown.** This is incomplete and reflects what is known at the time of fieldwork.

As at 2010, total capacity of food reserve silos ascertained in Osun and Oyo states were 113,100 MT and 47,000 MT respectively. The distribution of these capacities among individuals, industries and government is provided in Table 2. In Osun state, the private sector including farmers, traders or middlemen, and private companies operate a total of 73.9% of all silos in the State, accounting for 77.0% of total silos capacity. In Oyo state, the public sector holds 33.3% of non SGRD silo capacity, while the private sector holds 66.7% of the count of silos and 99.5% of storage capacity.

6.6 Utilisation

Data on actual food storage is very scarce. A report from fieldwork in Oyo state shows that the state holds a buffer warehouse. As a result of the huge financial requirements, storage capacity utilisation is mediocre, especially in the public sector where capacity utilisation rates are estimated at below 5%.[9] Utilisation of buffer stocks at state level is highly likely to be worse, rather than better, due primarily to the limitations of warehouses for long-term storage. Private storage is likely to hold stocks, but the quantities of stock held by the companies is not publicly available, and their storage technologies are less developed than the federal silos.

7. Limitations to Public Food Reserves – Operating Costs

The financial requirement of building up stock is quite large, and governments are unable to allocate the needed funds to food storage. It is estimated that the SGRD would require N110 billion to stock all the strategic reserve silos in 2014. This cost is monumental when compared to budget allocation of N37 billion to the entire agriculture sector for the year.[10] Similarly, the produce services department of Oyo State Ministry of Agriculture and Rural Development estimates that stocking the new 10,000 MT silo presently under construction in Oyo Central senatorial district with 5,000 MT of maize (50% capacity utilisation) will cost the state N290 million. Incidentally, amidst other financial challenges, the state government was unable to pay staff salaries for months from January 2016. In addition to stocking costs, silos require frequent aeration and temperature checks, which make use of electric power. Frequent power outages make this challenging.

Owing to the enormous financial requirements of stocking, managing and maintaining the silos, the federal government recently began concessioning all but four of the federal silos to private operators.

[9] See http://nannewsnigeria.com/node/10549

[10] The report is credited to Dr Jide Olumeko, the Director, Strategic Grain Reserve, Federal Ministry of Agriculture during an interview with the News Agency of Nigeria (NAN) circa October 27, 2014. Accessed from http://nannewsnigeria.com/node/10549

8. Summary

The public food reserve system in Nigeria is far from efficient. Despite huge investments in public storage capacity, utilisation remains very low, with estimates falling below 5% nationally. Private storage is active but difficult to estimate, particularly as it undergoes accretion and depletion in line with the market. While publicly funded silos are fairly distributed across the country, covering both grain producing and non-producing areas, actual utilisation of the capacity is severely limited by financial constraints. Federal, state and local government councils are increasingly faced with financial challenges associated with running public facilities, including food reserves.

The federal government is presently concessioning the public silos to the private sector through partnership between the SGRD, Infrastructure Concession Regulatory Commission, the World Bank, and the Federal Ministry of Finance. It is expected that all but four of the SGRD silos will be leased to the private sector to enable them to provide reserves.

9. Conclusion

Based on the findings of this study, public food reserves have not played a substantial role in food security in Nigeria, particularly in the moderation of grain prices. Although the infrastructure exists, the costs of using and managing reserves are enormous. However, public reserves have played noticeable roles in providing in-kind transfers to households in response to food crises related to disasters. Permanent supplies to poor households from public reserves may exist at the subnational level, but these are not widespread. Private food reserves are widespread but serve mostly private and commercial interests, and thus are ill-suited to price moderation.

In relation to the four research questions asked, the following can be inferred:

1) *Is it better to act on market prices, to provide targeted transfers, or to intervene at both levels?*
   In the study context, public storage could facilitate provision of targeted transfers to households.

2) *If the choice is to act on market prices, is it better to do it through public stocks, trade policies, policies to support private storage, or a mix of (some of) these tools? To what extent are public stock interventions and trade policies disruptive for private trade and private storage?*
   In this context, it seems that policies to support private storage and internal trade, especially across ecological zones, would be beneficial for poor households. While private storage would enable poor households to exert better control over their food supplies, increased trading will reduce price variations across zones and in the process be beneficial to poor households in areas outside of the main cultivation zones of specific crops.

3) *If transfers are implemented, is it better to transfer food, cash, vouchers, assets, inputs, or a combination of (some of) these goods? What is the influence of the nature of the transfer on logistical costs, governance, and food consumption? What is the influence of the nature of the transfer on the price paid by other households on the domestic market?*

An electronic (mobile-phone based) transfer system has been used to provide vouchers to farmers to enable them pick up fertilisers at subsidised rates from collection centres. Given the wide penetration of mobile phone services into rural areas where most of the poor people live, it seems that this infrastructure would provide a very low-cost option both in terms of operationalisation and governance. Thus, a combination of cash, vouchers, or input transfers could be implemented.

4) *If food transfers are provided, to what extent are public stocks necessary (instead of real time purchases)?*

Public stocks would be needed both as a means of reducing the costs that would be associated with the alternative of spot purchases, given that the objective of the transfer is to help poor people cope with rising food prices. A variety of local institutions are available that can serve as collection points.

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