

## ASSESSMENT OF PARAMETERS AFFECTING THE OPERATIONS OF SELECTED STRATEGIC GRAIN RESERVE CENTERS IN NIGERIA

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### ABSTRACT

*Neglecting agricultural productivity, particularly in staple food crops, can drive a nation to rely on imports for sustenance. To address these challenges, the Federal Government established Strategic Grain Reserves to reduce post-harvest losses, ensure food storage for the population, provide relief during disasters, and support other countries in need. This study assessed factors affecting selected grain reserves using primary and secondary data. Primary data were collected through questionnaires administered at six Strategic Grain Reserves in Ondo, Kwara, Oyo, Osun, Ogun, and Ekiti States. The findings revealed that 50% of the facilities were operational, 40% were under construction, and 10% awaited commissioning. The reserves had stored grains for a maximum of 36 months and a minimum of 24 months. Despite their current status, grain losses were minimal, at less than or equal to 5%. However, at the time of the study, the reserves had no stock in storage. Secondary data, covering population growth, grain production, export, import, and demand from 2006 to 2015, were analyzed using correlation coefficients. The results indicated weak and negative relationships between most parameters: -0.3 for population and grain production, -0.4 for exports, -0.2 for imports, and -0.02 for demand, showing no significant correlation. The exception was a positive but moderate correlation (0.5) between grain imports and population growth, highlighting a growing dependence on imports. Although the reserves are equipped to function effectively, they are underutilized due to low grain productivity and insufficient supply from catchment areas. Ideally, domestic grain production should meet the needs for export, import, demand, and storage. However, the analysis shows that production levels are inadequate. Consequently, the reserves remain largely unused, with minimal grain stored to fulfill their intended purpose.*

**Key words:** Strategic grain reserves, Silo storage structures, Storage stature, grain production, import.

### 1. INTRODUCTION

The strategic grain reserve is stocks of grain held in reserve intentionally by government programs for the purpose of meeting future, domestic and international needs. The strategic Grain Reserves Department is the apex of the three tier of the National Agricultural Food Storage Programme (NAFSP) of the Federal Government launched in 1987 to prevent post-harvest losses, and to provide the first line of food relief internally and to friendly countries in times of disaster, natural or man-caused disaster and to make food available at all times at affordable prices. (FMARD, 2013).

The postharvest policy of the Nigeria food security programme is centered on three tier grain storage; Strategic Grain Reserve being handled by the Federal Government, Buffer Stock to be coordinated by the State Government and the On-Farm Storage handled at the local level. The on-farm Storage Programme is to hold 85% of the grains required for food security (Olumeko, 1998). The "Buffer Stock Storage Programme" being operated by the states to reduce inter-seasonal variation in food supply, thus guaranteeing price stabilization to both the consumer and the producer. And the "On-Farm Adaptive Storage Programme" which is to promote adequate prevent Local post-harvest losses at farm level. (FMARD, 2013).

Strategic Grain Reserves, also called emergency food reserves or food security reserves have received considerable attention following the global food crisis of 2007-08. Various models for holding reserves have been discussed at such high – level forums as the G-8 summit and have been studied by the New Economic Partnership for African Development (NEPAD) and other regional economic organizations. (Ahmed, 2011).

Following the global food crisis of 2007/2008, Nigeria Government had merged the Strategic Grain Reserve (SRG) with other projects / departments like the Projects Coordinating Unit (PCU), Fertilizer Department, Cooperatives Department and Federal Department of Agriculture's (FDA's) Engineering / Mechanization and Post – Harvest Technology Divisions to form what is presently known as National Food Reserve Agency (NFRA). The NFRA is a parastatal of the Ministry of Agriculture to oversee Nigeria's Food Security Strategy. The agency has regional offices in each of the country's six geo- political zones.

The main objective of NFRA to significantly improve Nigeria's agricultural productivity; improve large scale production, storage/processing capacity as well as required infrastructure to achieve food stability; to achieve national food sufficiency and derive over 50% of the nation's foreign exchange through agricultural export strategy designed to promote self – sufficiency in rice production, processing and packaging even though the country still imports some.

The total completed Silo Complexes meant for Strategic Reserves are 18 and 15 are still under various level of construction and 45 community Warehouses with a total capacity of 94,000mt were as well constructed. (Delaporte et al, 2015). Strategic Grain reserves are being embraced in Nigeria also, to lessen the country's dependence on external assistance, particularly on food aid but also on food imports and reduction in capital wastage. For instance, Nigeria, a country which is considered as a major food exporter, now found itself in the crisis of food importation (Agriculture in Nigeria, 2011; Abdulrahman, 2013; Abu, 2012; Adebayo, 2010; Adebayo et al., 2009).

Lawal (2009) reported that the National Food Reserves Agency (NFRA) in her effort to cater for strategic grain reserves has commenced additional twenty (20) silo complexes nationwide during the year, while Okunola et al. (2007) reported, that the Strategic Grain Reserve in Akure has silos with storage capacity of up to 2,500metric tonnes and Ware house of up to 5,000metric tonnes and the major problems identified during the study include leakages, inadequate ventilation and poor drainage as a result of the adaptation of existing structures, which were not originally warehouse, but eventually converted to warehouse after some modifications were effected by artisans. According to Oni (2014), the Federal Government has taken measures to address some issues responsible for food crop losses. For instance, "As at 2011, 12 silos were distributed across the geo-political zones with a combined storage capacity of 300,000tonnes for assorted grains, beans, and gari, while twenty additional silos have been built by the Federal Government.

Adewumi and Oduwole (1995) gave the report that silos in Nigeria have performed below expectation. Since, most of them are mostly used for short term storage with age ranged between 3-37 years and size range of 5-2500 tons. A lot still need to be done in the area of storage, processing, rendering of extension services, promotion and ensuring compliance to the standard and grades of agricultural produce. While twenty additional silos have been built by the Federal Government to further raise the joint storage capacity of the nation's silo to 1,336 million tonnes. These have been completed by the present administration to bring the total to thirty – three (Olukayode, 2014).

## 2. METHODOLOGY

The purposive sampling method was used to select the strategic grain reserve to be used. Six states in Nigeria including five in the Southwest and one in the North Central geo – political zones. The Strategic Grain Reserves Locations in Ondo, Kwara, Oyo, Osun, Ogun and Ekiti State. Two sets of data obtained for this research included the primary and the secondary data. The primary data was obtained using questionnaires administered to the selected SGR locations. The questionnaire was designed to ascertain the functionality and the level of usefulness of these reserves in terms of types of grain stored, handling and technical equipment available, maximum and minimum months of storage, level of grain losses experienced during storage, period at which their stored produce meets market demand in their zones and their present status.

The secondary data used was obtained from FAO publications, world – Bank publications, FAOSTAT Trade Statistics, National Bureau of statistics Journal, World – Grain and USDA – Annual Reports. Essential parameters affecting Strategic Grain Reserves required for the evaluation were firstly, studied for ten years (2006 – 2015). They include: Nigeria population growth as seen in (Table 1), grain output production (Table 2), grain export (Table 3), grain import (Table 4) and quantity in demand (Table 5). Correlation coefficient method was used to analysed and evaluate the relationship between these identified parameters.

## 3. RESULTS AND DISCUSSION

### 3.1 Results

Figure 1 shows the percentage of functional and non – functional visited Strategic Grain Reserves. 50% of the SGRs were in use and operational, the remaining 50% were yet to be in operation in which one had been completed but is awaiting commissioning, while the ones under construction are at 50% and 90% construction level respectively.

The assessment report indicates that 50% were functioning while the remaining 50% were yet to be in operation. All the three functioning locations visited stored the same grain crops which were maize, millet, sorghum, soyabeans in Silo Structures and gari, while location B (Kwara) include rice. They all stored these grain crops in silo storage structures but stored gari in warehouse for a maximum of 36 months except location B (Kwara) which had only been storing for 24 months (Figure 2). Also, the following handling and evaluating equipment were available for carrying out standard test and evaluation: moisture meter, hectoliter machine, scale and scoop; they were functioning and operating to expectation (Figures 3 and 4).

The highest percentage grain loss experienced during storage by these functioning locations was less than or equal to 5% with a least percentage loss of 1%. (Figure 5) using grain percentage damage factor method (Ajisegiri, 1991). Correlating identified parameters affecting grain security as conversant to Strategic Grain Reserves shows a negative and weak correlation. The relationship between the total grain output production and Nigeria population growth is  $-0.3$ , that of total grain import and output production is  $-0.4$ , total grain export and total output production is  $-0.2$ , while the relationship that existed between the total grain output production and grain demand is  $-0.02$  which is negative, weak and even established no correlation. (All the values used were obtained for 2006 -2015).

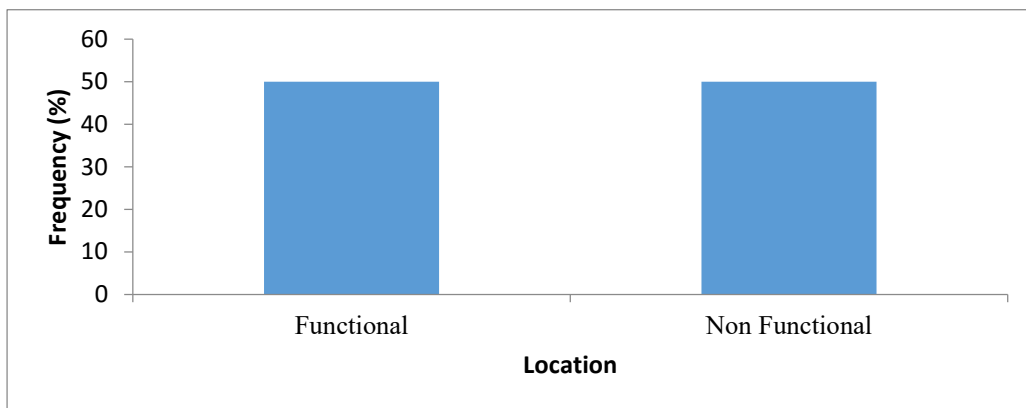


Figure 1. Functional and Non – functional Strategic grain reserves location

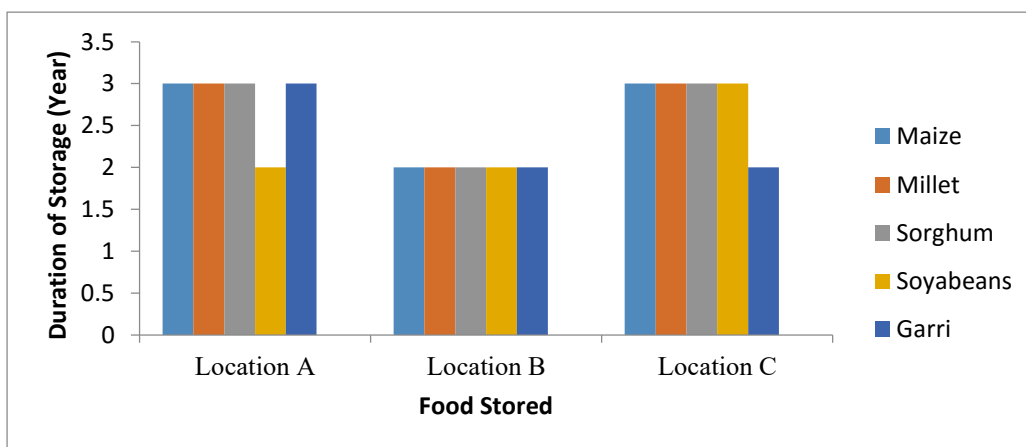


Figure 2. Duration of storage versus food stored

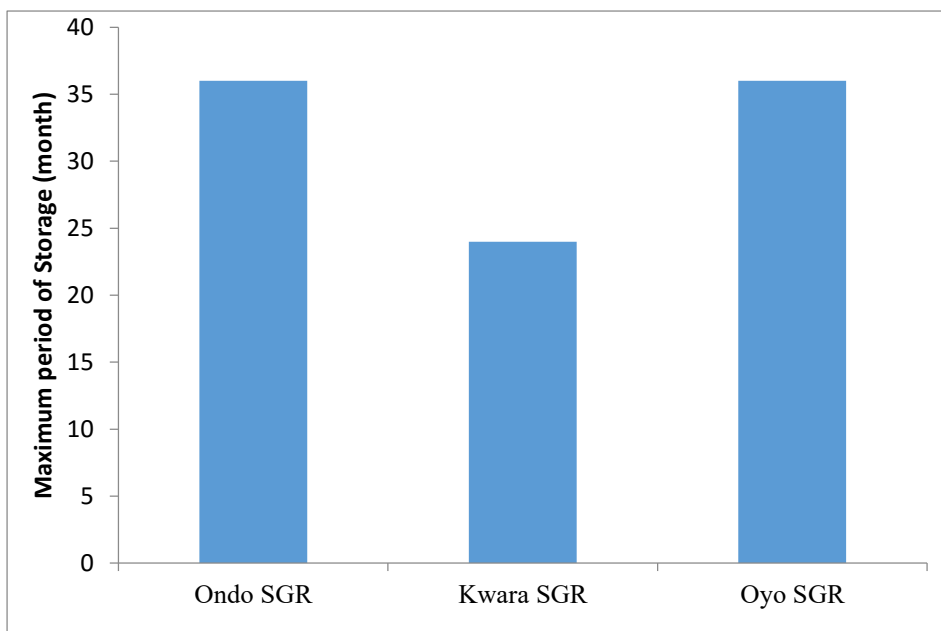


Figure 3. Maximum period of storage for Operational location

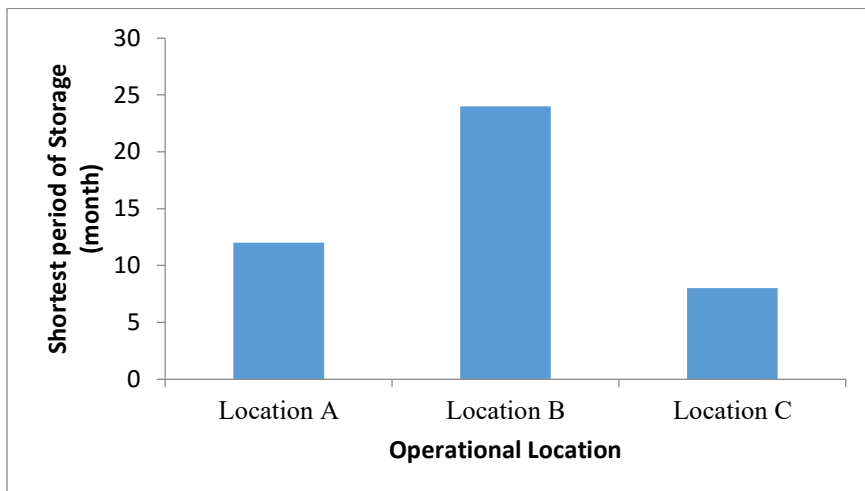


Figure 4. Shortest period of storage of Operational location

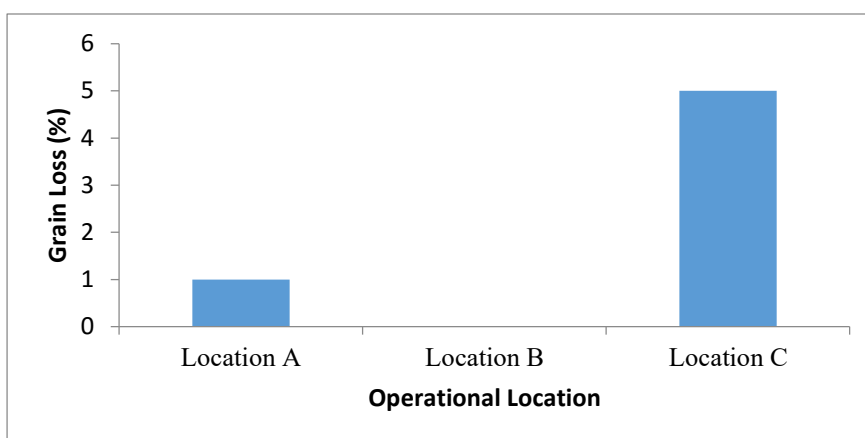


Figure 5. Level of grain loss in Operational locations

In contrast, the relationship established between the total grain import and population growth is 0.5 which showed positive correlation and established great dependence on grain import for the populations' survival.

Table 1. Nigeria Estimated Population for 2006 – 2015

Year	Population (Millions)
2006	143.00
2007	147.15
2008	151.00
2009	155.21
2010	159.42
2011	164.77
2012	168.24
2013	172.82
2014	177.48
2015	188.20

Source: World Development Indicator (2016)

Table 2. Nigeria Estimated Agricultural Grain Crops Production for 2006 - 2015

Year	GRAIN CROP / PRODUCTION (OUTPUT) Tonnes (T)							Total
	Rice (Milled)	Wheat	Maize	Soyabeans	Sorghum	Millet		
2006	2,873,420	—	7,023,000	1,650,090	6,474,000	5,940,000		23,960,510
2007	3,186,000	44,000	5,796,670	580,000	5,429,000	4,388,000		19,423,790
2008	4,179,000	53,000	9,113,710	591,000	5,218,400	4,327,610		23,482,720
2009	3,546,250	37,000	7,338,840	610,000	5,271,000	4,884,890		21,687,980
2010	4,472,520	34,200	7,669,180	460,000	7,133,820	5,167,090		24,936,810
2011	4,700,000	100,000	8,800,000	500,000	6,500,000	1,000,000		21,600,000
2012	2,709,000	100,000	9,250,000	510,000	6,900,000	5,000,000		24,469,000
2013	2,370,000	70,000	7,630,000	650,000	6,493,000	5,000,000		22,213,000
2014	2,772,000	70,000	7,700,000	650,000	6,592,000	5,200,000		22,984,000
2015	2,900,000	100,000	10,800,000	—	7,000,000	—		20,800,000

Sources:FAOSTAT 2011, 2014; USDA, 2011 – 2015; World – Grain.com, 2011

Table 3. Estimated Nigeria Agricultural Grain Crops Export for 2006 – 2015

<b>Grain Crop Export in Tonnes (T)</b>						
<b>Year</b>	<b>Rice (Milled)</b>	<b>Wheat</b>	<b>Maize</b>	<b>Soyabeans</b>	<b>Sorghum</b>	<b>Total</b>
2006	2,497	15	3,666	11,500	699	18,377
2007	251	82	10,416	15,300	378	24,427
2008	46	12	1,023	15,000	17	16,098
2009	-----	12	-----	14,400	30	14,488
2010	0	200,000	35	0	100,000	300,035
2011	0	570,000	100,000	0	60,000	730,000
2012	0	480,000	100,000	0	70,000	650,000
2013	0	450,000	50,000	0	0	500,000
2014	0	500,000	100,000	0	30,000	630,000
2015	0	500,000	200,000	0	100,000	800,000

Sources: FAOSTAT, 2012; FAOSTAT Trade statistics; Food Security Portal; Grain and Feed Annual Report, 2011-2015; FAO Food Outlook, 2011

Table 4. Estimated Nigeria Agricultural Grain Crops Import for 2006 - 2015

Grain Import in Tonnes (T)						
Year	Rice (Milled)	Wheat	Maize	Soyabeans	Sorghum	Total
2006	1,000,000	3,244,000	9,612	23,124	0	4,276,736
2007	1,216,962	7,795,100	687	23,124	24	9,035,897
2008	971,815	1,132,180	49	83	12,601	2,116,728
2009	1,056,000	1,134,000	29	-----	12,000	2,202,029
2010	2,100,000	3,400,000	400,000	4,000	-----	5,904,000
2011	2,400,000	4,051,000	100,000	4,000	13,000	6,568,000
2012	2,890,000	3,800,000	100,000	10,000	0	6,800,080
2013	2,500,000	4,140,000	100,000	-----	0	6,740,000
2014	3,000,000	4,215,000	100,000	-----	0	7,315,000
2015	3,500,000	4,350,000	100,000	-----	0	7,950,000

Sources: Food Security portal; World – Grain.com, 2015; FAOSTAT, 2012; USDA, 2011 – 2015; FAO, Food Outlook, 2010



Table 5. Estimated Nigeria Agricultural Grain Crops Demand for 2006 - 2015

Grain Crops/ Food Demand in Tonnes (T)						
Year	Rice (Milled)	Wheat	Maize	Soyabeans	Sorghum	Total
2006	5,200,000	3,243,985	7,028,985	1,667,174	5,216,871	23,351,516
2007	3,100,000	7,839,018	5,786,944	587,824	5,428,766	22,742,552
2008	3,000,000	1,185,168	9,112,736	586,083	5,205,782	19,089,769
2009	2,800,000	1,170,988	7,338,869	595,600	5,282,970	17,188,247
2010	5,000,000	3,581,000	8,069,145	454,000	7,146,803	24,250,948
2011	5,030,000	3,490,000	8,825,000	484,000	6,690,000	24,519,000
2012	5,200,000	3,970,000	9,250,000	520,000	6,790,000	25,730,000
2013	5,000,000	3,970,000	7,800,000	650,000	6,850,000	24,270,000
2014	6,000,000	3,835,000	7,700,000	650,000	6,830,000	25,015,000
2015	6,000,000	3,920,000	7,511,000	-----	6,600,000	24,031,000

Sources: Agricultural Transformation Agenda, 2011; USDA, 2011 - 2015

### 3.2 Discussion

The major problem with these SGR is low farm output which invariably affects the quantity available for storage. For effective grain storage and functionality of structures, productivity and supplies from catchment areas and maintenance of the existing structures are paramount. The study has been able to reveal that 50% of grain reserves visited were functioning which according to Olumeko (1998) and FMARD (2013) were to be supplied grains from buffer stock, which are used to stabilize commodity prices and also aim to protect producers from price drop and or consumers (Annelies, 2014). Despite the aim of buffer stock which is to give room for grain storage for at least 2-3 years, the SGRs visited are not performing to expectation since its being alone compared with India Reserves where the government implements its price stabilization and food security policies through the Food Corporation of India (FCI) aiming at providing farmers' ruminative prices, to make food available at reasonable prices particularly to vulnerable section of the society and intervene in market for price stabilization. While McCreary, 2012 examined the performance of this programme a success-story. The non – functioning reserves would be due to lack of their supplies or technical failures of reserves as observed in Akure by Okunola et al (2007).

However, considering the estimated national population growth rate and other factors, the level of productivity of grain could only meet with local demand but insufficient to supply. The level of impact of the grain reserves indicates the needs to step up productions and increase the number of reserves adequacy. Notwithstanding the crops covered by grain reserves have excluded most crops prone to rapid spoilage and maximum percentage losses such as horticulture crops like fruits and tubers of different types.

Moreover, the merging of various parastatals to provide efficiency and combat food crisis has not yielded any positive improvement in performance of the reserves. Hence a major food exporting country is now importing food to augment food supply in the country. their point to the Federal

Government to step up efforts in funding, staffing and enhancing adequacy in quantity or structure and in their maintenance

#### **4. CONCLUSION AND RECOMMENDATIONS**

The evaluation carried out on the visited and functioning Strategic Grain Reserves showed that they have the potential to perform and operate adequately. Even though, they have handling, technical and mechanical facilities, they all require upgrade for adequate performance with minimal grain losses but were yet to satisfy the aims of their establishment judiciously as they were under – utilized due to low grain production. In view of this, the facilities were not stored to expectation as their present status indicated.

Nevertheless, the analysis obtained from secondary data clearly shows that Nigeria is low in grain production, having little or nothing to export, greatly depends on import to meet the population growth demand therefore, nothing is left for storage.

To optimize the performance of the Strategic Grain Reserves in Nigeria, the following recommendations are made for improved performance.

1. Establishment of farms by the government majorly for those strategic grain reserves within their locations to at least cater for half of their stored produce. This is to add those obtained from the contractor outside to keep up to the stock required.
2. Employment of more extension and marketing officers to link the grain producing farmers with the reserve centers directly to enhance adequate deposition of their produce and to offer the best agricultural practices required for improved production.
3. Training of officers and implementation of the outcome of their training on how to use facilities provided for improvement.
4. Employment of relevant personnel such as Agricultural Engineers and Technologist who are more experienced in the field of storage than the use of non – professionals as witnessed in the SGRs visited during the conduct of the research.
5. The Federal Government of Nigeria through the National Agricultural Technology Innovation Policy (NATIP) should employ the use of Information Technology (IT) in the management of the SGRs to enhance effective grain storage as there is no report of the use of software in the management of stored grain in the SGRs visited.

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