Project Report:

Digital Technology and Fertilizer Reforms in Nigeria

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1 Introduction

Over the years, several attempts have been made to boost farmers' productivity, among which are supplying farm inputs (such as improved seeds, agrochemicals and fertilizers) at subsidized prices to the farmers. Various domestic and imported fertilizer production costs are subsidized to lower prices to farmers. A historical review of Nigerian fertilizer policies indicates an inconsistency of government fertilizer distribution and subsidy policy over the years. The fertilizer subsidy programs ranged from conventional subsidies to "market-friendly" subsidies. Conventional fertilizer subsidies include the following key features: government importation and distribution of fertilizer, the sale of fertilizer to subsidized pan-territorial prices via state-owned enterprises, and universal program availability to all categories of farmers. The key features of market friendly subsidies are the use of a targeting mechanism such as input vouchers to target poor farmers, and delivery of the subsidized fertilizer via the private input distribution system.

Prior to 2012, the conventional subsidy system was in place; this involved fertilizer distribution via direct government provision through state agencies, which purchase and distribute the fertilizers to selected farmers. However, the direct distribution system has been characterized by large-scale corruption and inefficiencies, with a large proportion of these inputs not reaching the farmers; as a result of the high level of corruption, insincerity and political interruption in the distribution channels. A Grow Africa Report (2011) noted that over NGN776 billion ($4.8 billion) was lost due to fertilizer scams between 1980 and 2010. In addition, problems of fertilizer quality, arbitrage, and timeliness of fertilizer distribution have persisted throughout the period.

In 2012, the Federal Government of Nigeria (FGN) began a new fertilizer distribution scheme called E-wallet system under the Growth Enhancement Support Scheme (GESS). The GESS represents a policy and pragmatic shift within the existing fertilizer subsidy interventions, by removing government from the distribution chain. The main innovation of the system is the introduction of a digital identification system which ensures direct delivery of subsidized farm

inputs (including fertilizers) to farmers, via Global System for Mobile Communication (GSM) phones (CRCMA, 2012). The overall objective of GESS according to FMARD (2013) is to: provide affordable agricultural inputs like fertilizers, hybrid seed and agrochemical to farmers; remove the usual complexities associated with fertilizer distribution; encourage critical actors in the fertilizer value chain to work together to improve productivity; enhance farmer's income and promote food security; and shift provision of subsidized fertilizers away from the general subsidy, and towards genuine small holder farmers.

This study examines the key impact of the reform based on survey of farmers in Nigeria. This is to help understand the impact of the reforms on farmers and compare its effectiveness with previous fertilizer distribution systems. It should be noted that Nigeria lacks some of the basic foundations for wide-ranging digital subsidy reforms involving direct benefit transfers – with the slow rollout of the national ID, many citizens cannot be uniquely identified; in addition, levels of financial inclusion are low. This paper considers how Nigeria was nevertheless able to roll out its reform, using digital vouchers for payment to dealers and SIMs as unique identifiers. It also considers the political economy of the reforms – who wins and who loses from such reforms – and the prospects for sustaining the new approach.

The subsequent layout of the study is presented as follows: Chapter Two presents an overview of past fertilizer subsidy systems in Nigeria; Chapter Three presents the indicators of performance of current fertilizer subsidy systems in Nigeria; Chapter Four presents analysis of the results from survey conducted; and Chapter Five concludes the report, with lessons to be learnt and actionable policy recommendations.

2 Nigeria's Fertilizer Subsidy System

2.1 The Previous System of Fertilizer Subsidy and Distribution

The Federal Government, State, and Local Governments have all been involved in fertilizer procurement, distribution, and the subsidizing of fertilizer at various times. Subsidies on fertilizer was first introduced in the 1970's with a subsidy level ranging between 25 and 50 percent of the landed cost of fertilizer shared by the Federal, State and Local Governments (Eboh et al. 2006) . However, the subsidy was not uniformly implemented across states as different prices were used in different states. During this period, the state government was in charge of fertilizer procurement and distribution, through sales agents and the extension system.

Following persistent problems such as interstate arbitrage, congested ports and demurrage charges, no control over fertilizer type or quality or package quality, as well as poor subsidy administration and control in the distribution chain; the federal government took over the procurement and distribution of fertilizer in 1976, through the Fertilizer Procurement Distribution Division (FPDD). The subsidy levels during this era ranged from 75 to 85 percent, depending on the states. This system of fertilizer distribution continued until 1987, when the responsibility of fertilizer distribution and procurement was restored to the state government, while the Federal Government reimbursed transport costs. To enhance the efficiencies of the distribution system, six fertilizer depots were created by the FPDD - in Minna, Gombe, Lagos, Port Harcourt, Funtua and Markudi; in 1991.

Between 1992 and 1994, the subsidy rates were 77, 65, and 65 percent respectively for the three years, and remained the responsibility of the federal, state and local governments. However, the depot system introduced in 1991 was eventually abandoned, and the FPDD was given the responsibility to distribute only imported fertilizer; while NAFCON distributed locally-produced fertilizer. State Agricultural Ministries and Agricultural Development Projects (ADPs) distributed

the fertilizer to farmers in each state. Although this initiative reduced the system cost, non-delivery of fertilizer, as well as handling, storage, and transit losses persisted. The Federal Government in 1994 also experimented with distributing 80 percent of the fertilizer through Local Governments and 20 percent by the State Governments. This experiment was run for one year and then abandoned.

In a bid to promote public-private partnership and improve the performance of the distribution chain, the Federal Government stopped the importation of fertilizer, and transferred the responsibility to the private sector from 1995 to 1996. NAFCON and blending plants became agencies for distributing locally produced fertilizer. States collected their fertilizer allocation from the fertilizer plants, to be reimbursed for transport by the Federal Government. The subsidy levels during these years were 87 and 74 percent respectively. Nonetheless, this was unable to solve the persistent problems of non-delivery of fertilizer; in addition to attendant handling, storage and transit losses.

Between 1997 and early 1999, the Federal Government adopted a complete privatization and liberalization of the fertilizer subsector. All fertilizer subsidy and distribution programs were discontinued; and the import tariff reduced from 10 to 5 percent. The initiative was largely ineffective because the groundwork had not been laid out properly for the private sector to take over. Fertilizer use declined sharply, and the Federal Government reintroduced a fertilizer subsidy of 25% in May 1999, under the Federal Market Stabilization Programme (FMSP). 101, 000 tonnes of fertilizer was procured for distribution by states. The fertilizer was to be targeted at poor farmers by the Local Governments. Subsequently, the FGN discontinued the subsidy in August 2000, and abolished the import fertilizer tariff. The FGN again procured and subsidized a portion of Nigeria's fertilizer in 2001 (164,000 tonnes). In 2002, 163,700 tonnes was approved to be procured and subsidized at 25%, and the import tariff was reinstituted at 5%. Consequently depending on a farmer's state and local government of origin, the rate for subsidized fertilizer under the FMSP typically ranged between 25 and 75 percent.

2.2: The impetus for reform

In the FMSP, the quantity of subsidized fertilizer was rationed at the aggregate level. The subsidized fertilizer market was not competitive because the government, rather than the market,

determined the quantity of subsidized fertilizer to be distributed. Past studies indicate that in Nigeria, subsidized fertilizer was often diverted and sold in the open market by farmers or dealers who were well-connected with government officials or public institutions (Banful et al., 2010); which might have crowded out the commercial traders, who can only sell fertilizer through the commercial channel. Poor targeting of fertilizer subsidies might have also induced leakages and led to the ineffectiveness of the subsidy to meet the potential demand of the intended beneficiaries (Banful et al., 2010).

In 2012, the Nigerian government began a new fertilizer program called the Growth Enhancement Support Scheme (GESS). In contrast to the previous subsidy system, the GESS scaled up a previously piloted paper voucher-based program to the national level, delivering vouchers electronically to registered farmers with mobile phones. The private sector handled procurement and distribution of the fertilizer. Under the current scheme, farmers are restricted to receiving 2 bags of subsidized fertilizer (typically subsidized at 50% of market price) in contrast to the FMSP, where no quota existed.

3 The E-wallet System of fertilizer Distribution

The entrance of the Growth Enhancement Support Scheme (a component of the Agricultural Transformation Agenda) came with the objective to target 5 million farmers in each year for four years -ultimately 20 million by the end of the four years (FMARD, 2012). More specifically, it sought to provide timely direct input (fertilizers, seed distribution and soft loans) support to farmers at affordable rates, increase farmers' productivity across the country through education on best farming practices, and increase fertilizer usage from 13kg/ha to 50kg/ha. In addition, the scheme aspired to modify government interventional roles from the conventional direct procurer and distributor of fertilizer to a catalytic regulator for private sector participation in the value chain. To achieve its objective, a mobile e-wallet network that extended to thousands of villages and about eight million farmers was designed by a software company- Cellulant- and deployed for about two years. The scheme recruited farmers using the criteria:

- The farmer must be 18 years and above.
- The farmer must have participated in a survey authorized by the government to capture farmers' detailed personal information.

- The farmer must own a cell phone with a registered SIM card, with a minimum amount of call credit on the cell phone.
- The farmer must attend training programmes designed for the scheme (Agristat, 2018).

Basically, GESS e-wallet uses mobile technology to transfer fertilizer subsidies from the government directly to farmers, bypassing middlemen (some of which businesses use fraudulent documents to collect subsidized fertilizers from government stores and sell at market rates). The scheme was implemented by a collaboration of the federal government with the state ministry of agriculture, supply chain managers (SCMs), and the platform builder -Cellulant.

The Federal Government, through the Federal Ministry of Agriculture and Rural Development (FMARD), formulated the policy guiding the scheme and supervised its implementation. They mobilized the registration of over five million farmers and coordinated the redemption of inputs across Nigeria. Furthermore, the ministry liaises with officials of the State Ministry of Agriculture to designate redemption centres. During the redemption process, the ministry approves relevant redemption forms and certificates, and deploys staff to all redemption centers to supervise the distribution. Periodically, using all the information collected during this process, a report on registration and redemption of inputs is developed and presented. The state Ministries of Agriculture manage the scheme's activities in their region. Working with SCMs, they designate redemption centers, mobilize and coordinate the registration of farmers, and the redemption of inputs in their states. In addition, they deploy staff for supervision purposes during redemption, and prepare reports of the activities.

Cellulant, the technology partner, designed and provided the e-wallet platform for the implementation of the GESS scheme across the country. To enhance user functionality of the platform, Cellulant provides guidelines and training to the supply chain managers (SCMs). The database, which includes the registered farmers, agro-dealers, redemption centers and other stakeholders, resides with the firm, who provide templates and confirm all transactions made in the e-wallet software. In addition, the firm generates and prints farmer registers when the need arises, and notifies farmers of redemption time.

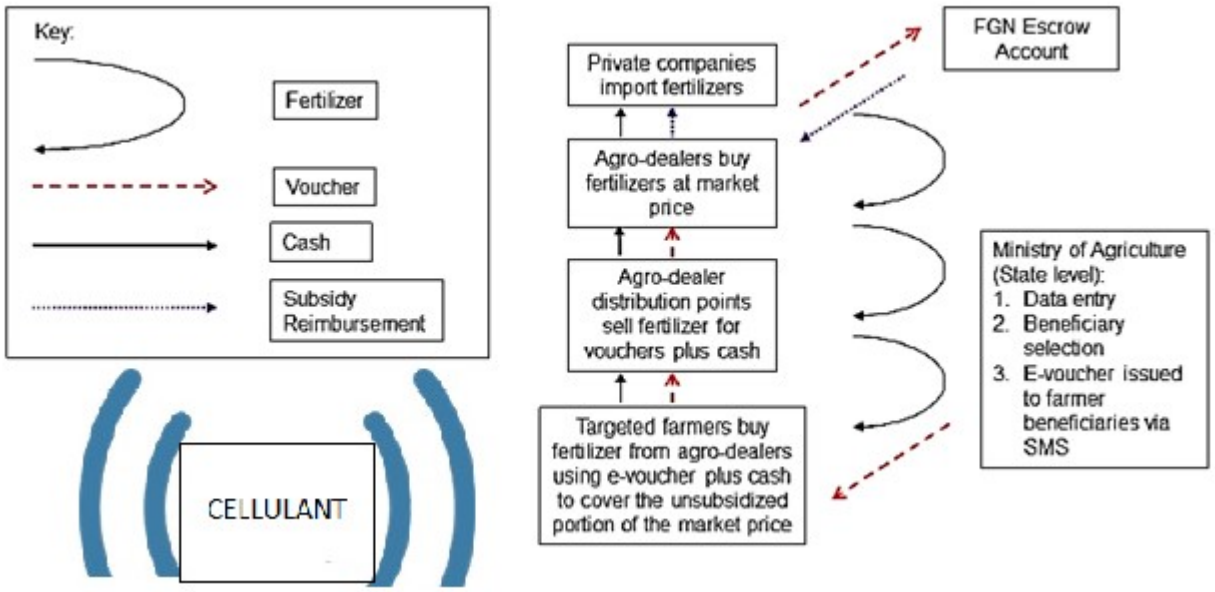
Supply Chain Managers (SCMs) are in charge, and key to the distribution farm input. These stakeholders engage relevant state officials, the software developer, input suppliers, and banks;

and recruit the agro-dealers using the agreed selection guidelines. SCMs compile the register of participating suppliers, banks and agro-dealers; as well as coordinate the disbursement of e-vouchers, operate redemption sites and databases, and ensure that farm input distribution runs hitch-free. To facilitate the process, SCMs appoint, compensate and train the field staff. In addition, they confirm the availability of stocks, coordinate submission of requests for agro-dealers payment, and submit certificates of redemption, confirmation and reconciliation to the Federal Fertilizer Department and Cellulant.

After the success of the paper voucher in 2009-2010 in Kano, Taraba, Bauchi and Kwara, the FGN, in collaboration with states expanded the program through the use of electronic vouchers this time (IFDC & FAI, 2017), using the e-wallet software designed by Cellulant. (a) Selected farmers were registered and a database created. (b) About 19 fertilizer importers and suppliers with the needed capacity were recruited to feed agro-dealers. (c) 880 agro-dealers with distribution points across the country were nominated to aid the distribution (d) 1,450-distribution centers were established, with each serving about 5000 farmers (e) Each stakeholder was given relevant training on the operation of the scheme..

At first, the registered farmers receive e-wallet vouchers through their mobile phones and use these to redeem a pack (figure 3). In redeeming these inputs, the farmers receive two subsidized 50kg bags of fertilizer (one bag Urea and one bag NPK) at 50% subsidy each (the farmer pays the differential cash). In addition to these, the selected farmers also get one free 25kg of rice or 20kg of maize seeds (FEPSAN & FMARD, 2014). Subsequently, the Federal and State Governments share the remaining 50% cost of each fertilizer at 25% each. These vouchers are submitted to the importers/suppliers electronically and redeemed at the FGN Escrow account. At different points of exchange, Cellulant confirms transactions and prints when needed.

Figure 3: GSS fertilizer E-Wallet subsidy process



Source: (IFDC & FAI, 2017), Modified

Although, the program was rated successful by stakeholders, locally and globally, it has not been without its challenges and shortfalls -ranging from insufficient funds and telephone network challenges to lack of access to mobile phones by some farmers.

3.1 Reform Implementation Process & Challenges

I. Preliminary planning

The planning stage of the scheme was laced with several hiccups; for instance, farmers and other stakeholders were not adequately sensitized. As a result, urban and more organized farmers (especially the ones that belong to trade unions) seemed to benefit more in the scheme during the first year compared to rural farmers. As a Federal Government-initiated project, the partnership arrangement with the State Governments which serves as the foundation of the scheme initially did not goas expected. In addition to these, there were challenges in the process of classifying farmers who were not into scales of production, thereby making it difficult to disburse inputs according to scales of production.

II. Registration and Identification

As a country with a weak national database management, there were difficulties distinguishing real farmers from non-farmers, and determining exact farm location and sizes. This led to the provision of input to farmers without taking their actual needs into consideration, in the first year. There were duplications of names of farmers as well. However, these were surmounted with the Nigeria Agriculture Payment Initiative (NAPI); biometric registration was carried out and duplicity of names eliminated.

III. Management & Regulatory challenge

The scheme also had managerial challenges in sustaining government enthusiasm, in addition to poor incentives for the field workers, organizing stakeholders, etc. For instance, there was a weak relationship between agro-dealers and other input suppliers dealing with seeds, micronutrients etc. The Poor synergy between agro-dealers (distributors) and input suppliers particularly seed companies was because the scheme literally forced agro-dealers to trade with specific suppliers that were accredited and vetted. Furthermore, the supply side could not respond adequately, as there was an insufficiency of seeds resulting from a the lack of breeders and foundation seeds to produce certified seeds to be distributed to the farmers. The disruption in the implementation of the scheme due to changes in government was also a major challenge. The nonexistence of enabling laws that allow uninterrupted implementation of the programme by succeeding governments often led to nonsettlement of outstanding claims of agro-dealers and inputs suppliers.

IV. Financing and Market Reactions

Apart from inadequate provision of funds in the budget to meet the quantum of subsidy required to support the number of farmers registered, some farmers were unable to pay their own contribution for the value chain input package (as established farmers' lending programme was not in sync with scheme). Furthermore, some of the agro-dealers were unable to source inputs due to lack of finance and credit from banks (the conceived plan that agro-dealers can borrow using stock as collateral and previous trade history as a reference never translated to reality during the course of the scheme). To resolve this, the Federal Ministry of Finance (FMF) signed an MOU with banks and the Federal Ministry of Agriculture and Rural Development (FMARD) for the provision of guarantee on 70% of the credit provided by banks participating in the scheme. In

addition, the entrance of the scheme undoubtedly distorted the market pricing: high cost of inputs was experienced, even as the cost of foreign exchange increased. This affected the scheme's budget, in addition to the non-renewal of Nigeria Incentive-Based Risk Sharing System for Agricultural Lending (NIRSAL)'s MOU to warrant provision of financing mechanism. This led to the provision of generic input to the farmers in respect of their needs, and subsequently, inadequate provision of inputs in terms of quantity and balance nutrients.

V. Logistic and supply chain management

The scheme employed the use of supply chain managers that were not well informed about the public settings. Despite the high cost of supply chain management, coordination was done using private sector strategies. As a result, several challenges were observed which, include: poor input tracking between the suppliers and distributors, non-integration of extension delivery system into the scheme, difficulty in accessing some geographical areas, the untimely supply of input etc. In addition, there were shortages of fertilizers in the country , particularly Urea 46% N due to a ban on its importation. The shortages were also occasioned by the restriction of movement by Office of the National Security Adviser (ONSA), due to security reasons (such as the movement of IEDs across the country by insurgency), and inadequate inputs markets across the rural areas.

VI. Technological Challenges

Intermittently, there were network breakdowns and the e-wallet platform provider was unable to cover all the redemption centres effectively. In addition to this, the provider could not transfer the e-wallet platform operation and farm database management to the Ministry. This technological problem eventually led to the use of offline platforms for the redemption of inputs, and corrupt practices such as round-tripping ensued. Furthermore, there was a cessation in the implementation of knowledge management and sharing using ICT platforms, due to the unstable network.

VII. Exclusion Criteria

The scheme was biased toward the crop production sub-sector of the agricultural sector. There was a lack of support for other non-crop sub-sector value chains in fisheries and aquaculture as well as livestock. This affected the growth of these excluded agriculture subsectors. Fisheries, and especially the livestock and forestry subsector performances have been on a downward trajectory since 2012 when the e-wallet was initiated. Aside from these, the Nigeria Incentive-Based Risk

Sharing System for Agricultural Lending (NIRSAL) MOU financing arrangement excluded farmers and other input suppliers. Hence, some farmers could not afford their share of the cost of input. All these were in addition to rural farmers that were excluded due to unawareness or illiteracy.

3.2 Continuing problems

In 2014, the agro-dealers in charge of disbursement of inputs to farmers were being owed about 61 billion Naira outstanding payment. With the change in administration, about 35 percent was paid in 2016. The unresolved debt distorted the scheme, leading to a buildup of debt and bank loan default by the agro-dealers, to the extent that NIRSAL could no longer guarantee their risk. The end of the GESS came with the announcement by the new government of its own version called the Presidential Fertilizer Initiative (PFI). This was a partnership with OCP, a State-owned Moroccan company. Three cooperation agreements were signed; they include: i) A strategic Morocco/Nigeria 5,600 kilometric gas pipeline ii) Nigeria Sovereign Investment Authority (NSIA) for the development of an industrial platform for the production of Ammonia and related products; agricultural vocational training and technical supervision between the Agriculture Ministries of the both countries for the joint development of griculture and fisheries in Western Africa iii) The construction of a fertilizer production platform by the Dangote Group, which will be powered by gas from Nigeria and phosphate provided by OCP (Alimi, 2018). OCP is to supply phosphate, needed for the local blending of fertilizer. About 11 fertilizer-blending plants were put in place with plans to add new numbers of plants in the future. The impact of these on the farmers and agricultural landscape in Nigeria are still anticipated.

3.3 Summary of existing evidence on the effectiveness of the reform

Prior to the growth enhancement support scheme (GESS), there was a disconnect between a Government interested in stimulating the agricultural sector output and the farmers impeded by climatic conditions and expensive inputs. Policies and programs targeted at farmers were hijacked by middlemen who divert subsidized agricultural inputs to the market and neighbouring countries for about four decades - with only 11 % getting to the farmers (Adesina, 2012). Field Interviews with farmers, the Federal Ministry of Agriculture and Rural Development (FMARD) and other stakeholders revealed that the scheme, to some extent, was able to meet the needs of farmers, bring

mobile financial services to the farmers and establish a verifiable database of 10.5 million farmers across the country.

Nigeria has 34,000,000 hectares of arable land and consumes about 13kg/ha of fertilizer per hectare of arable land (Food and Agriculture Organization, 2015; FAMARD, 2018). On average, the nation, uses about 8,840,000 bags of 50 kg of fertilizer in a year. Presently, Nigeria consumes about 366 % of the value of fertilizer it produces and the majority of the products imported. With the ambition to increase fertilizer usage to about 50kg/ha of arable land, the e-wallet system targeted supply of about 34,000,000 bags of 50 kg of fertilizer in a year, with the local market sources included.

In 2012, the e-allet system provided 2,430,456 bags of 50 kg fertilizers to 1,215,228 farmers, an average of 2 bags per farmer; unable to reach 3,784,772 farmers as planned. According to the NBS 2012 survey, 2,681,846 bags of 50 kg fertilizer were used in 2012. Of these, 7.58% were from the Ministry (Extension Services) and the agro services centres, 86.52% were from the local markets, and 5.90% from other sources (see figure 3.1). The first year of the scheme was filled with challenges, while the target was surpassed in 2013 and 2014 (see table 3.1). Deductively, majority of the subsidized fertilizers supplied are diverted to the local markets and are resold at the market rate. While the e-wallet system was effective in establishing an agricultural input distribution system and connecting farmers directly to the government, it could not truly distinguish farmers from non-farmers, due to a long-existing poor database culture in the country.

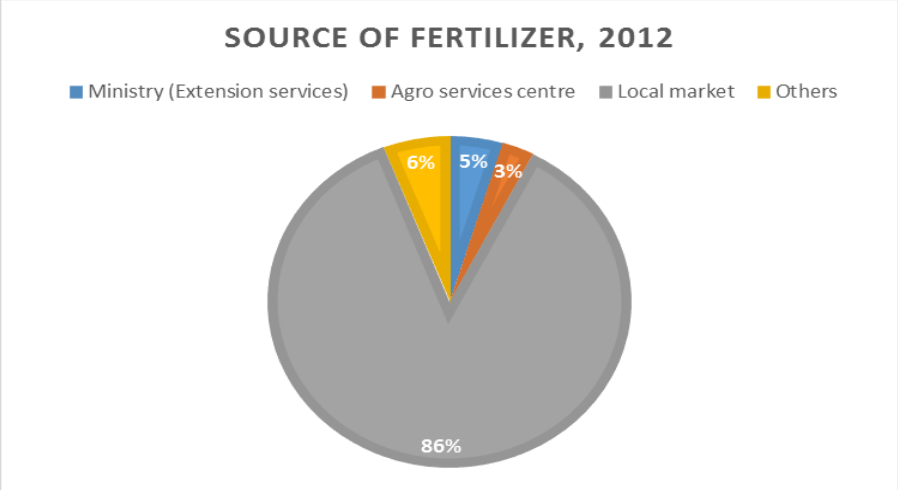
Table 3.1: Summary of quantities and number of farmers redeemed

Year	Planned number of farmers to be reached	The actual number of farmers reached	Quantity (Bags) disbursed	Average Bags/Farmer
2012	*5,000,000*	*1,215,228*	*2,430,456*	*2.00*
2013	*5,000,000*	*5,525,494*	*11,050,989*	*2.00*
2014	*5,000,000*	*7,978,283*	*15,956,566*	*2.00*
2015	*5,000,000*	-	-	
2016	-	*97,183*	*194,366*	*2.00*

Totals	**20,000,000**	**14,816,188**	**29,632,377**	**2.00**

Source: Farm Inputs Support Service Department, FAMARD; CSEA Analysis

Figure 3.1



Source: NBS, 2018

Before the implementation of the GESS, successive governments had sought to achieve self-sufficiency in food production, and ensure the availability of cheap agricultural input. The sector has witnessed a series of economy-wide, sector-specific and crops-targeted interventions, both from the supply and demand side. They include: National Accelerated Food Production Programme (NAFPP) of the 1970s, Agriculture Development Projects (ADP) of 1974, Operation Feed the Nation (OFN) of 1976, Green Revolution of 1980, Directorate for Food, Roads and Rural Infrastructure of 1986, National Economic Empowerment and Development Strategy of 1999, National Special Programme on Food Security (NSPFS) of 2002, Root and Tuber Expansion Programme (RTEP) of 2003, (Daneji, 2011; Iwuchukwu & Igbokwe , 2012; AZIH , 2008), Food Security and Agriculture of the Seven-Point Agenda in 2007, Agriculture Transformation agenda (ATA) of 2012 (of which the GESS is sub programme) and presently the presidential fertilizer Initiative of 2016. As demands from rapid population growth reduce the use of the traditional bush fallow system for soil enrichment, the insignificant use of fertilizer by the farmers has been unable to compensate for the soil nutrient loss. The use of fertilizer has been in its abyss since the 1990s due to the absence of government participation. The situation became worse with its attendant poor

yields, food shortage and low income for farmers, as fertilizer use dropped from 506,000 tonnes (mostly Urea and compound fertilizers) in 1993/94 to 200,000 tonnes in 1999/2000 -one of the lowest use-values among countries around the world. With the introduction of the market stabilization programme, the new democratic government of 1999 provided a 25% subsidy. In most cases, farmers end up paying higher prices, despite the government's huge budgetary expenditure on fertilizer procurement and subsidy (Mogues et al. 2008).

With the GESS, a direct and electronically verifiable distribution system was created, eliminating middlemen by connecting the farmers directly to about 4,280 agro-dealers spread across the country. Furthermore, the agro-dealers were fed by selected fertilizer suppliers networking with the participating banks and information technology (IT) firm. After a nation-wide farmers' census, an electronic verification system called the e-Wallet was created. To regulate the quality of supplies, a bill on Fertilizer Quality Control was drafted, which sought to standardize the importation, manufacture, distribution, and quality control of fertilizer in the country. Unfortunately, the bill did not become law for the whole duration of the e-wallet system but scaled second reading of legislature in the Senate in September 2017 after its first reading in November 2016.

Table 3.2: Fertilizer production, importation and use in Nigeria

Nutrient nitrogen N (Tonnes)				Nutrient phosphate P2O5 (Tonnes)			Nutrient otash K2O (Tonnes)	
Year	Production	Import Quantity	Export Quantity	Production	Import Quantity	Agricultural Use	Import Quantity	Agricultural Use
2002	0	125,131	0	0	13,734	13734	15,117	15,117
2003	0	167,778	0	0	21,480	21480	25,677	25,677
2004	0	116,343	0	0	18,663	18663	24,073	24,073
2005	0	213,221	0	0	20,698	20698	25,185	25,185
2006		216,854			80,687	80687	71,890	71,890
2007		70,115			39,922	39922	45,550	45,550
2008		140,846			63,840	45547	78,617	40,986
2009	54,743	44,847	0	24108	11,211	35318	16,119	33,446
2010	31,998	240,243	8,717	5100	66,746	71843	68,061	68,057
2011	65,940	83,205	8,717	5738	36,285	41686	43,307	42,970
2012	170,159	101,524	8,717	6,376	55,816	57371	73,797	53,434
2013	115,000	352,782	26,778	6,440	77,551	65261	57,127	40,602
2014	115,000	175,120	18,245	6,440	50,439	63545	41,203	67,196

2015								30,150

Source: FAO, 2018

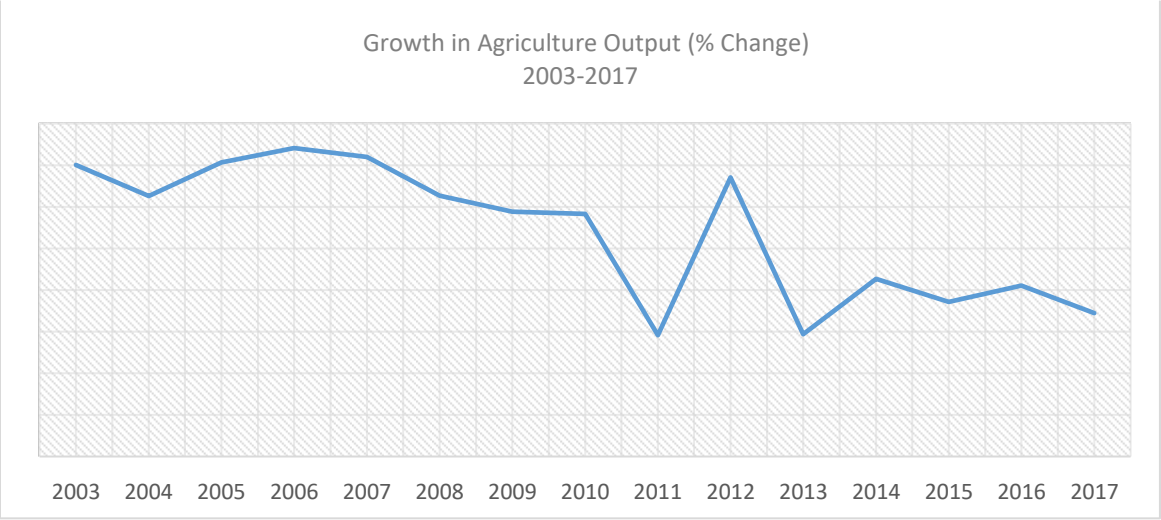
At the commencement of the e-wallet programme in 2012, with expectations in the industry to meet the anticipated demands, records showed by the Food and Agriculture Organization (FAO) of the United Nations revealed an upsurge in the local production and importation of fertilizer into the country compared to previous years. The local production of Nitrogen N fertilizer increased by 158.1%, importation of same rose by 22.0%; local production of phosphate P2O5 rose by 11.1%, importation by 53.8%; while there was insignificant local production of potash K2O, but a 70.4% rise in its importation. In response to the scheme, the use of fertilizer expanded. Tactlessly, these trends were not sustained as government restricted the subsidy to 2 bags of 50kg of fertilizers per farmer, making the increase of agricultural use for the same period about 37.6% and 24.4% for phosphate P2O5 and potash K2O respectively. From 2012-2013, production, importation, and use of varieties of fertilizer plummeted.

Nigeria agricultural sector output for measurement sake is decomposed into Crop Production, Livestock, Forestry, and Fisheries. The Growth Enhancement Scheme (GESS) and the e-wallet system targeted the supply of subsidized fertilizer and seeds to farmers. Technically, the scheme focused more on crop production over the livestock, forestry and fisheries subsectors. This was an efficient utilization of scarce resources in influencing the agricultural sector since the crop production sub-sector dominates the agricultural sector by contributing over 80% of the sectoral output. With the introduction of the scheme, there was a sharp loss in output of the livestock and forestry subsectors mainly. Growth livestock fell from 2.0% in 2011 to -2.0% in 2012, while forestry fell from 5.0% to 2.6%, and fisheries fell from 8.3% to 7.8% in same period.

Prior to the e-wallet system, the sector had been dwindling in size starting around 2007. These periods coincide with the era of disconnection between the Nigerian farmers and the government. By responding through the e-wallet scheme in addition to other market factors, the agricultural sector recovered sharply from its downward trend in 2012, contributing about 22.1% to the gross domestic product for that year. However, the agricultural sector driven by the crop production subsector had been growing sluggishly all through the duration of the e-wallet scheme after the crash of crop production in 2013 (Figure 3.2). Although crop production has been the highest

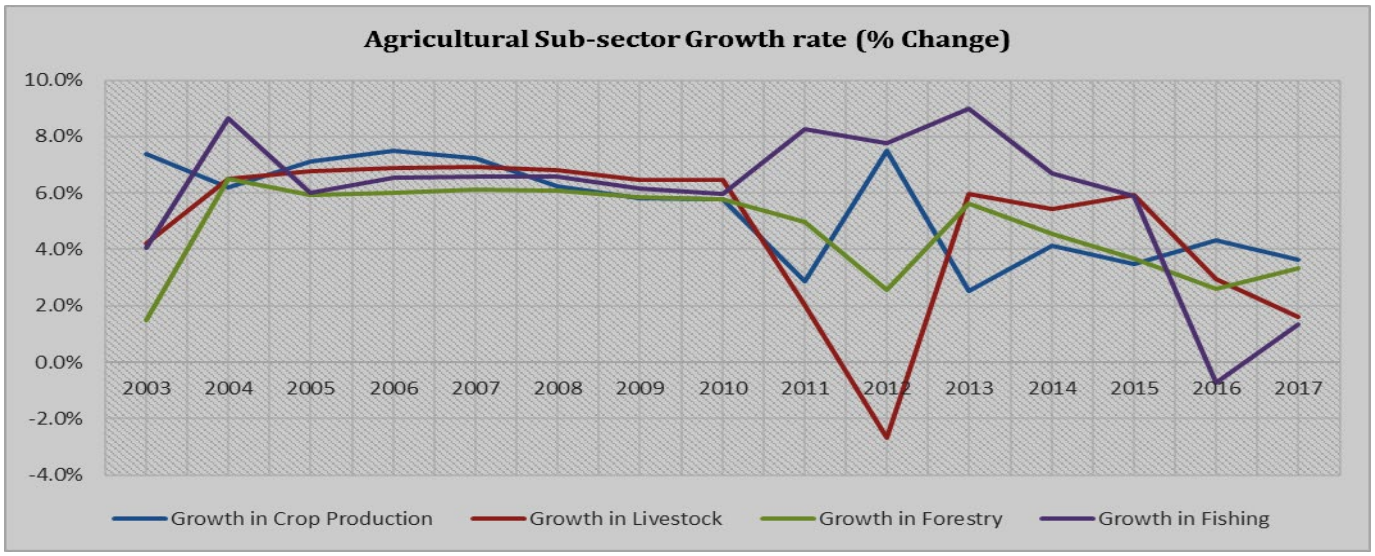
contributor to the sector for years, its share of the sector in 2012 (88.97%) surpassed the two years before and have been on the downward trend thereafter.

Figure 3.2: Growth in Agricultural Output, 2003-2017



Source: CBN, 2017

Figure 3.3: Agricultural sub-sector growth rate



Source: CBN, 2018

To boost the supply side of the fertilizer distribution system, the presidential fertilizer Initiative (PFI) was initiated in December 2016 by a new administration. This seeks to achieve sufficient local production of blended Nitrogen, Phosphorous, and Potassium (NPK) Fertilizer through the country's partnership with Morocco. OCP, a state-owned Moroccan company is to supply

Phosphate to Nigeria to feed 11 blending plants with 2,143,000 metric tonnes capacity (see table 3.3). While the initiative focuses only on the availability of the blended Nitrogen, Phosphorous and Potassium (NPK) Fertilizer, other varieties are likely to be met through importation. With the slow pace of implementation, the impact on the availability of fertilizers to farmers is not yet known, and the e-wallet system has not been used since 2016. Yet, the e-wallet scheme has established an identification medium and distributive channel that is suitable for any fertilizer intervention plan now or in the future.

Table 3.3: Fertilizer Blending Plants

	Name	Location	Capacity (Metric Tonnes)
1	Superphosphate Fertilizers & Chemicals	Kaduna	200,000
2	Golden Fertilizer & Company Limited	Lagos	300,000
3	Fertilizers & Chemical Ltd.	Kaduna	300,000
4	Morris Nigeria Limited	Niger	300,000
5	Funtua Fertilizers and Chemicals Ltd	Katsina	108,000
6	Kano Agricultural Supply Company	Kano	200,000
7	Bauchi Fertilizer Company	Bauchi	120,000
8	Ebonyi State Fertilizer and Chemical Co.	Ebonyi	115,000
9	MFB Fertilizer & Chemicals Company Ltd	Kaduna	100,000
10	Aliyuma Fertilizer & Chemical Company Ltd	Kano	200,000
11	BEJAFTA Group Nigeria	Jos	200,000
	Total		**2,143,000**

4 Evidence from a Survey of Nigerian Farmers

The survey instruments for the fieldwork was developed in June 2018 and subsequently improved upon. After this, to ensure readability, clarity of words, feasibility, layout and style, the instrument

was subjected to content validity test. The field surveys were carried out from the 9th of July 2018 to 14th July 2018. Interviewers and local facilitators arranged meetings with the head of farmers in the targeted localities and local government officials in the agriculture department of the area councils. Visits were also paid to farmlands and agro-dealers in the communities. The responses were analyzed using statistical packages such as SPSS, Stata and GraphPad Prism and presented in tables and charts.

Figure 4.1: Some photos of the field Surveys

Visit to farmers in Nasarawa State

Visit to a farmland, Awgbu, Anambra State

Meeting with Cooperative farmers, Moniya, Akinyele LGA, Oyo State

Visit to a farmland, Enugwuabor Community, *Anambra* State

Field Survey, 2018

4.1 Features of the target population, the sampling framework, the sample

The survey was carried out in two streams (telephone interviews and field surveys). The approach also allowed us to observe the deviation of the responses between farmers in the field survey and those in the telephone interview[1]. In the first survey, a pure simple random technique was applied, 53 farmers were selected from the six regions across the country using the farmers' register. Each of the farmers was interviewed via telephone using a structured schedule reflecting the main survey questionnaires. Then, the main survey (field survey) was carried out using representative sampling without ignoring the need for randomness in the farmer selection process, out of six geopolitical regions, three geopolitical regions were selected at random. Out of the selected regions, one state each was randomly selected: Nassarawa, Anambra and Oyo states. Then a representative sample was drawn from each state, concerning the budgetary considerations, limited time and distance coverage capability. Fifty-one (51) farmers were selected from Nasarawa State, fifty (50) farmers from Anambra and fifty-nine (59) farmers from Oyo State.

Figure 4.2: Sampling Framework

4.2 Execution of the survey

The field survey in Oyo state recruited farmers from Akinyele, Egbeda and Lagelu Local Government Areas; specifically in Erunmu Township, Moniya and Oyedeji community. These

[1] The farmers' register list used for the telephone interview was supplied by the federal ministry of Agriculture and rural development (FMARD)

farmers specialized more in crops production. They grew majorly yam tubers, cassava, vegetables, fruits etc. Men, adults and the aged people dominate the agricultural sector in that part of the country, with minimal mechanized farming existent. As with most parts of the country, the majority of the farmers in Oyo State are peasant farmers but cooperative farming is more prominent in Moniya. The farming season spans from May to August of each year with little deviation depending on the crops the farmers specialize on.

In Nassarawa, Local Government Areas such as Akwanga, Keffi, Kokona, and Nassarawa-Eggon were visited. In these areas, farmers in communities such as Sabon Gari, Wulko, Nyanku, Gudi, Garaku and Maloney Hills were sampled. Farmers in the region grow more of cassava tuber, maize and yam. Majority of the farmers (90.2%) are peasant farmers but many of them belong to one or two social organizations (Salau, Saingbe and Garba 2013), with pockets of mechanized farmers (5.9 %) in Gora, Akwanga. On specialty of farmers, 89.8% of the respondents from Nasarawa were into the crops farming subsector, 2% were into livestock management, while about 8.2% combined the listed with fish farming. The farming season spans from March or April to October every year.

In the South East, fifty (50) farmers were sampled in Anambra state. Respondents were from Enugwuabor and Awgbu communities. The telephone interview coverered farmers from Abia, Imo and Ebonyi States. Majorly, crops such as yam, cassava, cashew and oil palm are cultivated in this region. About sixty (60)% of the farmers operate as cooperative, 30% were peasant farmers, and six (6)% were mechanized farmers, while only 4% of labourers were recorded. On the agriculture subsector engaged, almost 80% were into crops farming, with less than 3% specializing only in livestock management, and 16.7% combining livestock management with farming. The farming season spans from March to September.

Table 4.2.1 Sampled Communities

Fields Survey				***Telephone Interview***		
Zone	***States***	***Frequency (%)***		***Zone***	***States***	***Frequency (%)***
1. North Central	*Nasarawa*	*51 (31.9%)*		*1. North Central*	*Nasarawa*	*12(22.6%)*
2. South-East	*Anambra*	*50 (31.3%)*		*2. North East*	*Adamawa*	*7(13.2 %)*
3. South-west	*Oyo*	*59 (36.9%)*		*3. North West*	*Kaduna*	*9 (17.0%)*
				4. South East	*Abia*	*8(15.1 %)*
					Imo	*1(1.9 %)*
					Ebonyi	*1 (1.9 %)*
				5. South-South	*Cross River*	*5(9.4 %)*

6.	*South-West*	*Oyo*	*10(18.9%)*

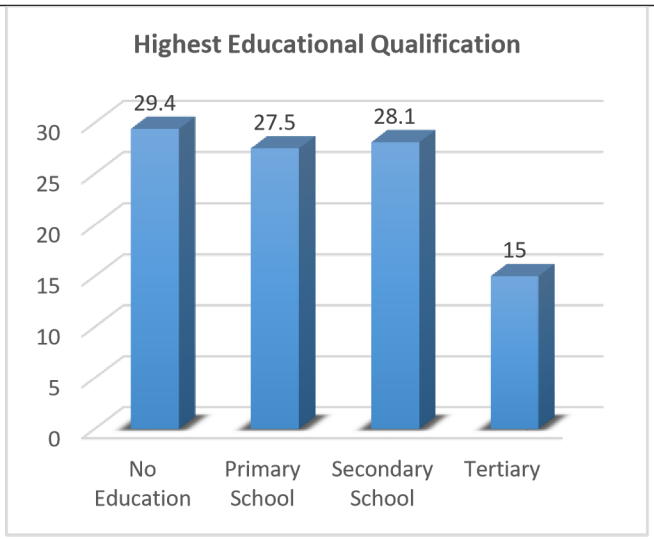
Source: CSEA Field Survey

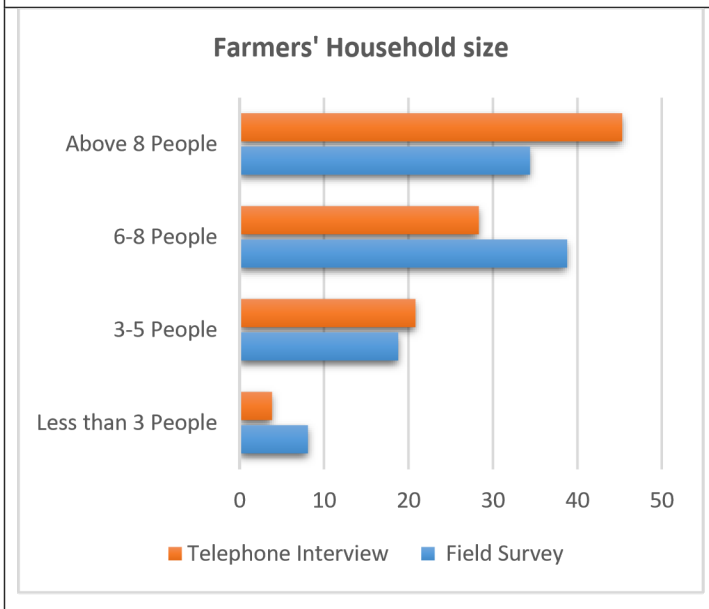
4.2.1 Farmer Background Details / Demographics

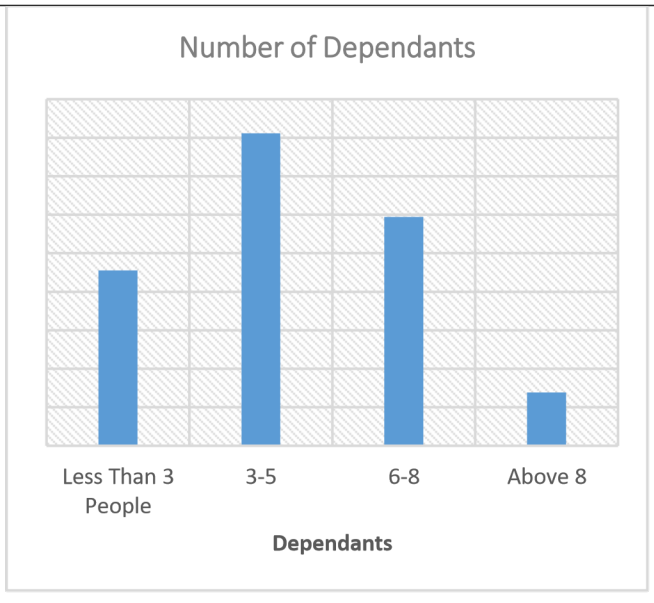
From the 160 farmers sampled in the field survey (see table 4.2.1), majority were male. Half of the farmers were elderly -50 years of age and above - and almost all were married. Of the 53 telephoned farmers, majority were male, a bit younger and holdin with about 85.0 % having at most secondary education. In general, the farmers are elderly men and with less education.

Table 4.2.2: Farmers' Demographics

Field Survey		Telephone Interview	
Gender		**Gender**	
Female	25 (15.6 %)	Female	5 (9.40%)
Male	135(84.4 %)	Male	48(90.6%)
Age Group		**Age Group**	
18-35	3(1.90%)	18-35	4 (7.50%)
26-35	32 (20.0%)	36-60	19 (35.8%)
36-50	50 (31.3%)	61+	20(37.7%)
> 50 Years	75(46.9%)	DK/RF	10 (18.9%)
Marital Status			
Married	141 (88.1%)		
Single	19 (11.9%)		





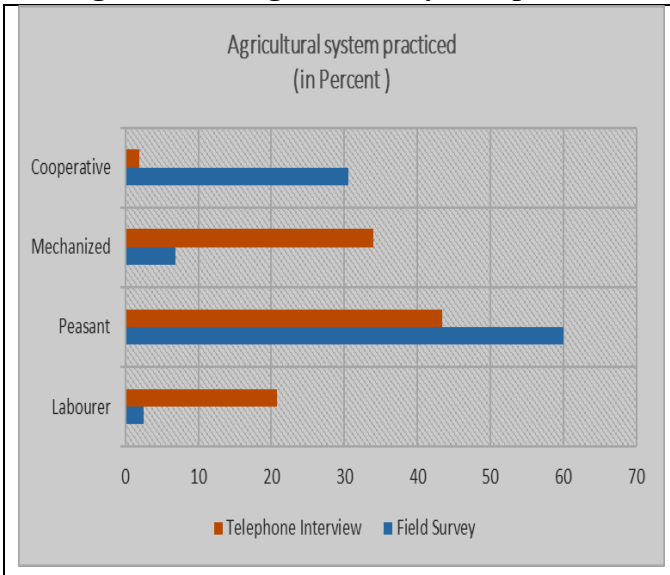


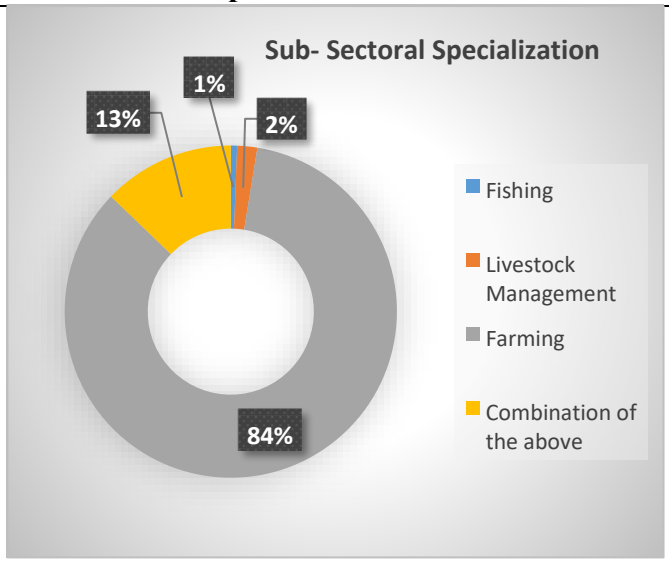
Field Survey, 2018

4.2.2: Farm Profile

Several farms were visited in the targeted communities during the field survey, and farmers that were offsite gave details of their farms: size, use of fertilizers, average income and specialties, and agriculture system practised. Farmers interviewed via telephone also supplied information about their farms. The field survey showed that majority of Nigeria farmers (60.0%) are peasant farmers, about 30.6% are into cooperative farming, and about 6.9% are mechanized farmers; while 2.50% were labourers (figure 4.2.2). The telephone interviews mirrorred the fact that majority of the farmers were peasants farmers: about 43.4% indicated peasant farming. Divergence was observed in responses from the field and telephone survey as regards the other agricultural systems practised. While this could mean that most farmers do not register with the ministry as cooperative farmers, it may also signify that majority of those encountered on the field are key farmers or farm owners. 34.0% of the telephoned farmers were mechanized, 20.8% were laborers, with only one farmer indicating as a cooperative farmer. The sub-sectoral specialty of farmers reflected the structure of the sub-sectoral output; about 84.0% are into crops farming, 13% combined the subsectors, while 2% are into livestock management, and only 1 % were into fish rearing.

Figure 4.2.2: Agriculture system practised and Sub- Sectoral Specialization





CSEA Survey, 2018

Table 4.2.3: Monthly Average Farm Income

Field Survey				Telephone Interview			
Average farm Income per Month	**Freq.**	**Percent**	**Cum.%**	**Income Level per Month**	**Freq.**	**Percent**	**Cum.%**
Less than N50,000	57	36.5	36.5	Less than 18,000	4	7.7	7.7
N50,000 - less than N100,000	61	39.1	75.6	18,000 - 50,000	22	42.3	50.0
N100,000 - less than 150,000	21	13.5	89.1	51,000 - 100,000	4	7.7	57.7
N150,000- less than 200,000	9	5.8	94.9	101,000 - 200,000	12	23.1	80.8
More than N200,000	8	5.1	100	201,000 - 400,000	8	15.4	96.2
Total	156	100		Above 400,000	2	3.8	100.0
				Total	52	100.0	

The average farm size shows prevalence of smallholding farming. Over 50 percent of the farmers were on 3 hectares of land or less, with slight deviation across the regions**.** In Nassarawa State, 60.4% of the farmers were on less than 1 hectare of land, 38.2 % in the Oyo state and 19.1% in Anambra. The intensity of fertilizer used decreased as farm size increased, from about 5 bags of fertilizer per hectare for farmers with one hectare to less than one bag of fertilizer per hectare for farmers with 10 hectares of land. **Table 4.2.4: Average farm size**

Field Survey	**Frequency**	**Percent**	**Telephone Interview**	**Frequency**	**Percent**
Less than 1 Hectare	59	39.3	Less than 1 hectare	2	3.8
1-3 Hectares	66	44.0	1 - 3 hectares	26	49.1
4-6 Hectares	16	10.7	4 - 6 hectares	5	9.4
7-9 Hectares	7	4.7	7 - 10 hectares	7	13.2
At least 10 Hectares	2	1.3	More than 10 hectares	13	24.5
Total	150	100.0	Totals	53	100

4.3 Results: Do the Beneficiaries Support the New Digital Approach – and If So, Why?

Comparing the e-wallet scheme with the old system (direct fertilizer distribution), the field study shows that about 66.3% of Nigerian farmers participated in the old scheme, while about 58.1 percent participated in the e-wallet scheme (table 4.3.1), suggesting that the old scheme was wider in scope and coverage than the e-wallet scheme. However the telephone interview findings dispute this, since those that indicated participation in the e-wallet were 7.5 percent more than those that participated in the direct fertilizer distribution, suggesting a concentration of e-wallet participants in the telephone survey list. To unveil the reason for the wide disparity, we probed farmers (on

the field survey) that indicated non-participation in the e-wallet further; about 55.9% that did not participate were not aware of the scheme, 20.6% got the registration information late, 10.3% were excluded, 7.4%t were not interested in the scheme, 1.5% were situated distant to the agro-dealers/collection centres,1.5% were not available for registration, while 2.9% had other reasons for not participating. Furthermore, those that indicated non-participation in the scheme from the telephone interviews were only farmers excluded in the registration process. Of all participants of the e-wallet, only 28.7 percent indicated there were trained on the use of the e-wallet system.

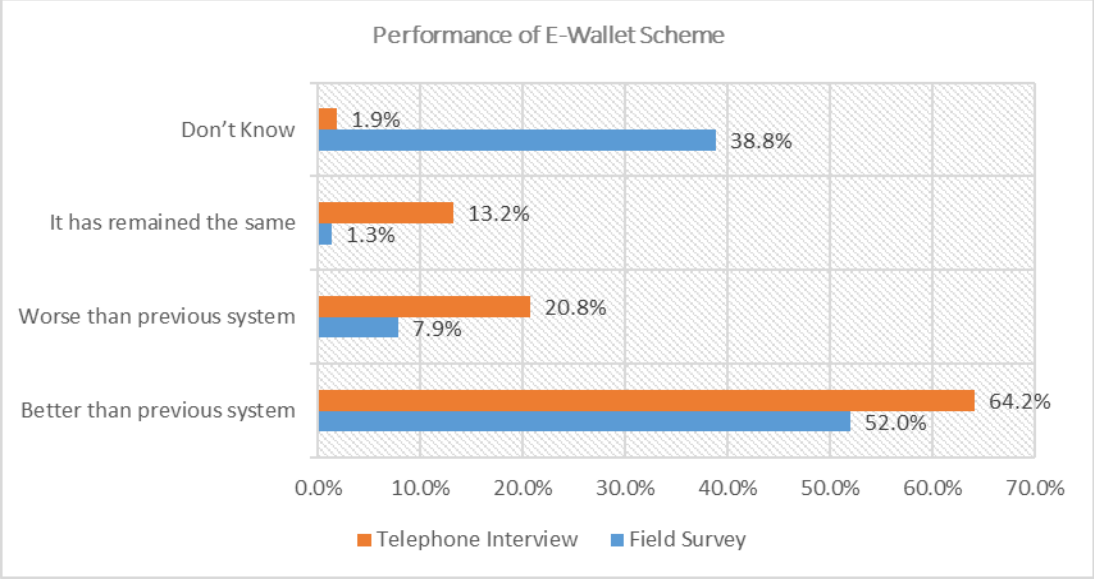
Table 4.3.1: Participation in the direct and e-wallet scheme

I. Farmers that participated in the direct fertilizer distribution by the government	***Field Survey***		***Telephone Interview***	
	Frequency	**Percent**	**Frequency**	**Percent**
Participants	106	66.3	46	86.8
Non-Participants	45	28.1	7	13.2
II. Farmers that participated in the e-wallet scheme for fertilizer distribution	**Frequency**	**Percent**	**Frequency**	**Percent**
Participants	93	58.1	50	94.3
Non-Participants	58	36.3	3	5.7

4.3.1 Perceived successes

To ascertain the success recorded in the scheme, farmers were probed on performance comparison between the e-wallet and the old method, and the majority of the farmers indicated that the e-wallet outperformed the previous system. 64.2% of the farmers interviewed via telephone signified that the e-wallet was better than the previous system, while 52.0% of the farmers interviewed in the field survey concurred to the position.

Figure 4.3.1: Performance of E-Wallet Scheme



CSEA Survey, 2018

Both sampled farmers agreed that the scheme improved in several areas, comparative to the old scheme: prominent responses were, "timely access to fertilizer", "getting the desired quantity and type of fertilizer", as well as "price advantage", in favour of the new scheme (see table 4.3.2). About 37.5 percent of the farmers sampled on the field and 16.4 percent of the telephoned farmers indicated that price per bag of fertilizer has become cheaper due to the entrance of the e-wallet scheme. In the same vein, about 32.4 percent of the field sampled and 32.7 percent of the telephoned farmers acclaimed the improvement to timely access to fertilizers during the farming period. Similarly, 14.7 percent of the farmers on the field and 20 percent of those telephoned indicated that getting the desired quantity of fertilizer improved with e-wallet. In sum, the e-wallet scheme seems to have improved upon the old system in the areas highlighted.

Table 4.3.2: Improvement in fertilizer scheme

	Field Survey		*Telephone Interview*	
What has become better?	Frequency	Percent	Frequency	Percent
Timely access to fertilizers during farming period	44	32.35%	18	32.73%
Getting the desired quantity of fertilizer	20	14.71%	11	20.00%
Getting the desired type of fertilizer	18	13.24%	10	18.18%
Price per bag is cheaper	51	37.50%	9	16.36%

	-		3	5.45%
	-		4	7.27%
	136	100.00%	55	100.00%
Have nothing to say	3	2.21%	-	
Transparency in Distribution				
Others				
Totals				

CSEA Survey, 2018

4.3.2 Continuing Problems as Seen by the Beneficiaries

The e-wallet was not without its own challenges, as pointed out before: its coverage was limited due to the low level of awareness by the farmers and insufficient fertilizer supply compared to the old system, despite its many successes (Agristat, 2018). Farmers that perceive the scheme as worse than the previous system were about 20% in the field survey and 7.9% in the telephone survey, and it actually pointed to the fact that there is room for improvement in the scheme. Prominent among the complaints from participants was regarding the inability to secure the desired quantity (36.7% from field survey and 20% from telephony) and type of fertilizer of fertilizer, as well as delayed access to fertilizers (28.3% from field survey and 40.0% from telephony). As mentioned before, the scheme is restricted to the subsidy of only 2 bags of 50kg of fertilizers per farmer, while farmers used 8 bags of fertilizers per season on average. With limited resources to extend the subsidy to the actual amount of fertilizer the farmers needed, therefore, the desired quantity was not achieved.

Table 4.3.3 Weakness of the E-wallet fertilizer scheme

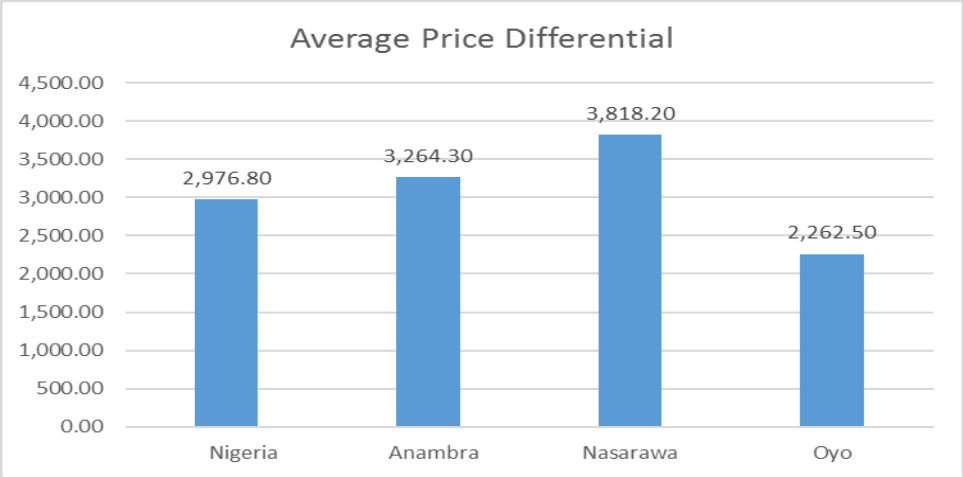
What has become worse?	***Field Survey***		***Telephone Interview***	
	Frequency	**Percent**	**Frequency**	**Percent**
Delay access to fertilizers	17	28.3%	6	40.0%
Unable to secure the desired quantity of fertilizer	22	36.7%	3	20.0%
Unable to secure the desired type of fertilizer	11	18.3%	2	13.3%
Price per bag is more expensive	7	11.7%	1	6.7%
Have nothing to say	2	3.3%		0.0%
Unable to get any fertilizer	1	1.7%		0.0%
Preferential treatment			3	20.0%

Total	**60**	**100**	**15**	**100**

CSEA Survey, 2018

Price of fertilizer despite being subsidized, varied across the regions and states; In Nasarawa, the market price of fertilizer and the government price varied by about N3, 818.2. It was about N3, 264.3 in Anambra State and N2, 262.5 in Oyo State, reflecting the cost of transportation and markup. This also echoes the existence of few middlemen, as about 30% of the farmer indicated the presence of middlemen. Nationally, the price difference was N2, 976.80, with minimum N2, 000 and maximum N6, 000, and standard deviation of N786.2.

Figure 4.3.3: Average price difference between government price and the market price of fertilizer.



CSEA Survey, 2018

Sustainability for the E-Wallet System

With the change in administration, about 73.4% of the farmers on the field believe that the scheme has changed for worse, while only 45.3% of those telephoned shared that view. Significant among the reasons stated were delayed access to fertilizers, rising cost of fertilizers, inability to secure the desired type and quantity of fertilizers, as well as the sudden elimination of the scheme (see table 4.3.4). On the contrary, more of the telephoned farmers (about 54.7%) believed the scheme has changed for better; topmost on the list of improvements cited ware access to fertilizers, cheaper price per bag, assess to desired quantity and type of fertilizer (see table 4.3.5). This confirmed the

fact that the e-wallet system was not fully functional in every part of the country under the new administration from 2015 until it was replaced by the Presidential Fertilizer Initiative (PFI) initiated in December 2016.

Table 4.3.4: The E-Wallet System; what has changed for Worse?

What has changed for Worse?	*Frequency*	*Field Survey*	*Frequency*	*Telephone Interview*
Delay access to fertilizers	30	37.0%	19	55.9%
Unable to secure the desired quantity of fertilizer	14	17.3%	5	14.7%
Unable to secure the desired type of fertilizer	11	13.6%	2	5.9%
Price per bag is more expensive	22	27.2%	4	11.8%
Have nothing to say	4	4.9%	-	
Preferential Treatment			4	11.8%
Total	**81**	**100%**	**34**	**100%**

CSEA Survey, 2018

Table 4.3.5: The E-Wallet System; what has changed for better?

What has changed for better?	*Frequency*	*Field Survey*	*Frequency*	*Telephone Interview*
Timely access to fertilizers during farming period	52	49.1%	16	44.4%
Getting the desired quantity of fertilizer	16	15.1%	6	16.7%
Getting the desired type of fertilizer	4	3.8%	4	11.1%
Price per bag is cheaper	23	21.7%	7	19.4%
Have nothing to say	11	10.4%	-	
Others	-		3	8.3%
Total	**106**	**100.0%**	**36**	**100.0%**

CSEA Survey, 2018

On the telecommunication network and technical challenges, only about 23% of the farmers have indicated that the e-wallet authentication system (phone number and activation of the system) was not effective, especially for areas such as being susceptible to fraud and poor network. On the contrary, majority of the farmers (67.0% from the field survey and 52% from the telephoned) believe the system was effective for transaction, shortening of delivery time and absence from fraud. Of the field farmers, 55.6% agreed that transaction/delivery time has shortened compared

to the old system, fraud has been eliminated (31.3%), and that paper work is not required (15.6%); while about 30.2% of those telephoned believe the authentication eliminates fraud, and 26.4% pointed to reduction of transaction/delivery time. While farmers reached a conclusion that the system was effective, about 75% pointed out that there is no backup in case of failure of the digital system, which would make the scheme revert to paper usage.

Table 4.3.6: Area of system effectiveness

In what areas is the new system ineffective (Multiple choices)?	*Field Survey*	*Telephone Interview*
Susceptible to fraud		
Difficult to use		
Poor network		
No extension officer to assist		
Transaction/delivery time has increased		
Don't get desired quantity fertilizers		
Have nothing to say		
In what areas is the new system effective (Multiple choices)?		
Absence of fraud		
Transaction/delivery time has reduced		
Regular support for extension officers		
No paper work required		
Have nothing to say		
Others		

CSEA Survey, 2018

The question of who the beneficiaries of the scheme are may seem superfluous, since the target is the Nigerian farmers. However, past related programmes have been seen to benefit middlemen, while the farmers were shielded away from the subsidies (Adesina, 2012). According to the interviewed farmers, there seems to be a consensus that farmers are actually the biggest beneficiaries of the scheme. About 55% of the farmers on field survey agreed that farmers were the beneficiaries, while 45.3%t of those telephoned also shared the same view. They however added that the scheme needed improvement by eliminating corruption within it, creating more awareness, ensuring continuity and increasing the quantity of fertilizer per farmers.

Table 4.3.7: Beneficiaries of the scheme

Frequency	Percent	Frequency	Percent

In your assessment, who are the beneficiaries of the Field Survey Telephone Interview program (Multiple choices)?	88	55.0%	15.6%	24	45.3 20.8
	25	16.3%		11	24.5
	26	17.5%		13	18.9
Farmers	28			10	
Agro-dealers					
Officials within Min. of Agriculture					
Government					

5. Conclusion

Nigeria's fertilizer reforms whether in the past or present have the crucial objectives to stimulate the agricultural sector output; bring down the cost of food products nationwide, import bills, and rural-urban migration (e.g. NAFPP, Operation Feed the Nation, Green Revolution, etc.); and enhance the general outlook of the rural-based populace. The last objective stems from the fact that over 70% of the population earn their living from agriculture-related enterprises (Daneji, 2011). Prior to the e-wallet scheme, a sub-component of the GESS, the former programmes rarely took advantage of technology in their strategic planning to connect with farmers. However the old systems, such as the GESS, recorded some levels of success, , even though they also had obstacles.

5.1 Lessons from Nigeria's fertilizer reforms: effectiveness and inclusion

In terms of overall performance, the direct method has little impact on the sector output, which continues to decline from a peak of about 7.2% in 2006, to 6% in 2009 to 3% in 2011; before the GSS was introduced. On the use of fertilizer, a spike was witnessed in 2006 and 2010. Fertilizer consumption reached its highest of level of about 369,000tonnes in 2006, impacting the agriculture sector output, with only 31.7% of the fertilizer subsidized (Takeshima, H., & Nkonya, E., 2014). Furthermore, subsidized fertilizer are rationed from the federal unit rather than by the market, giving room for corruption and diversion to the open market and neighbouring countries by dealers who are well-connected to public office holders (Banful et al., 2010). While the direct method was available to all farmers without any exclusion criteria (about 66.3 percent of the Nigerian farmers

participated), its effectiveness was marred with the non-market and non-competitive distribution approach. This automatically excluded the uninfluential farmers, especially those that are a not members of any cooperative societies or connected to government officials.

On the other hand, the e-wallet scheme allows fertilizer to be distributed by the market mechanism, but had exclusions criteria in its registration process. It redesigned the market such that the included farmers (about 58.1%) and excluded farmers can both operate but with a different set of prices, where the registered farmers benefitted by paying half the market price on 2 bags of 50kg fertilizers. Built on technology, the e-wallet scheme enhanced the market distributive mechanism at a different point in time, aside from periods of network disruptions. More so, it stimulated both local production and importation of fertilizer, especially in its first year, impacting on market price. While the e-wallet was effective during the beginning of the scheme, it was short-lived andfaced with funding challenges and minimal corrupt practices, compared to the old system.

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Appendix

Experts' consultations were sought to ascertain that the questionings sufficiently covers the targeted subject matter. An Average Congruency Percentage (ACP)[2][3] of 8 experts was computed and found to be valid at 93.2 percent. More so, the reliability[4] of the instrument and the logical link of the questioning was ascertained. The reliability test[5] ensures that the questionnaire produces consistent results given its repeatability under constant conditions. The pre-test procedure was carried in Abuja environs using the test-retest reliability procedure (also known as the coefficient of stability). The test-retest reliability coefficient varies from 0 to 1 such that;

[2] Hambleton & Eignor (1978)
[3] Taherdoost, (2016)
[4] Christodoulou et al (2015)
[5] Leark, Wallace, & Fitzgerald (2005)

Table 1: Reliability Thresholds

1; Unity	Perfect Reliability
Less than 1, but greater or equal to 0.9:	Excellent Reliability
Less than 0.9, but greater or equal to 0.8	Good Reliability
Less than 0.8, but greater or equal to 0.7	Acceptable reliability
Less than 0.7, but greater or equal to 0.6	Questionable reliability
Less than 0.6, but greater or equal to 0.5	Poor Reliability
Less than 0.5	Unacceptable Reliability,
0; Zero	No Reliability

A pretest correlation on this scale, of 0.90 signifies 90 percent indication of very high reliability, while a value of 0.10 or 10 percent represents a very poor or low reliability. The test-retest analysis of 16 respondents each in Abuja environs (10 percent of the sample size)[6] on 25th and 28th of June respectively were computed to find the coefficient correlation between the two sets of pretest and describe the degree of reliability. The result revealed good reliability value at 0.86 (86 percent).

[6] The sample size of 160 was calculated using the Cochran sample size formula $n_0 = \frac{z^2 pq}{e^2}$ where *n, z, p, q, and e* are sample size, normal distribution, estimated proportion of the population, *1-p,* and margin of error respectively.