

THE PRO-POORNESS OF FERTILIZER SUBSIDY AND ITS IMPLICATIONS ON FOOD SECURITY IN NIGERIA

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Abstract

We examined the pro-poorness of the newly introduced fertilizer scheme (GES) in Nigeria in this study. The study made use of the Nigeria General Household Survey (GHS)-Panel Datasets of 2010/2011 and 2012/2013. The data were analysed using pro-poor price indices, average and marginal benefit incidence analyses to estimate the share of the poor and non-poor in the fertilizer scheme and to check the pattern of the change in their shares over time in Nigeria. The pro-poorness analysis suggests that while Voucher Fertilizer Subsidy Scheme seems to be more pro-poor than E-wallet Fertilizer Scheme on the basis of accessibility, none of them was pro-poor when the analysis was done on the basis of quantity of fertilizer purchased. On that basis of the share of the poor in Government expenditure on fertilizer subsidy, the study shows that the share of the rich (N6090 million) and the richest (N8070 million) income group were 3 and 4 times higher than the share of the poorest quintile (N1979 million) respectively in 2010/2011 in Government expenditure on fertilizer subsidy. The same trend was noticed in 2012/2013, as the share of the rich (N6813 million) and the richest (N8735 million) income group were 3 and 4 times higher than the share of the poorest quintile (N2262 million) respectively. The implication of this is that the rich and richest farmers are the immediate beneficiaries of fertilizer subsidy scheme that are designed to assist poor small-scale farmers in Nigeria. Apart from income profile, the study shows that education was a distinguishing factor associated with purchasing fertilizer during fertilizer subsidy scheme in Nigeria. It shows that those that attended formal schools shared about 70% and 64% of fertilizer subsidy during Fertilizer Voucher and E-wallet Fertilizer Schemes respectively. The marginal benefit analysis reveals that if fertilizer subsidy expenditure increased by 100% (double) the share of the poorest (core poor which is the target of E-wallet fertilizer subsidy), will decline by about 8% (-0.0791), while the share of the rich will increase by 8% (0.0803). The study also indicated that the marginal benefit in E-wallet fertilizer scheme increases with initial accessibility to E-wallet Fertilizer subsidy. The finding suggests that the poor's initial rate of access to a fertilizer may determine the relative extent to which the poor will be benefit from the expansion of the fertilizer subsidy scheme. The conclusion is that any constraints that limit the accessibility of the poor farmers to fertilizer subsidy will also hinder their share of the fertilizer subsidy even the government spend more on fertilizer subsidy scheme in Nigeria. All these findings may cast doubt on the ability of E-wallet Fertilizer Scheme to significantly increase fertilizer application among farmers in Nigeria. Based on these findings we recommend that the Federal Government should phase out fertilizer subsidy gradually. After 2016, which is the final year of E-wallet, fertilizer subsidy be replaced with virile fertilizer market that will sell fertilizer at cheaper price. This can be made possible by encouraging local production of organic and inorganic fertilizer by private fertilizer firms. All the fertilizer importing firms should be mandated to open their fertilizer manufacturing firms between now and next year. Capital constraint is a limiting factor to accessibility to fertilizer in Nigeria. About N25376 Million and N28270 Million spent on fertilizer

subsidy in 2010 and 2012 respectively by Nigerian government can be converted to farming input soft loan scheme for the farmers as the farmers need fertilizer and other inputs to increase their productivity.

1.0 Introduction

1.1 Background

Nigeria is Sub-Saharan Africa's most populous country; World Bank report of 2011 put the population of Nigeria at about 162 million¹. It has been observed that Nigeria is one of the poorest countries in the world despite her rich resource endowment. Research has shown that despite some positive economic growth experienced in Nigeria, poverty and inequality have worsened(NBS,2012). The trickle-down effect of growth was not evident in Nigerian case². Anyanwu (2012) showed that the poverty level has increased from 28% in 1980 to about 72% in 2011. He revealed further that the poverty incidence is higher in rural area than urban area in Nigeria. He said that in all the years, rural poverty incidence had dominated urban poverty. He also indicted that Nigerian poverty depth and severity are not only high but rising, and that rural poverty was more widespread, deeper, and more severe than urban poverty³.

The poverty in Nigeria does not only possess a location dimension it is also highly correlated with occupation in Nigeria. It is hypothesized that occupation has a high correlation with poverty because occupations which require low amounts of capital, either human or physical, will be associated with low earnings and therefore with higher poverty rates. This is the case in Nigeria as 67% of the people that are involved in Agriculture were poor, while only 34% of people who are involved in jobs that require technical profession were poor(NBS,2012). This may be the reason why Nigeria government directed most of her poverty alleviation programmes and schemes to rural areas and to agricultural sectors, especially farming.

In order to reduce poverty in rural area and promote food security by developing agriculture, successive Nigerian government put in place several programmes/initiatives. These programmes/initiatives include: Fertilizer Subsidy Scheme, Commodity Boards, Agricultural Research Institutes, National Accelerated Food Production, Nigerian Agricultural Cooperative Banks, and Agricultural Development Projects (FEWSNET, 2007). Others include: River Basin Development Authorities, Operation Feed the Nation, Green Revolution, Directorate of Food, Roads and Rural Infrastructure and National Agricultural Land Development. Furthermore, presidential initiatives on

¹ <http://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS>

² Economic growth that is not derived from increases in labour productivity in sectors where the poor work will not enhance poverty reduction.

³ Some of the reasons advanced for higher poverty in rural area than urban area include the fact that historically government policy has been biased against rural areas; rural areas are heavily dependent on agricultural production, which in Nigeria is characterized by low labor productivity and hence low incomes; and natural disasters such as flooding and drought tend to affect rural areas more heavily than they affect urban areas (Anyanwu, 2012).

cocoa, cassava, rice, livestock, fisheries and vegetables and National Special Programme on Food Security were also implemented. Most of these schemes and programmes have come and gone but the most persistent of them all is the fertilizer subsidy scheme. The Fertilizer subsidy in Nigeria aims at making fertilizer price affordable by smallholder farmers in order to increase agricultural productivity and its efficiency; thereby increase their income and reduce their poverty and food insecurity⁴.

1.2 Research Issue

According to IDEP (2011), the past Nigerian Government fertilizer subsidy programmes has been characterized by high level of policy inconsistencies, ambiguities and instabilities that has led to arguments regarding its basis, application, impacts and sustainability. The gains of the subsidy are also not widely spread among the targeted beneficiaries (Kabir, 2014), hence the government came on board with a new pro-poor fertilizer scheme in 2011 that is termed Growth Enhancement Scheme (GES) for implementation in all the states and Federal Capital Territory (FCT). The rationale for the Growth Enhancement Support Scheme (GES)⁵ is through the Voucher Scheme to target beneficiaries through the electronic system(E-wallet), by encouraging the delivery of GES, via the development of private sector distribution channels.

According to the Federal Ministry of Agriculture and Rural Development (FMARD), Growth Enhancement Support Scheme (GES) represents a policy and pragmatic shift within the existing Fertilizer Market Stabilization Programme and it puts the resource constrained farmer at its center through the provision of series of incentives to encourage the critical actors in the fertilizer value chain to work together to improve productivity, household food security and income of the farmer. It is a special scheme introduced by the Federal Government under President Jonathan's Agricultural Transformation Agenda (ATA), which seeks to increase farmers' access to subsidized farm inputs such as fertilisers and improved seeds through the private sector.

The Goals of GES are:

- Target 5 million farmers in each year for 4 years that will receive GES in their mobile phone directly totaling 20 million at the end of 4 years.
- To increase productivity of farmers across the length and breadth of the country through increased use of fertilizer to 50kg/ha from current 13kg/ha⁶.

⁴ According to World Bank (2014), the achievement of self-sufficiency in basic food supply and the attainment of food security is main policy agricultural objective in Nigeria. The main features of the policy include the evolution of strategies that will bring about improvement in the level of technical and economic efficiency in food and tree crops production.

⁵ FMARD (2012). Growth Enhancement Scheme. Available on the internet at <http://www.fmard.gov.ng/index.php/ges/86-ges-overview>

⁶ The Africa Fertilizer Summit was convened by the African Union's New Partnership for Africa's Development (NEPAD) and implemented by IFDC. According to the Summit the average fertilizer used in Africa should be increased to 50kg/ha.

- Change the role of Government from direct procurement and distribution of fertilizer to a facilitator of procurement, regulator of fertilizer quality and catalyst of active private sector participation in the fertilizer value chain

The FMARD (2014) claimed that no fewer than 10 million farmers have now been captured in the database of the Growth Enhancement Support (GES) currently being implemented by the FMARD⁷ in conjunction with private sector firms. According to information provided by Cellulant Nigeria, the technology partner of the scheme, an increasing number of farmers have been captured in recent months following the success of the scheme in 2012. There is therefore the need for study to empirically investigate this innovative and new scheme in order to improve it so that it will not end up as other past agricultural schemes in Nigeria. We need to know if this new fertilizer scheme has benefited the poor farmers more than the non-poor farmers. Does literate farmers, urban farmer and male farmers benefited more proportionately than illiterate farmer, rural farmer and female farmer respectively? Has the scheme led to increase in the use of fertilizer in Nigeria? Has the new scheme increased the productivity of the participating farmers? If the scheme is expanded will the poor farmers benefited more than non-poor farmers? The empirical answers to some of these questions will help in effectiveness and efficiency of the GES in Nigeria and make it pro-poor.

1.3 Objectives of the Study

The broad objective of this study is to analyse the pro-poorness of the new fertilizer subsidy scheme (GES) and establish its implication on food security in Nigeria. Specifically, we shall:

- (1) Review the GES Scheme since its inception in Nigeria.
- (2) Estimate the pro-poor indices for GES among the farmers in Nigeria.
- (3) Compute the average and marginal benefit incidence of GES based on location, gender, literacy and regions in Nigeria.
- (4) Compare the yield of the GES participating farmers before (2010/2011) and during the scheme (2012/2013).

2.0 Review of Literature and Conceptual Framework

2.1 Review of Fertilizer Production, Consumption, Importation, Distribution and Finance in Nigeria

The fertilizer market of Nigeria was originally driven by government policies of direct participation in production, procurement and distribution. For many years, all fertilizer used in country was imported by the Federal Government of Nigeria (FGN) and state governments. By the early 1970s, the FGN established the Fertilizer Procurement and Distribution Division (FPDD) with its supporting institutions under the Federal Ministry of Agriculture (but now called Federal Ministry of Agriculture and Rural Development) to facilitate the formulation and coordination of all fertilizer policies at the national level and to centralize procurement and distribution. By the mid-1970s, the

⁷ http://www.fmard.gov.ng/news_inside.php?nid=135

FGN started to implement domestic production of fertilizer under the FPDD, making large investments for the establishment of production and blending plants. This initiative was supported by the private sector with the purpose of meeting the country fertilizer needs. Under this initiative, two major fertilizer plants were established: the Federal Superphosphate Fertilizer Company (FSFC) and the National Fertilizer Company of Nigeria (NAFCON) for the production of urea. The FSFC was established in 1973 with an installed production capacity of 100,000 metric tonnes of single superphosphate (SSP) fertilizer, mainly to supply the national market with the phosphate rock from Kaduna State. Since its establishment, FSFC never utilized its full potential; hence the plant was shut down in 2000. The plant resumed production of TSP in 2008 after being privatized and acquired by TAK Continental (IFDC/PROMIDIA, 2008). The second established plant, for the production of ammonia and urea, was NAFCON in 1981 near Port Harcourt. The plant entered into full operation by the mid-1980s and was recognized as the only production facility in West Africa for granulated nitrogen products. This plant has an installed production capacity of 1,000 mt of ammonia, about 1,500 mt of urea, in addition to the 1,650-mt blending capacity of NPK per day. The NAFCON plant stopped operating in 1997 as a result of poor management and damaged equipment (IFDC/PROMIDIA, 2008). More recently, NAFCON was privatized, acquired by Notore Chemical Industries Ltd. Notore's plans were to reactivate the plant with a gradual increase in production starting with urea and NPK blends for domestic use and export, then scale up production until it reaches maximum capacity. However, these plans were delayed due to technical problems with the operation of the plant⁸.

After NAFCON stopped operations in 1997, the urea supply dried out, forcing these plants to operate mostly with imported products (N, P and K). Most of these plants have been out of operation for many years and the equipment has become deteriorated and obsolete. As a result, their respective administrative structures prefer to keep the fertilizer operations by competing in the government tenders for supplying imported fertilizers to the market under the subsidy program⁹.

The fertilizer market in Nigeria is the largest in West Africa representing an average of 45 percent of total fertilizer consumption (in nutrients base) in the Economic Community of West African States (ECOWAS), followed by Burkina Faso, Côte d'Ivoire, Ghana and Mali for the years 2005-2009 (Fuentes et al, 2012). Yet, the average nutrient fertilizer consumption was estimated at around 2.0 kg/ha in 2009 (FAOSTAT, 2011), which is below the ECOWAS's average of 4.0 kg/ha.

⁸ In addition to FSFC and NAFCON, a handful of bulk-blending plants with varying production/ processing capacities were established across the country in different states. Ownership of these blending plants ranged from state governments to private ownership or mixed capital investments. Out of more than 30 established blending plants, only a few reached active production after installation (The NEEDS, 2004). Even at the peak of production, the combined output of all plants operating in Nigeria was less than 1 million metric tonnes of products, accounting for about one-third of the country's installed capacity.

⁹ Importing N, P and K for blending would require investment in repairs and updating equipment. Efforts were being made to reopen some of the plants with the intention to seek efficiency in the supply of blended fertilizer by blending locally and, in the process, reduce cost and the price for farmers (FMARD, 2008).

Nigeria imports the bulk of its fertilizer and, like most countries in the region it is a price taker in the international market. Thus, the increased price fluctuation in the international market may explain in part the high price farmers pay for fertilizer in the Nigerian market. Additionally, there is ample evidence suggesting that in Nigeria, there are market constraints throughout the domestic supply chain that contribute to about 42 percent of the total fertilizer domestic cost, almost doubling the price farmers ultimately pay relative to the international/border price (Fuentes et al, 2012).

The main types of fertilizer imported and distributed in Nigeria include straight products, particularly urea and phosphate compound fertilizer and, more commonly, various NPK compounds and blended formulations (i.e., triple 15, 20-10-10, etc.), according to the specific crop needs. According to Fuentes et al (2012), during 1990-2009 period, the average quantity of fertilizer imported and consumed in Nigeria was about 252,000 metric tons per year which ranges between 69,000 metric tons per year in 2004 and about 498,000 metric tons per year in 2008. Fertilizer imports declined sharply between 1993 and 1997 following the disengagement of the FGN from fertilizer production and importation, as a result of market liberalization policy and the elimination of subsidies. This disengagement caused problems with the supply of fertilizer since the private sector was not able to take over the responsibility of imports and distribution. Consequently, during the 1997/98 farming season, the fertilizer market suffered shortages resulting in low agricultural production. These low fertilizer imports and consumption levels lasted until 1999, when consumption started increasing again. After a period of continuous private sector investments to fill the void left by the government, the FGN reintroduced subsidies in late 1990s at a 25-percent level and resumed production and importation. Since then, there has been a slow and oscillated upward trend in fertilizer importation and use in Nigeria, attributed to the effect of the FGN stabilization policy on farmers' fertilizer demands. This policy had the unexpected effect of constraining farmers' specific demands to relatively small quantities, according to the amounts of fertilizer subsidized and supplied by the government. This is in opposition to relying on the capacity of the private sector to supply larger quantities, according to farmers' actual needs. This erratic pattern reflects the inconsistency of the government policy on fertilizer imports, which has sent mixed signals to the private sector on whether to supply larger amounts of fertilizer from one year to the other (Fuentes et al, 2012). Prior to 2007, the FGN awarded contracts to suppliers who had limited capacity to undertake the entire importation process¹⁰.

¹⁰ Most of these actors represented private entrepreneurs registered specifically to support the government in fertilizer importation under the subsidy program. However, many of them did not import fertilizer but were engaged in arbitrage, using the contracts issued by the government as negotiable instruments with the few established companies with the capability and the logistics to actually import the products. This practice contributed to higher prices of imported fertilizers under the government contracts because of successive markups introduced in the process. This practice is one of the reasons the government has been encouraged to withdraw from importation and distribution of fertilizer.

After 2008 the FGN reduced the number of eligible contractors to three – TAK Continental¹¹, Golden Fertilizers¹² and Notore Chemicals¹³. This practice may prevent other genuine participants from competing in the Nigerian fertilizer market because of the difficulty competing against heavily subsidized products. Many of these have now stopped importing and those that remain do not have access to FGN contracts and have developed strong affiliations with the state governments to supply the product.

In Nigeria, three fertilizer distribution networks have been operating since the country's independence. At first the government created a network of 'Primary Distribution Points' (PDPs) at different locations in the country operated by the FPDD. Under this arrangement, the subsidy on fertilizer was for transportation. The FPDD hired trucks from the private sector to move products from Lagos port to the PDPs for distribution to all states of the federation. The products were deposited at the Farm Service Centers (FSC) scattered all over the states, where fertilizer was sold to farmers. This practice ceased to operate after 1997 when the government temporarily withdrew from fertilizer distribution. Subsequently, many other options were employed, including the engagement of NAFCON by the government as the sole distributor of domestic and imported products to different parts of the country. Prior to 2011, there exists a dual fertilizer distribution system in Nigeria. This consists of two distribution channels: the public and the private distribution channels, dominated by the public channel. The public channel arrangement involves the private sector in the acquisition of fertilizer from the international market (imports) through a tender process. Private importers/suppliers incorporate distribution costs in their bids, according to procurement contracts to deliver the product to designated state warehouses. The product is then distributed through public channels without the participation of the private sector distribution network. Additional imported quantities by private importers are distributed through the small-scale agro-input dealers located in the local markets and semi-urban areas. The public distribution system of subsidized fertilizer is embedded in inefficiencies and endemic mismanagement practices. The international procurement of subsidized fertilizer for the federal and state governments is done through the private sector. Nevertheless, there had been limited incentive and opportunities for the private sector to develop alternate private distribution channels down to the final user and beneficiaries of the subsidy

¹¹ TAK Continental, a family own company, is the largest fertilizer supplier to the Nigerian market. The company owns five blending plants in several states of Nigeria and the Federal Superphosphate manufacturing plant in Kaduna state.

¹² Golden Fertilizers is a Greek-owned company, whose main operation in Nigeria is flour milling. The company has a subsidiary shipping line (Gold Star Shipping) and a trading business, which allows them to bring in mixed cargoes of wheat and fertilizer into the Nigerian market.

¹³ Notore Chemicals PLC is a consortium formed by Nigerian and African investors (60 percent) in addition to an Egyptian fertilizer manufacturer and U.S. investors (20 percent, respectively). NAFCON the only domestic compound (ammonia and urea) fertilizer product manufacturer plant in Nigeria was commissioned to Notore Chemicals PLC for its operation in 2008 by the FGN, after being closed for 10 years.

and fertilizer. The main reason, according to distributors, is the difficulty to make a reasonable profit and expand supply and distribution nearer to the farmers (Fuentes et al, 2012).

Each year, the FGN allocates funds for the provision of fertilizer. The FGN, through the FFD, consolidates orders from and allocates volumes depending on the federal budget allocation to each of the states. Under the agricultural market stabilization program, the FGN pays a 25-percent subsidy at the source (importers or producers) and charges the remaining 75 percent of the cost to the states. The intent with this program has been to establish a revolving fertilizer fund. Therefore, the states are to remit funds equivalent to 75 percent of fertilizer cost (after subsidy) to the FGN from fertilizer sales (Fuentes et al, 2012)¹⁴. Under the agricultural market stabilization subsidy program, the FGN starts negotiations with the states and suppliers between September and November of the preceding year, negotiations that may last until January of the following year. During these negotiations, prices and quantities supplied are determined for each importer based on tenders. The negotiated price is based on free on board (f.o.b.) market prices during or at the time of negotiation. Consequently, the price is fixed at that point for the following cropping seasons. A single price for all of Nigeria is determined for each product, meaning that the freight cost of delivery must be standardized to all nominated state government storage sites in each state. All products have to be supplied before the end of October of the year of the contract. Allocations of procurement contracts cannot be made until the federal budget is approved, which typically occurs early in the new year after the fertilizer budget was approved. As a consequence, Nigerian farmers normally do not receive an adequate supply of fertilizer in time for the cropping season (Fuentes et al, 2012). At that time, there is limited product in the country, because suppliers are not prepared to take the risk of importing products without government contracts. The fertilizer season starts in the south in May and continues until July in the northern regions. Fertilizer products to be delivered are typically assigned to a state representative who is in charge of receiving the product at the warehouses¹⁵.

2.2 Review of Fertilizer Policies in Nigeria

Agricultural policy in Nigeria has developed considerably since the country's independence. In 1998, after years of neglect, the government adopted an agricultural policy that had the objective,

¹⁴ However, in reality, these remittances rarely happen and that is why the FGN deducts the outstanding funds from the Federal Government Federation Account payments to the states from the division of oil revenues. State and local government authorities (LGAs) can add to the amount of subsidized fertilizer supplied by the FGN through direct purchase from importers and/or add additional subsidy. This can amount to as much as 50 percent additional subsidy for a maximum of 75 percent combined FGN, state and LGA subsidies. Under the FGN subsidy program, once the product is delivered to the states, the amount of fertilizer to be distributed to beneficiary farmers is determined by allocation committees at the state and local levels, where the state committee is appointed by the state governor. The states may then choose whether to increase the amount of subsidized fertilizer supplied by the FGN or simply add an extra subsidy.

¹⁵ There are allegations that in many instances, the product never reaches the warehouses since about 70 percent is sold in transit in the black market to the retail network (IFDC/PROMIDIA, 2008).. Consequently, about 30 percent of the FGN-subsidized fertilizer reaches the intended farmers. The rest of the product sold in transit enters the open market as 'recycled product' and is sold at a non-subsidized price, normally approaching the actual market price

among others, of ensuring food security for the population by developing local production. The Nigerian “*New Agricultural Policy Thrust*,” issued in 2001, assigned the agricultural sector an important role in its strategic planning frameworks. This policy is supported by a number of sub-sector policies, such as the *National Fertilizer Policy for Nigeria* and the *National Policy on Integrated Rural Development*, both of which are crucial for the attainment of national food security¹⁶.

The *National Fertilizer Policy for Nigeria*, adopted in 2006, is comprehensive and has the broad aim of “facilitating farmers’ timely access to adequate quantity and quality of fertilizers at competitive and affordable prices.” The policy launched many desirable principles including market friendliness, truth-in-labeling and environmental integrity, among others. In addition, it indicated directions for government intervention in the following domains: fertilizer production, international trade, domestic marketing, research and development, quality control, environmental impacts, farm use and governance and institutions. As such, this policy provides broad guidance on government actions to develop the fertilizer sub-sector in harmony and in support of the organised agricultural development. The challenge has been to translate these policies and guidelines into a politically coherent and feasible implementation strategy. The implementation of some of the principles in the policy document has been neglected, specifically those dealing with regulatory mechanisms (The New Nigerian Agricultural Policy, 2009). Other than quality assurance, some of the major constraints facing the fertilizer sub-sector are identified in the policy document as:

- Increase and improve the use of fertilizers.
- Achieve agricultural competitiveness through fertilizer usage.
- Induce and sustain nutrient use efficiency.
- Safeguard the environment with fertilizer production and use.
- Exploit available raw materials for fertilizer production.
- Raise employment in the fertilizer industry

Since 1970s, Nigeria government has been subsidizing fertilizer procurement in Nigeria. Fertilizer subsidy has been central to the agricultural policy direction of Nigeria and has been justified on many grounds such as market failures and equity considerations and as a mechanism for dealing with skewed income distribution(Crawford et al, 2005). Since the late 1970’s, fertilizer has typically been subsidized, with rates that has been as high as 80 percent. The federal government under the Federal Market Stabilization Programme (FMSP) procures fertilizer for sale to states at a subsidy of 25 percent and in addition to this, extra subsidy is also provided by the states and local government councils (IDEP, 2011).

¹⁶ Full details of other agricultural policies and how they are aligned with the current Agricultural Transformation Agenda of the present government are outlined in Appendix 3.

However, the review of Nigerian fertilizer subsidy indicates an inconsistency of government fertilizer policy over the years (Nagy and Edun (2002); Ogunfowora and Odubola (1994); Ogunfowora (2000) and Kwa (2002). Policies kept changing almost year by year to try to answer problems of availability, leakage and arbitrage. The Federal Government of Nigeria (FGN) monopoly on pre-1996 fertilizer procurement and the subsidy policy stymied the private sector. The FGN did not properly follow through on the liberalization process started in 1997 by ensuring that the preconditions for a transition to a privatized fertilizer sector were implemented. The FGN opted for a full withdrawal from fertilizer procurement and subsidy, leaving the industry stranded. The private sector did respond, but the ad hoc procurement/ subsidy policies of the FGN in 1999, 2001 and 2002 were damaging to the growth of the private sector. Annual fertilizer use fell by about 50% in the post-1996 as compared with the pre-1996 period. The main constraints to fertilizer use were high prices, low fertilizer quality and non-availability of fertilizer at the time required (IDEP, 2011). Government fertilizer policies also had an effect on national, state, and local government budgets. Between 1975 and 2007, the fertilizer subsidy cost as a percentage of the national agricultural budget ranged from 0% to as high as 80% (FAO, 2012). Government fertilizer policy also failed to capture the benefits of using the considerable resources available in Nigeria to produce fertilizer for in-country use and for export to the rest of Africa.

Until recently, the Federal Market Stabilization Program (FMSP) remained an integral part of fertilizer policy in Nigeria and accounted for 43 percent of total capital spending in agriculture from 2001 through 2005 (Mogues et al. 2008). In May 2006, the Federal Executive Council approved the National Fertilizer Policy with the objective to facilitate farmers' timely access to adequate quantity and quality of both organic and inorganic fertilizers at competitive but affordable prices in the country. Based on experiences from other countries such as Malawi and Mozambique, the International Fertilizer Development Centre (IFDC) in collaboration with the Federal Ministry of Agriculture and Rural Development, piloted a Fertilizer Voucher Program (FVP) in Kano and Bauchi States in 2008. The programme was expanded incrementally in 2009 and 2010. It demonstrated the feasibility and efficiency of a voucher system to administer subsidies to farmers which indicated that smallholder farmers could benefit directly from the private sector supply of subsidized fertilizers. Arising from above, in March, 2011, the Fertilizer Voucher Programme (as a Policy Instrument) was adopted nationwide. The Ministry has therefore designed the Growth Enhancement Scheme (GES) for implementation in all the States and FCT. The rationale for the Growth Enhancement Support Scheme (GES)¹⁷ is premised on building on the successes achieved through the Voucher Scheme to target beneficiaries through the electronic system (E-wallet), by encouraging the delivery of GES, via the development of private sector distribution channels.

¹⁷ Federal Ministry of Agriculture and Rural Development (2012). Growth Enhancement Scheme. Available on the internet at <http://www.fward.gov.ng/index.php/ges/86-ges-overview>

2.3 Review of Effectiveness of Fertilizer Subsidy Policies

The main reason for advocating fertilizer subsidies is that farmers are very poor and typically lack sufficient cash resources to buy productive inputs, which can result in suboptimal input use. Indeed, poverty combined with financial constraints may generate high discount rates that can lead to low investment (Holden, et al, 1998). In 2005, Malawi was the first country to reintroduce high levels of input subsidies to improve national food self-sufficiency and reduce its dependence on food aid. In a short time, Malawi managed to turn a food deficit into a food surplus, and was considered to be a success story (Denning et al, 2009). The new twist to this subsidy program was that it was targeted poor smallholders through a coupon system. Other countries have copied Malawi, and similar programs have arisen and expanded in Ghana, Kenya, Tanzania and Zambia (Dorward and Chirwa, 2011; Minde et al, 2008).

Chirwa et al (2011) revealed that the main goal of the Farm Input Subsidy Programme (FISP) in Malawi is to raise incomes and household food security of up to 2 million (out of 3.4 million) smallholder farmers through improvements in their agricultural productivity. The programme targets smallholder farmers who have land but cannot afford to purchase inputs (principally maize seed and fertilisers) at market prices. However, Holden and Lunduka (2013b) working on experiment on input subsidies, cash constraints and timing of supply suggest that low use of agricultural inputs in Malawi is primarily caused by limited ability to buy inputs and not time-inconsistent behavior. They recommended that the current input subsidy design in Malawi should be replaced by smarter and more cost-effective designs that involve smaller packages of fertilizer and delivery of inputs at harvest time, as well as at planting time. Dorward and Chirwa (2011) in their study on agricultural input subsidy programme in Malawi showed that the use of voucher as smart subsidy had similar shortcomings just like the universal subsidy programme. Similar findings were also observed by Holden and Lunduka (2013a) in Malawi where a subsidy program aimed to provide coupons for purchase of subsidized fertilizer and seeds targeted at poor rural households also faced serious problem. The critical findings were that the poverty and vulnerability reduction potentials of the programme were not optimal, leakages of coupons and fertilizers and misallocation of coupons away from the needy resulted through rent seeking.

Chirwa et al (2011) working on conceptualizing graduation from agricultural inputs subsidies in Malawi, considered ways in which the concept of graduation may be usefully applied to the Farm Input Subsidy Programme (FISP) and sets out a broad conceptualisation of graduation for potential application in programme design and implementation. For the Malawian farmers to graduate from relying on fertilizer subsidy and be able to purchase fertilizer at competitive price, they recommended potential graduation conditions which include reduced input prices, substitution with cheaper inputs, increased working capital for input purchases, diversification out of maize production, and access to low cost credit for input purchases.

Duflo et al (2008) tested the hypothesis in Kenya of the possibility that, while fertilizer and hybrid seed increase yield on model farms, they are actually not profitable on many small farms, where conditions are less than optimal. They revealed that the mean estimates of yield increases due to fertilizer use are in the range of the estimates found on model farms. They found that the mean rate of return to using the most profitable quantity of fertilizer they examined was 36% over a season, or 69.5% on an annualized basis. However, other levels of fertilizer use, including the combination of fertilizer plus hybrid seed recommended by the Kenya Ministry of Agriculture, are not profitable for farmers in their sample. Thus, while fertilizer can be very profitable when used correctly, one reason why farmers may not use fertilizer and hybrid seeds is that the official recommendations are not adapted to many farmers in Kenya. This also suggests that fertilizer is not necessarily easy to use correctly, which implies that it may not be profitable for many farmers who do not use the right quantity.

Duflo, et al (2011) conducted a study and social experiments in Kenya and found that poor households are willing to invest in response to small, time-limited discounts in the form of free fertilizer delivery just after harvest. Indeed, a 50% subsidy on fertilizer at planting time did not increase fertilizer use more than this harvest-time free delivery discount. These authors' finding may indicate that the distribution and sales of fertilizer just after harvest can be a more effective system than the sale of fertilizers at planting time, when households may no longer have sufficient funds remaining from the sale of the previous year's harvest. The purchase of inputs at harvest time for the next growing season may serve as a commitment device (DellaVigna, 2009) and reduce the need for subsidies.

Banful (2010) evaluated the Ghana's 2008 fertilizer subsidy programme. He observed the role that political influence can play in a fertilizer subsidy even in programmes that incorporate the new best practices of fertilizer subsidies (e.g voucher system). He noticed the evidence of "vote-buying" activity in Ghana's 2008 subsidy program which suggests that despite the innovations in design and implementation of fertilizer subsidies, the new programs have the potential to experience at least some of the significant pitfalls of former subsidy programs. The current innovations are not enough to make the new fertilizer subsidy programs economically and socially efficient. He indicated that the farmers collected vouchers that they had no intention of using or could not afford to use. They rightly predicted that there would be periods of shortage of vouchers and sold the vouchers to other farmers who desperately needed to apply fertilizer.

Banful et al (2010) opined that the parallel sales of subsidized and market fertilizer (unsubsidized) in Nigeria tend to create an avenue for lower-priced subsidized fertilizers to be diverted for sale at higher market prices. These shortcomings of fertilizer subsidies led to introduction of vouchers or smart subsidies or coupons. The vouchers imply farmers are given vouchers and make purchases from private input suppliers. The cost of the fertilizer to the farmer is reduced by the value

of the voucher. The supplier in turn is reimbursed for its value at designated banks. A number of advantages were attributed to the use of vouchers which are: reducing the costs like transportation and storage by the government, building the private-sector distribution network, serves as a sure opportunity to secure the input by a farmer holding a voucher and a replacement for food aid in case of need among others (Minot and Benson, 2009).

Recently, Kabir (2014) conducted a study on political economy of fertilizer subsidy in Nigeria. He indicated that the trend of leadership in the country has led to inconsistencies and instability in fertilizer subsidy policies in Nigeria. He also concluded that the gains are not widely spread among the targeted beneficiaries hence, a negative implication on the increased food production programme. He showed further in his study that majority of the farmers disagreed that the fertilizer subsidy was timely available (65.3%). He recommended that Nigerian Government involvement in procurement and distribution of fertilizer should be redefined.

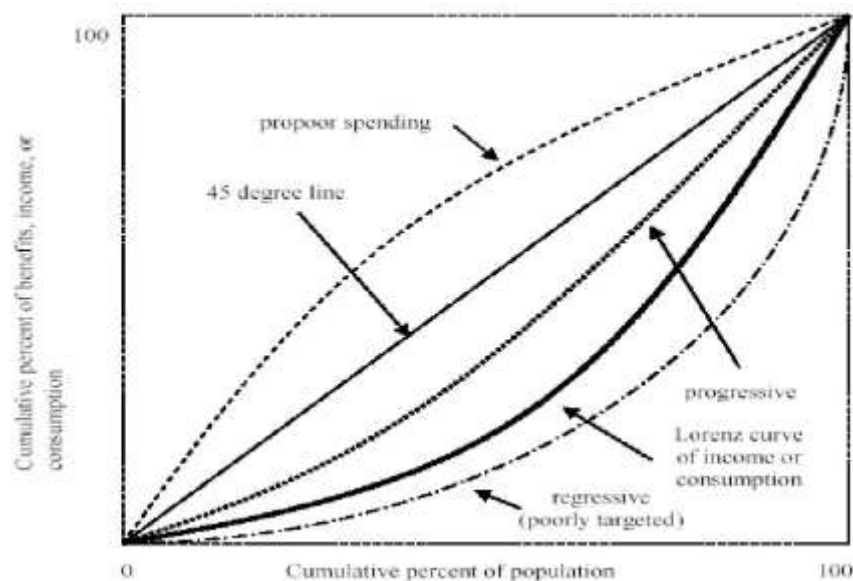
All these shortcomings associated with fertilizer subsidy led the Nigeria to adopt GES, where private sectors played the role of supplying and distribution of fertilizer and government involved the registration and payment of 50% of the fertilizer and other agro inputs received by the farmers. The hope is that this would better serve the intended beneficiaries who are farmers and reduce the fiscal burden of universal fertilizer subsidy from the government and makes it more effective. However, there is need to find if this new scheme is better than the previous ones that have been implemented and test its pro-poor objectives in Nigeria.

2.4 Conceptual Framework for Benefit Incidence Analysis

Benefit incidence analysis (BIA) is better understood in relation to the concepts of targeting and progressivity of social spending. Targeting is a tool used to select eligible beneficiaries of any government intervention. In principle, it should concentrate the benefits of social assistance programmes to the poorest segments of the population. All targeting mechanisms share a common objective: to correctly identify which households or individuals are poor and which are not. Targeting is a means of increasing the efficiency of the program by increasing the benefits that the poor can get with a fixed programme budget (Coady et al, 2004). Conversely, it is a means that will allow the government to reduce the budget requirement of the program while still delivering the same level of benefits to the poor. One way to assess the targeting of government subsidies is with reference to the graphical representation of the distribution of benefits, i.e., concentration curve or benefit concentration curve. A concentration curve is generated by plotting the cumulative distribution of “benefits” of public spending on the y-axis against the cumulative distribution of population sorted by per capita income/consumption/asset on the x-axis. One can assess the progressivity or regressivity of a public subsidy by comparing the benefit concentration curve with the 45-degree diagonal and the Lorenz curve of income/ consumption/asset. The diagonal indicates neutrality in the distribution of benefits. If the distribution of benefits lies along this line, the poorest 20 percent of the population gets

20 percent of the subsidy. Thus, the diagonal reflects perfect equality in the distribution of benefits and it is also referred to as perfect equality (PE) line. The distribution of benefits is said to be progressive (pro-poor) if the lower income groups receive a larger share of the benefits from government subsidy than the richer income groups. For instance, if the concentration curve lies above the diagonal, then the poorest 20% of the population receives more than 20% of the benefits and the distribution of benefits is said to be progressive in absolute terms or pro-poor (Figure 1). Conversely, if the benefit concentration curve lies below the diagonal, then the poorest 20% of the population captures less than 20% of the benefits and the distribution of benefits is said to be regressive in absolute terms.

Figure 1: Lorenz and Concentration Curves of Benefit



Source: Cuenca(2008)

On the other hand, a benefit concentration curve that lies above the Lorenz curve of income signifies progressivity of public subsidy relative to income. To wit, the benefits share of the poorest 20% of the population is larger than its income share. Thus, if the benefits from the government service are converted to its income equivalent, the post-subsidy distribution of income-cum-benefit would be more equitable than the original distribution of income if the benefit concentration curve lies above the Lorenz curve of income. Conversely, a concentration curve that lies below the Lorenz curve of income distribution suggests transfers that are more regressively distributed than income. The concentration coefficient (index), also called Suits index, is the most common summary measure of benefit incidence. It is estimated in like manner as Gini coefficient but it is based on concentration curve instead of the Lorenz curve (Cuenca, 2008). While Gini coefficient is computed as the ratio of the area between the diagonal and the Lorenz curve to the total area below the diagonal, the concentration coefficient is the ratio of the area bounded by the diagonal and the concentration curve to the total area below the diagonal.

If the distribution of benefits is pro-poor, the Suits index is negative. Conversely, if the distribution of benefits is regressive in absolute terms, then the Suits index is positive. On the other hand, if the Suits index is algebraically smaller than the Gini coefficient, then the distribution of benefits is said to be progressive relative to the distribution of income.

3.0 The Methodology

3.1 Data Sources and Collection

This study was carried out in Nigeria. Nigeria lies between 4⁰16¹ and 13⁰53¹ North Latitude and between 2⁰40¹ and 14⁰41¹ East Longitude. It is located in the West Africa bordered on the West by the Republic of Benin, on the north by the Republic of Niger and on the east by the Republic of Cameroon. To the South, Nigeria is bordered by approximately 800 kilometers of the Atlantic Ocean, stretching from Badagry in the west to the Rio del Rey in the east. The country also occupies a land area of 923,768 km² and the vegetation ranges from mangrove forest on the coast to desert in the far north. Administration-wise, Nigeria consists of 36 states and a Federal Capital Territory. Each state is further divided into Local Government Areas (LGAs). There are presently 774 LGAs in the country. The total population of Nigeria stood at 166.2 million in 2012 according to the estimate from Nigeria Bureau of Statistics (NBS)¹⁸.

The study made use of the Nigeria General Household Survey (GHS)-Panel Datasets of 2010/2011 and 2012/2013. These datasets were supplemented with Living Standard Household Survey for 2004/2005¹⁹ and secondary data on expenditure on fertilizer subsidy in Nigeria in 2010 and 2012. Data on expenditure on fertilizer subsidy were obtained from Federal Ministry of Agriculture and Rural Development in Abuja, Nigeria.

The Nigeria General Household Survey (GHS)-Panel was carried out by the National Bureau of Statistics (NBS)²⁰. The survey was the result of a partnership that NBS has established with the Federal Ministry of Agriculture and Rural Development (FMARD), the National Food Reserve Agency (NFRA), the Bill and Melinda Gates Foundation (BMGF) and the World Bank (WB). They

¹⁸ Nigeria Population., available on the internet at <http://www.tradingeconomics.com/nigeria/population>

¹⁹ The Living Standard Household Survey had a national coverage, that is, all the 36 states of the Federation including the Federal Capital Territory of Abuja were covered. The sample design for the survey was a two stage stratified sample design. The first stage was the division of each state into clusters called Enumeration Areas (EA), while the second stage was the division of enumeration areas into housing units. One hundred and twenty (120) EAs were created for each state and 60 EAs for the Federal Capital Territory for the twelve months survey duration. Ten EAs for each state and five EAs for the FCT were covered per month (The survey was conducted through the twelve months period. On the whole, 600 households were studied per state and 300 for the FCT, which make the total sample for the survey to be about 21900 households. Data that were related to farmers were extracted which constitutes about 7218 farming households.

²⁰ The Nigeria (GHS)-Panel) was supported by the Living Standards Measurement Study - Integrated Surveys on Agriculture (LSMS-ISA) project undertaken by the Development Research Group at the World Bank. The LSMS-ISA project aims to support governments in seven Sub-Saharan African countries to generate nationally representative, household panel data with a strong focus on agriculture and rural development. The surveys under the LSMS-ISA project are modeled on the multi-topic integrated household survey design of the LSMS; Household, Agriculture, and Community questionnaires are an integral part of every survey effort.

developed a method to collect agricultural and household data in such a way as to allow the study of agriculture's role in household welfare over time. This GHS-Panel Survey responds to the needs of the country, given the dependence of a high percentage of households on agricultural activities in the country, for information on household agricultural activities along with other household information such as human capital, other economic activities, and access to services and resources. Under the work of the partnership, a full revision of the questionnaire was undertaken and, at the same time, a sub-sample of the GHS now forms a panel survey. The panel component applies to 5,000 households with information on multiple agricultural activities and household consumption. As the focus of this panel component was to improve data from the agricultural sector and link this to other facets of household behavior and characteristics, the GHS-Panel drew heavily on the Harmonized National Living Standards Survey (HNLSS-a multi-topic household survey) and the National Agricultural Sample Survey (NASS-the key agricultural survey) to create a new survey instrument to shed light on the role of agriculture in households' economic wellbeing that can be monitored over time. The first wave of the GHS-Panel was carried out in two visits to the panel households (post-planting visit in August-October 2010 and post-harvest visit in February-April 2011). The second wave of the GHS-Panel was carried out also in two visits to the panel households (post-planting visit in September-November 2012 and post-harvest visit in February-April 2013). The panel data set are downloadable at the Living Standards Measurement Study - Integrated Surveys on Agriculture (LSMS-ISA) website address²¹.

The sample design was a two-stage probability sampling. The primary sampling Unit (psu) were the Enumeration Areas (EA). These were selected based on probability proportional to size (Pps) of the total EAs in each state and FCT and the total household listed in those EAs. A total of 500 EAs were selected using this method. Households were selected randomly using the systematic selection of ten (10) households per EA. This involved obtaining the total number of households listed in a particular EA, and then calculating a sampling interval (S.I) by dividing the total households by ten (10). The next step was to generate a random start 'r' from the table of random numbers which stands as the 1st selection. Consecutive selection of households was obtained by adding the sampling interval to the random start. In all, 500 clusters/EAs and 5,000 households were interviewed. These samples were proportionally selected in the states such that different states had different sample sizes. However, the selection covers all the Local Government Areas and all the states in Nigeria, The urban and rural areas were also included in the sample. The Nigeria GHS-Panel datasets have been recently used by Oseni et al (2014). The information on post-planting and post-harvest questionnaire are presented in Appendices 1 and 2.

²¹ <http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/EXTLSMS/0,,contentMDK:2949589~menuPK:4196952~pagePK:64168445~piPK:64168309~theSitePK:3358997~isCURL:Y~isCURL:Y~isCURL:Y,00.html>

The summary statistics of the data are presented in Table 1. The table reveals that most of the socio-economic characteristic of the respondents in the panel data sets such as proportion of the gender in the sample, the mean age of the respondents, household size and literacy rate did not change significantly during the two sampling periods. However, there were large differences in expenditure, farmland size and accessibility to mobile phone. For instance, the average cultivated farmland declined from 6109.62m² per farmer in 2010/2011 to 5100.67m² in 2012/2013 on the average. Other details that are relevant to this study are presented in Table 1. Appendices 1 and 2 provide further details on the information requested in the questionnaire used to collect the data.

Table 1: Descriptive Statistics of Panel Datasets of 2010/2011 and 2012/2013

Variable	2010/2011	Code	2012/2013	Code
SOCIO-ECONOMIC CHARACTERISTICS OF THE HOUSEHOLDS				
Sex	Male=49.97% , Female=50.03%	Sect1-plantingwi	Male=49.47%,Female=50.53%	Sect1-plantingw2
Household Size	5.9	Sect9-plantingw1	5.8	Sect9-plantingw2
Literacy Rate	60%	Sect2-plantingw1	63%	Sect2-plantingw2
Annual Mean Non Food Expenditure(Post-Planting Period)	N15905.51	Sect8 ₄ -plantingw1	N59683	Sect8 ₄ -plantingw2
Annual Mean Non Food Expenditure[Others] (Post-Planting Period)	N2410.14	Sect8 ₅ -plantingw1	N4055.97	Sect8 ₅ -plantingw2
Annual Mean Non Food Expenditure (Post-Harvest Period)	N13193.13	Sect11 _d -harvestw1	N31611.20	Sect11 _d -harvestw2
Annual Mean Non Food Expenditure(others) Post-Harvest Period)	N1951.93	Sect11 _e -harvestw1	N2002.70	Sect11 _e -harvestw2
Mean General Annual Household Income(Post Planting Period)	N239100	Sect10-plantingw1	N307436.83	Sect10-plantingw2
Mean Annual Household Income (Post-Harvest Period)	N216100	Sect13-harvestw1	N253391.78	Sect13-harvestw2
Sample Size	5000		5000	

Source: Computed From Panel Datasets of 2010/2011 and 2012/2013

3.2 Analytical Procedures

In this study we estimated pro-poor price indices for GES scheme in Nigeria. Average and marginal benefit incidence analyses were also conducted to estimate the share of the poor and non-poor in the scheme and to check the pattern of the change in their shares over time in Nigeria.

3.2.1 Benefit Incidence Analysis

Benefit Incidence Analysis (BIA) will be performed using Distributive Analysis Stata Package (DASP) 2.2 procedure as indicated in Araar and Duclos (2009). This will be done for fertilizer subsidy based on gender, regions, location (rural or urban) and nationally. Benefit incidence analysis (BIA) is widely used to infer distributional impacts of public spending. It depends on both the allocation of public spending and the behavior of households in using the services. It estimates the distribution of public expenditure with a two-step methodology. The first step is to analyze the net unit costs of providing any service (fertilizer subsidy). These are usually based on officially reported public spending on the service (fertilizer subsidy) in question. The second step is to analyze the pattern of utilization of the service (fertilizer subsidy) (e.g. how many units are utilized by poor households and how many by rich households).

3.2.2 Progressivity of the Benefits (PB)

Progressivity of Benefit (PB) was also conducted using Distributive Analysis Stata Package (DASP) 2.2 procedure. In following their procedure we estimated the progressivity of fertilizer subsidy by comparing its Lorenz and concentration curves. In doing this, the fertilizer subsidy used by the farmers were ranked according to their associated farm size (asset) expenditure. The fertilizer subsidy scheme is considered pro-poor if the concentration curve for its benefit lies anywhere above the line of Perfect Equality. This means that such fertilizer subsidy scheme accrue more to the poor than non-poor. A non-pro-poor subsidy scheme has its concentration curve of its benefit lying below the line of Perfect Equality. The graphical analysis will be supplemented with Concentration Index and Kakwani Index of Progressivity. Normally, the higher the Concentration index, the more concentrated is the fertilizer subsidy and the higher the inequality. Hence, of the two fertilizer subsidy schemes, the more regressive one would be associated with the highest concentration index (Kamgnia, 2008).

Kakwani index²² is directly related to the graphical method described above. The Kakwani index is defined as twice the area between a payments' concentration curve and the Lorenz curve and is calculated as:

$$K = L_c(P) - L_x(P) \text{ or } K = 2 \int_0^1 L_c(P) - L_x(P) dp \quad (1)$$

²² http://siteresources.worldbank.org/INTPAH/Resources/Publications/Quantitative_Techniques/health_eq_tn16.pdf

Where, K is the Kakwani index of progressivity, $L_c(P)$ is the fertilizer payment concentration index and $L_x(P)$ is the Gini Coefficient of the prepayment income(expenditure).

The value of K ranges from -2 to 1 . A negative number indicates regressivity; a positive number indicates progressivity. In the case of proportionality, the concentration lies on top of the Lorenz curve and the index is zero. It should be noted that the Kakwani Index of Progressivity could also be zero if the Concentration and Lorenz curves were to cross; the negative and positive differences between them cancel. Given this, it is important to use Kakwani Index of Progressivity, or any summary measure of progressivity, as a supplement to, and not a replacement of, the more general graphical analysis (O'Donnelle et al, 2007).

3.2.3 Marginal Benefit Incidence Analysis (Using Panel Surveys)

We also estimated the marginal benefit incidence of fertilizer subsidy using two consecutive cross-sectional surveys of 2010/2011 and 2012/2013. Following the methodology suggested by van de Walle (1995, 2002). The change in quintile participation in fertilizer subsidy between the two years can then be represented by:

$$(F_{j2}/F_2) - (F_{j1}/F_1) \quad j= 1, 2 \quad (2)$$

where F_{jt} is the number of farmers in welfare quintile j , at date $t = 2010, 2013$ and F_t is the total number of farmers that used fertilizer at date t . Alternatively, this can be interpreted as the marginal incidence of spending on fertilizer subsidy between the two years where participation in fertilizer subsidy uses are multiplied by the appropriate subsidy level. The share of a given quintile in the total change in fertilizer subsidy can be expressed as:

$$(F_{j2} - F_{j1}) / (F_2 - F_1) \quad (3)$$

3.2.4 Pro-Poor Price Index

Indirect taxes and subsidies have direct impacts on prices. According to Son (2006), to analyze the effect of subsidies at the margin we can measure the impact of price changes (borne by the subsidies) on poverty. This can be accomplished by deriving poverty elasticity with respect to prices of the individual commodities. To derive the elasticity, the demand equations of k commodities can be represented as $q = q(x, P)$

Where, p and q are the $k \times 1$ vectors of prices and quantities of k commodities, and x is the disposable income. We can assume that all individuals face the same price vector, which means that the prices are fixed across individuals²³. Thus, we can write the demand equation as $q = q(x)$, which are the quantities consumed by an individual with disposable income x ²⁴. Utilizing this demand equation, the disposable income can be written as:

²³ The price of fertilizer in Nigeria is the same in every location due to the effect of subsidy or perfect market condition of ruling price can be assumed.

²⁴ Writing the demand equations in the form of $q = q(x)$ does not imply that all own-price and cross-price elasticities of demand are zero. It only implies that prices do not vary across individuals

$$x = \sum_{i=1}^k p_i q_i(x) + S(x) \quad (4)$$

Where, p_i is the price of the i th commodity and $q_i(x)$ is the quantity of the i th commodity consumed by an individual whose disposable income is x , where $i = 1, 2, \dots, m$. $S(x)$ is the savings of the individual with income x . Supposing that due to subsidies, the price vector p changes to p^* . How will this change affect the individual's real income? To answer this question, we can consider the cost function $e(u, p)$, which is the minimum cost required to obtain u level of utility when the price vector is p . The real income of the individual with income x will change by²⁵

$$\Delta x = -[e(u, p^*) - e(u, p)]$$

which, on using Taylor expansion, gives

$$\Delta x = -\sum_{i=1}^m (p_i^* - P_i) q_i(x)$$

This equation gives

$$\frac{\partial x}{\partial p_i} = -q_i(x) \quad (5)$$

A general class of a poverty measure that combines three characteristics of poverty is given as

$$\theta = \int_0^z P(z, x) f(x) dx \quad (6)$$

Differentiating (6) with respect to P_i , and using (5) gives the elasticity of θ with respect to P_i , as

$$\varepsilon_{\theta} = \frac{\partial \theta}{\partial P_i} \frac{P_i}{\theta} = -\frac{1}{\theta} \int_0^z \frac{\partial P}{\partial x} v_i(x) f(x) dx \quad (7)$$

Where $v_i(x) = p_i q_i(x)$ is the expenditure on the i th commodity. This elasticity can be written as the sum of two components:

$$\varepsilon_{\theta} = -\frac{\overline{p_i q_i} \eta_{\theta}}{\mu} + (\varepsilon_{\theta} + \frac{\overline{p_i q_i} \eta_{\theta}}{\mu}) \quad (8)$$

where μ is the mean of the disposable income and $\overline{p_i q_i}$ is the mean expenditure of the i th commodity. The first term in (8) is the income effect of the price increase which is always positive. The second term is the redistribution or inequality effect of price change. It is the redistribution effect that tells us whether an increase in price p_i hurts the poor proportionally more than the non-poor. If this component is positive, it means that the increase in the price of i th commodity hurts the poor proportionally more than the non-poor. This led Son (2006) to propose the pro-poor price index as

²⁵ $CV = [e(u, p^*) - e(u, p)]$ is the compensation variation, the compensation that should be given to an individual to maintain his or her utility level the same as before the price change.

$$\phi_i = -\frac{\varepsilon_{\theta_i}}{s_i \eta_{\theta}} \quad (9)$$

where $s_i = \frac{p_i q_i}{\mu}$ is the expenditure on the i th commodity as a proportion of the mean of the total disposable income. If ϕ_i is greater (less) than 1, an increase in the i th price hurts the poor more (less) than the non-poor. Thus, if ϕ_i is greater than 1, then the subsidy on i th commodity is justified, so that the poor can benefit more relative to the non-poor.

In estimating the pro-poor price index for fertilizer in Nigeria, we estimated poverty elasticity with respect to changes in price of fertilizer (ε_{θ_i}), the proportion of disposable income of the farmers spent on fertilizer (s_i) and growth elasticity of poverty [change in poverty as result of 1% change in the mean income of the farmers (η_{θ})]. Therefore, in this study, Pro-Poor Price Index as indicated in equation (9) was estimated for fertilizer in 2010/2011 (during the fertilizer Voucher era) and in 2012/2013 (during the e-wallet era), to establish if fertilizer subsidy is justified in the two era. The procedure for estimating poverty elasticity with respect to income growth and prices is well established in Araar and Duclos (2007) and Kakwani (1993). This is also available in DASP Version 2.2 as designed by Araar and Duclos (2009)²⁶. Son and Kakwani (2006) have equally applied this methodology to determine the impact of the price changes on poverty in Brazil.

4.0 Preliminary Results and Discussion

4.1 Preliminary Review of GES Scheme in Nigeria

Agriculture is predominantly practiced by resource poor farmers in Nigeria. They lack access to credit and farm input such as fertilisers, seeds and information to enhance their productivity (Atofarati, 2014). In view of this, the federal government introduced the Growth Enhancement Support Scheme (GES) which is designed to deliver government subsidized farm inputs directly to farmers via GSM phones. The GES scheme is powered by E-wallet, an electronic distribution channel which provides an efficient and transparent system for the purchase and distribution of agricultural inputs based on a voucher system. The scheme guarantees registered farmers E-wallet vouchers with which they can redeem fertilisers, seeds and other agricultural inputs from agro-dealers at 50% of the cost, the other half being borne by the federal government and state government in equal ratios. According to Atofarati (2014), this initiative, if well implemented, can be used to help solve the perennial problem of subsidized fertilizers not getting to the farmers. The initiative would also be instrumental in reducing bureaucracy and the role of middlemen in fertilizer distribution, which has

²⁶ In estimating the poverty elasticity it is important to set the parameter of inequality aversion (α) at $\alpha=1$ or $\alpha=2$. For $\alpha=1$, the poverty elasticity is estimated based on poverty gap ratio. For $\alpha=2$, the poverty elasticity is estimated based on severity of poverty and takes into account all three characteristics of poverty measure.

been marred with corruption and inefficiencies in Nigeria. This direct access to government by farmers will ensure that progress by the farmers is monitored directly by the government and its relevant agencies.

The new fertilizer subsidy scheme is part of agriculture transformation agenda (ATA) of the present government in Nigeria. The main different feature of the ATA when compared with past agricultural policy in Nigeria is the focusing on value chains of crops where Nigeria has comparative advantage. Growth Enhancement Scheme is one of the drivers of this value chain. Other supporting schemes in ATA are presented in Appendix 3 as Nigeria Incentive-Based Risk Sharing for Agricultural Lending (NIRSAL). This is a loan facility that will enable the Central Bank avail about N450b (Four hundred and fifty billion Naira) to farmers through the commercial banks. The Development of Staple Crops Processing Zones is to make each staple crop processing zone to be accessible, thorough and durable road network, adequate power supply, water and telephone services, etc, thus enabling access to Nigerian farm produce, locally and internationally. As part of ATA and as opposed to the former marketing boards, the government also launched Development of Private Sector Driven, Public Sector Enabled Marketing Corporation to stabilize the price of farm produce..

As earlier said, GES targets supporting twenty million farmers, beginning with 5 million farmers in the year 2012, with fertilizer and other requisite agro inputs, such as improved rice and maize seeds (FMARD, 2012). The inclusion of improved rice or maize seeds in the subsidy scheme is one of the advantages the new scheme has over the old fertilizer subsidy scheme that did not include provision of complimentary inputs as improved seeds and seedling. The combination of improved seeds with appropriate fertilizer will improve the yield of the farmers.

Table 2 shows that the current number of farmers registered for GES in stood at 9511674 as at 2013. The farmers' registration served dual purpose of keeping the bio data of the farmers for economic and agricultural planning purposes. It also served as indication of interest to participate in GES programme. Out of the total number of farmers that registered in 2012, only 1090673 of them were served with fertilizer and improved seeds, however, this has on the average increased by 711% to 4241855 in 2013. The low percentage redemption rate may be due to low phone penetration rate in 2012 which is estimated to be 37% and this has significantly increased to about 60% in 2013 has shown in Table 2. The phone accessibility is revealed to have increased in Nigeria from about 73% to 81% among farmers in the study area. The accessibility takes into account the fact that you can make use of your friend/neighbour, etc., to make and receive calls as indicated in Table 4. The low fertilizer and improved seeds redemption may be due to low number and inactivity of the redemption centres. Appendix 4 shows that the numbers of redemption centres were 1341 in 2013 and that about 94% of them are active. This is an improvement from about 804 redemption centres in 2012 and in

which only 76% of them were active in 2012²⁷ as indicated in Appendix 4. Federal Ministries of Agriculture and Rural Development claims that more redemption and registration centres are being created to make registration and redemption of e-wallet easier for the farmers.

On further assessment of the scheme reveals that initial lull about the scheme has gradually being replaced with interest and enthusiasm. This may explain the increase in the number of registered farmers from 4301661 in 2012 to 9511674 in 2013 which about 121% increase within the period²⁸. The 9511674 farmers registered in 2013 is closer to the target of 10 million farmers targeted for the period, with a deviation of about 5%. However, not all the farmers who registered were served as indicated in Table 2, although the service rate has increased by 711% compared with the previous years.

We indicated in Table 4 that the literacy rate among the farmers increased from 60% to 63% between 2010 and 2013. This implies that more than 30% of the farmers are not educated and this may hamper their chance of participating in the scheme. The scheme makes allowance for illiterate farmers to bring a relative that can assist them in registering (they have to come together). The relationship can be confirmed by Identification Card (or any form of Identification). The registration is done in the native language of the farmers to ensure that they understand the process. The finger print of the farmer is also collected as a form of identification. The identification process is also followed during the redemption of the e-wallet through the text message.

The service rate at the rural areas is also a major concern. Although the FMARD has no data on the service rate at the rural and urban areas, they claimed that the registration is being done at the Ward level instead of Local Government Council. The Ward is closer to the farmers than Local Government Council as one Local Government Council can have up to 10 Wards. This also will increase the registration and service point and bring it close to the farmers.

The GES through e-wallet is an improvement over voucher scheme because the voucher can easily be sold to someone else, but the text message directing farmer to collect fertilizer and agro-input cannot be easily sold as voucher. Nevertheless, the farmer may wish to sell his/her fertilizer after collection but this may not be rampant as the sales of voucher because of limited number of bags of fertilizer and agro-inputs(2 bags of fertilizer and 1 bag of maize or rice seeds) the farmers are entitled to get. The bulkiness of the fertilizer and inputs compared to voucher may discourage their possible reselling. The fact that the fertilizer and inputs received (2 bags of fertilizer and 1 bag of maize or rice seeds) are only sufficient to cultivate about one hectare of farmland (which is the average farm land in Nigeria) may also limit their potential for being resold to another farmers.

The major limitation to the GES scheme is the fact that not all the farmers can register. This is because the scheme is designed for 'core poor' farmers that are resource constrained and are not able

²⁷ <http://www.fmard.gov.ng/gesreport/2012/2012-Stats.htm>

²⁸ Available on the internet at <http://www.fmard.gov.ng/gesreport/2012/2012-Stats.htm>

to purchase fertilizer and agro-inputs at the competitive prices in the market. They are the ones that may be willing to go through the long process of registration at the registration centre, wait to receive text message from Cellulant (Service Provider) that will direct the farmers to designated centre for redemption of fertilizer and agro-inputs. The limitation of the number of the participating farmers will enable the government to accurately plan her fiscal burden and resources to make the scheme effective and efficient.

It should be said that opportunity for rent seeking is highly limited compared with fertilizer voucher or universal fertilizer subsidy schemes. The role of private sectors is also prominent in the supply and distribution of fertilizer. The scheme is one of the areas in which FGN and other tiers of government in Nigeria has cooperated well (World Bank, 2014).

Other countries have shown some sufficient interest in the GES scheme in Nigeria with possibility of adopting in their countries. For example a four (4) man study tour team came to Abuja from Malawi on Sunday 7th June, 2014, to under-study the implementation of the Growth Enhancement Support (GES) Scheme with a view to adopting the scheme in their country²⁹. The study tour team were in the country for one week (7 days) from 8th – 14th June, 2014, and during the tour period, they interacted with the relevant GES scheme stakeholders such as the Federal Ministry of Agriculture and Rural Development officials, Electronic technology platform provider (Cellulant Nigeria Limited), Supply Chain Managers, (IFDC, Jetlink & Ecalpemos) Input Suppliers, Agro-dealers and the benefitting farmers³⁰. Similar study tour team was in Nigeria last year 2013 from Tanzania to under study the GES scheme. FMARD (2014) claimed that about fifty-three (53) countries in Africa have indicated interest to under- study and implement the GES scheme because of its laudable achievements, impact and transparent mode of implementation.

According to FMARD Scorecard (2014), limited coverage of the rural areas by mobile phone networks continued to plague the redemption and reconciliation process in E-wallet Fertilizer Scheme. Although, this problem is being resolved through the pilot of a smart card technology that does not require network in the rural areas. Other challenges confronting the schemes are: registration of farmers started late and this created problems on the field because a number of farmers could not find their name on the farmer registers; reconciliation of claims had problems because documents submitted from the field has serious quality control problems; redemption center operations were not optimal due to the quality of staff and pressure of crowds during redemption; quality of backbone infrastructure were a problem with mobile networks degraded at the start of the season. This affected the quality of technology service delivery; poorly defined decision making prerogatives between the

²⁹ http://www.fmard.gov.ng/news_inside.php?nid=129

³⁰ The team is drawn from the Malawian Ministry of Agriculture and Food Security and African Institute of Corporate Citizenship.

state director, GES coordinator and supply chain manager led to an inability to effectively control key processes like agro-dealer selection on the field.

Table 2: Federal Government Information on Growth Enhancement Scheme(GES) (2012 to 2013)

Region	Participation		Redemption		Phone Owners		Inputs Received				2012 and 2013		
	Registered Farmers	Rolled out Farmers	No of Farmers Served	% Redeemed. Versus Registered	% of Farmers (2013)	% of Farmers (2012)	NPK (Unit of 50kg)	UREA (Unit of 50kg)	Maize (Unit of 10kg)	Rice (Unit of 12.5kg)	No of Farmers Served In 2012	No of Farmers Served In 2013	% Increase
North Central	1700585	1397696	1134506	67	58	39	1228851	1040161	374240	502248	218037	965971	429%
North East	2191351	1902688	1436135	66	63	27	1467291	1404980	333730	402375	366212	1008944	317%
North West	2412625	1574821	1664613	69	42	25	1693009	1636217	356116	874526	371773	1303856	318%
South - East	936029	775675	325494	42	71	48	353812	297077	134439	143440	34969	326107	924%
South-South	1188617	818210	474144	58	59	34	602201	346088	121528	432519	64464	426261	1685%
South-West	1082467	767184	208316	27	64	49	224434	198174	149915	34283	35218	210716	591%
National	9511674	7236274	5243210	55	60	37	5569698	4922697	1469968	2389392	1090673	4241855	711%

Source: FMARD (2014)

4.2 Preliminary Results and Discussion of Analysis of Accessibility to Agricultural Inputs by the Farmers in Nigeria

Until 2006, Nigeria implemented universal fertilizer subsidy scheme. In May 2006, the Federal Ministry of Agriculture and Rural Development, piloted a Fertilizer Voucher Program (FVP) in Kano and Bauchi States in 2008. The programme was expanded incrementally to other states in 2009 and 2010. As from March, 2011, the Federal Ministry of Agriculture and Rural Development designed and implemented the Growth Enhancement Scheme (GES) for implementation in all the States and FCT. GES premised on building on the Fertilizer Voucher Scheme to target beneficiaries through the electronic system (E-wallet). The three regimes in which the data were available are Universal Non-Voucher Fertilizer Regime (2004/2005), Voucher Fertilizer Regime (2010/2011) and E-wallet Fertilizer Regime (2012/2013).

Table 3 presents the proportion of the farmers that used fertilizer and other inputs during different fertilizer policy regimes. The table indicates that the proportion of farmers that applied fertilizer in Nigeria is low. It ranged from about 16% in 2004/2005 to 38% in 2012/2013 respectively. This position has been previously alluded to by Olayide et al (2010). Liverpool-Tasie et al (2010) indicated that fertilizer use in Nigeria is lower than that observed in other parts of the developing world, despite the fact that the country is experiencing deteriorating annual nutrient depletion. Fertilizer subsidy schemes were introduced to correct low fertilizer usage especially among smallholder farmers by making fertilizer price affordable by them, however, the information on Table 3 suggests that the proportion of farmers that used subsidized fertilizer is even lower. The table shows that the proportion of the farmers that used subsidized fertilizer increased from about 5% in 2004/2005 to 21% in 2010/2011 and then declined to about 16% in 2012/2013. This finding may cast doubt on the ability of GES (E-wallet) to significantly increase fertilizer application among farmers in Nigeria. It is interesting to know that the average amount of fertilizer used in 2010/2011 (46kg) was lower than the average amount of fertilizer purchased. This implies that is not all the fertilizer purchased that was used. This creates impression of fertilizer diversion or resale of fertilizer to well-to-do farmers that has a larger farm size that may need the fertilizer more than available subsidized quantities. Banful (2010) has also observed that farmers collected vouchers that they had no intention of using or could not afford to use. They rightly predicted that there would be periods of shortage of vouchers and sold the vouchers to other farmers who desperately needed to apply fertilizer.

Another important information in Table 3 is that the low use of fertilizer also affected other inputs. For example, the proportion of the farmers that applied herbicides and pesticides (agro-chemicals) increased from about 15% and 14% in 2004/2005 to about 27% and 15% in 2012/2013 respectively. The proportion of the farmers that made use of modern equipment such as tractors, ridgers, harvesters and planters were about 4% and 5% respectively. UNECA (2009) reports that SSA has 13 tractors/100km² of arable land compared with seven (7) tractors/100km² in Nigeria (World

Bank, 2011). Such low level of mechanization can compromise productivity. Low productivity of crops in Nigeria has been predicated on the low use of inputs (FAO, 2008). Without increased use of modern equipment, improved inputs, agrochemicals, fertilizers, improved seeds and soil, agricultural productive potential in Nigeria may not be realized (Alabi, 2014).

Table 3 : Fertilizer and Other Inputs Used During Different Fertilizer Policy Regimes in Nigeria

	Non- fertilizer 2004/2005	2010/2011	2012/2013
	Fertilizer Subsidy(Non-Voucher)	Fertilizer Subsidy (Voucher)	Fertilizer Subsidy (E-wallet)
% of farmers who used Fertilizer	15.90	38.84	37.70
% of Farmers who used Subsidized Fertilizer	5.25	21.02	16.40
Quantity of Fertilizer Purchased	-	112.20kg	-
Quantity of Fertilizer Purchased and Used	-	45.61kg	143.23
% of farmers who used herbicide	14.90	24.70	27.30
% of Farmer who used pesticide	14.10	13.80	14.70
% of Farmers who used modern agricultural equipment	-	3.46	4.74
% of Farmers who rented modern agricultural equipment	-	4.50	2.30

Source: Computed by the Authors

High cost of inputs may accounts for low use of productive factor among farmers in Nigeria. This is evident in Table 4, as it reveals that farmers spent N35349 and N30516 on farm inputs in 2010/2011 and 2012/2013 respectively. Comparing these figures with per capita GDP of N149352 (996USD) and N168349(1052USD) in 2011 and 2013, this translated to 24% and 18% of per capita GDP respectively in 2010/2011 and 2012/2013³¹. This becomes significant if we realized that Nigeria is high income inequality country and that most of these farmers are poor and spent about 70% of their income on food (Kuku-Shittu,et al, 2013). High cost of inputs has been attributed to low inputs use and productivity among farmers in Nigeria(Liverpool- Tasié, et al 2011).

During the Voucher Fertilizer Subsidy participating farmers were provided with vouchers, which were redeemable at certified agricultural input dealers within their local government of residence. The voucher provided a N2,000 discount per bag on two bags of Nitrogen Phosphorous Potassium (NPK 15:15:15) and one bag of Urea. Farmers were required to pay the difference between the market price and the N2,000 discount per bag (Liverpool-Tasié, et al, 2010a). In the case of E- wallet, the scheme guarantees registered farmers E-wallet vouchers with which they can redeem 2 bags of fertilizer and a bag of seeds (which may be rice or maize) from agro-dealers at 50% of the cost, the other half being borne by the federal government and state government in equal ratios. This suggests that compared with Voucher Fertilizer Subsidy Scheme, E-Wallet delivers less fertilizer (2 bags of fertilizer compared with 3bags of fertilizer during Voucher Fertilizer Subsidy Scheme) but provides additional inputs such as maize or rice seeds. This may be the reason why the cost of seed payment borne by the farmers reduced from N2974 in 2010/2011 to N2687 in 2012/2013.

It is of note that fertilizer is not the most expensive cost item in Table 4, even if we account for 21% and 16% of the farmers that purchased subsidized fertilizer in 2010/2011 and 2012/2013 respectively. For instance, while renting of modern agricultural equipment accounted for about 49% and 46%, cost of fertilizer of accounted for about 29% and 25% of cost of items in 2010/2011 and 2012/2013 respectively. The fact that fertilizer is not the most expensive cost item call to question the serious focus Federal government of Nigeria has put only on fertilizer subsidy. This reflected on the fact that despite low budget allocation and fund release to agriculture, expenditure on fertilizer subsidy alone was usually over 50% of the agricultural capital budget in Nigeria (NTWG, 2009)³². The recent available figure indicates that subsidy payment constituted about 43% of agriculture capital expenditure of Federal Government of Nigeria in between 2008 and 2010 and that 60% of the total agriculture expenditure was capital expenditure (Olomola et al, 2014; Nwoko et al, 2013).

³¹ <http://data.worldbank.org/country/nigeria>

³² <http://www.npc.gov.ng/downloads/Agriculture%20&%20Food%20Security%20NTWG%20Report.pdf>

Table 4: Cost of Fertilizer and other Variable Inputs (Naira) Used During Different Fertilizer Policy Regimes in Nigeria

	2010/2011		2012/2013	
Cost	Fertilizer Subsidy (Universal Fertilizer)	%Contribution	Fertilizer Subsidy (E-wallet)	%Contribution
Fertilizer	10084	28.53	7756	25.42
Herbicide	266	0.76	2357	7.72
Pesticide	4821	13.64	3650	11.96
Equipment Rent	17204	48.67	14066	46.09
Seed	2974	8.40	2687	8.81
Total	35349	100	30516	100

Source: Computed by the Authors

The capital constraints of the farmers could have been addressed if they have access to credit market from where they can borrow money to finance their farming activities. The important role of credit in agricultural enterprise development and sustainability has prompted the Federal Government of Nigeria (FGN) to establish credit schemes such as the Agricultural Credit Guarantee Scheme (ACGS) and Agricultural Credit Support Scheme (ACSS) to ensure farmers' access to agricultural credit³³. However, it is clear from Table 5 that none of the farmers in the sample got loan from Government sources in Nigeria in 2010/2011 and 2012/2013. In 2004/2005, only about 2% got their loan from Government sources. The fact that majority of Nigerians have not benefited from government loan has been alluded to by Akramov (2009). when he stated that accessibility to credit has not improved substantially in Nigeria. The tables shows that the major source of credit to famers is through informal sources(about 13% and 18% in 2010/2011 and 2012/2013 respectively, while only about 2% of the farmers go their credit through formal credit sources during the period under consideration. Enhancing Financial Innovation and Access (EFInA) (2008) notes that 23 percent of the adult population in Nigeria has access to formal financial institutions, 24 percent to informal financial services, while 53 percent are financially excluded. The implication of this is that, while accessibility to formal and informal credit (23% and 24%) is generally low in Nigeria, is more lower for famers with accessibility of 2% to formal credit financial services³⁴. The problem with informal credit is that the volume of the credit can be small, This may explain the fact that the mean loan received by farmers in 2004/2005 was N23412, which may not be enough to finance the input expenditure of the famers estimated in Table 4. The N23412 estimated as the average loan size received by the famers is close to N20, 000 as the maximum available credit under the ACGS without tangible security.(Badiru, 2013). Oke *et al* (2007) also found that the average loan size from NGO-MFIs institutions to farmers in southwest Nigeria was N23, 551.25, while actual loan amounts ranged from N5, 000 to N90, 000. Many factors have been attributed to low accessibility to formal loans by farmer in Nigeria. According to Okojie et al (2010), the lack of bank accounts, collateral, and information regarding the procedure for accessing credits from banks limit access to credit from formal institutions. Table 5 shows that only about 15% and 16% of the farmers have bank accounts in 2010/2011 and 2012/2013 respectively. The importance of credit to reduce the capital constraints of Nigerian farmers have been emphasized by various scholars. Badiru (2013) posited that timely credit provision facilitates the timely acquisition of farm inputs, which help farmers improve their livelihood. Odoemenem and Obinne (2010) reported that productivity and growth are hindered by limited access to credit facilities by the farmers.

³³ <http://www.ifpri.org/sites/default/files/publications/nsspnp25.pdf>

³⁴ It is estimated that only 2.5 percent of total Commercial Bank loans and advances is directed at agriculture in Nigeria (CBN 2008).

Table 5: Financial Institutions and Accessibility to Credit by Farmers in Nigeria

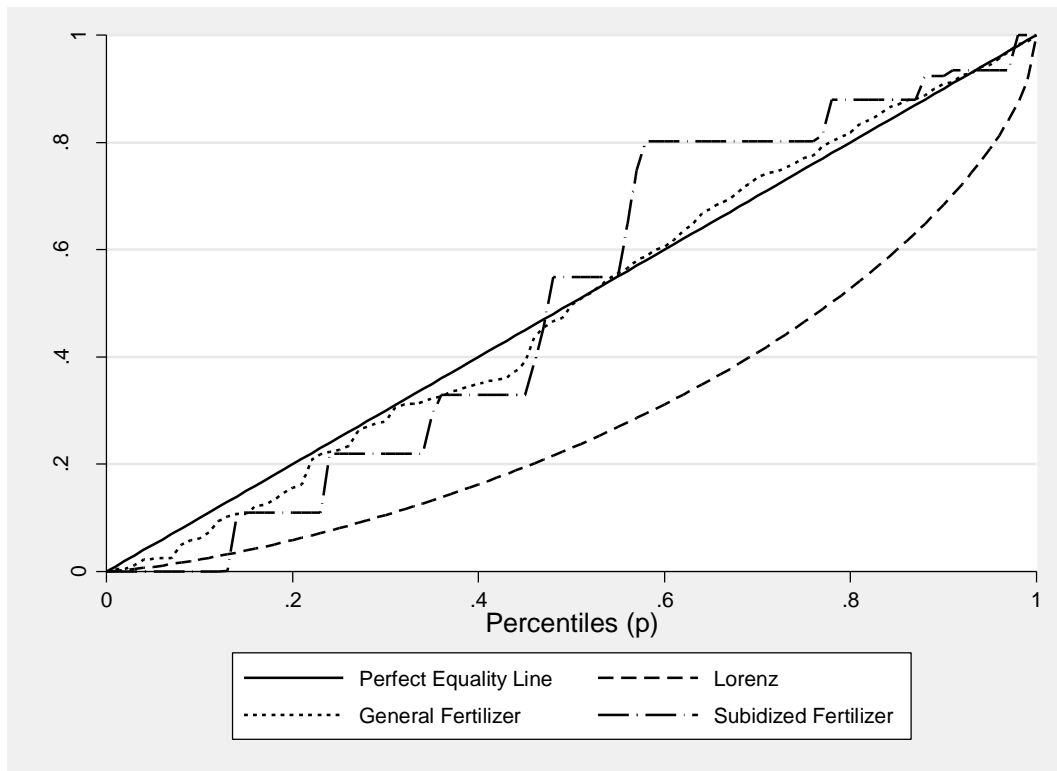
Institutions	2004/2005	2010/2011	2012/2013
Cooperative Society	10.83	52.15	37.01
Saving Association	8.33	16.67	47.76
Micro-Finance	0.42	18.28	9.85
Bank	4.16	12.90	5.37
Government Agencies	2.29	-	-
NGO	1.46	-	-
Friend and Relative	54.79	-	-
Other Informal Sources	26.04	-	-
Average amount of Loan	N23412	-	-
Accessibility			
% of Farmers with Bank Account	-	15.52	15.78
% of Farmers that used Informal Credit Sources	-	13.24	17.95
% of Farmers that used formal Credit Sources	-	1.52	2.32
% of Farmers that used Insurance Scheme	-	0.28	1.01

Source: Computed by the Authors

4.3 Preliminary Results and Discussion of Analysis of Pro- Poorness of Fertilizer Subsidy Scheme in Nigeria

In testing the pro-poorness of Universal Fertilize Subsidy Scheme, we compared the Lorenz of farmland size with concentration curve of accessibility to Universal Fertilize Subsidy Scheme 2004/2005 and General Fertilizer (subsidized fertilizer and fertilizer at the market price) in Figure 2. Figure 2 shows that although the concentration curves of accessibility to Universal Fertilize Subsidy Scheme and General Fertilizer lie above the Lorenz curve they are not far above the line of perfect Equality which is the condition that can make them pro-poor. The fact that they lies above Lorenz suggests that fertilizer subsidy during Universal Fertilize Subsidy Scheme was more evenly distributed than farmland in Nigeria. Since the concentration curves cut across the Line of Perfect Equality, the final decision about their pro-poorness can only be taken using the concentration indices presented in Table 6.

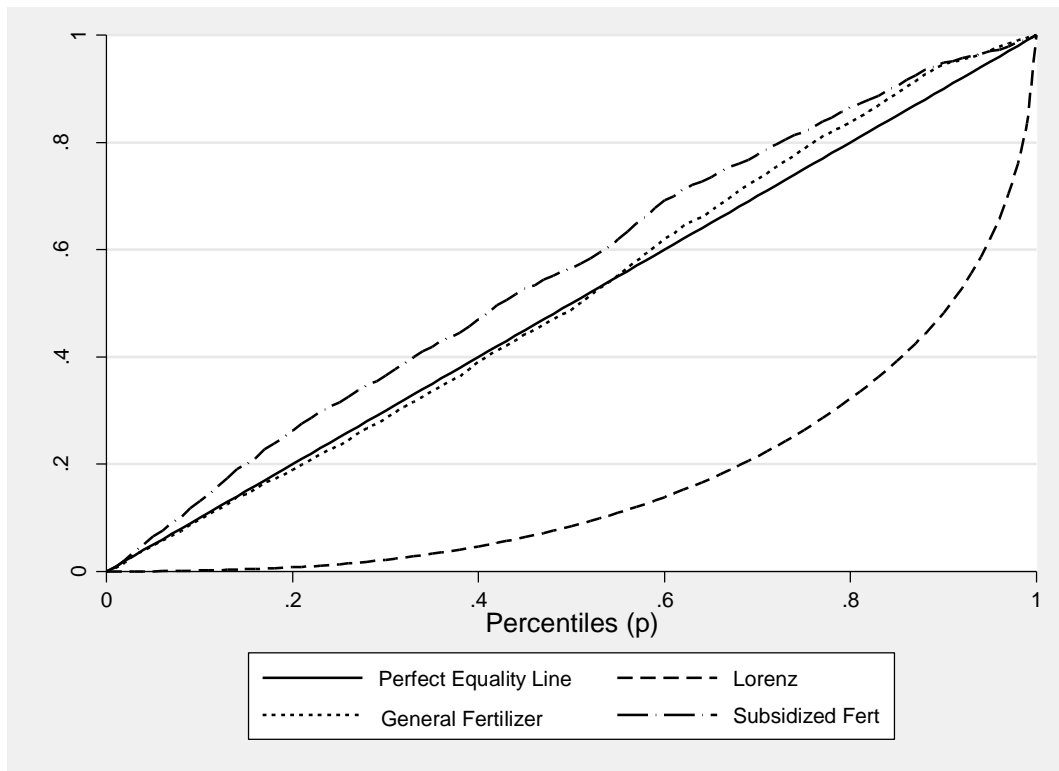
Figure 2: Lorenz and Concentration Curves of Participation in Universal Fertilizer Scheme in Nigeria



Source: Computed by the Authors

In Figure 3 we compared the Lorenz of farmland size with concentration curve of accessibility to Voucher Fertilizer Subsidy Scheme and General Fertilizer (subsidized fertilizer and fertilizer at the market price) in 2010/2011. This was done to answer the question of pro-poorness of Voucher Fertilizer Subsidy. Figure 3 shows that the concentration curve of accessibility to fertilizer subsidy lies above the Line of Perfect Equality and concentration curve of accessibility to general fertilizer (subsidized fertilizer and fertilizer at the market price) in Nigeria. This suggests that accessibility to fertilizer through Voucher Fertilizer Subsidy Scheme seems to be pro-poor than accessibility to general fertilizer (subsidized fertilizer and fertilizer at the market price). This implies that removal of Voucher Fertilizer Subsidy Scheme without removing the structural, market, credit and capital constraint that hinder accessibility to fertilizer may limit the accessibility to fertilizer by the poor farmers in Nigeria. Zoe and Barreiro-Hurle(2012) have isolated limited access, lack of physical access to fertilizer, lack of credit facility among the constraints limiting accessibility to fertilizer in Sub-Saharan Africa. Since Lorenz curve lies below concentrative curve of accessibility to Voucher Fertilizer Subsidy Scheme suggests that fertilizer subsidy is more evenly distributed than farmland in Nigeria.

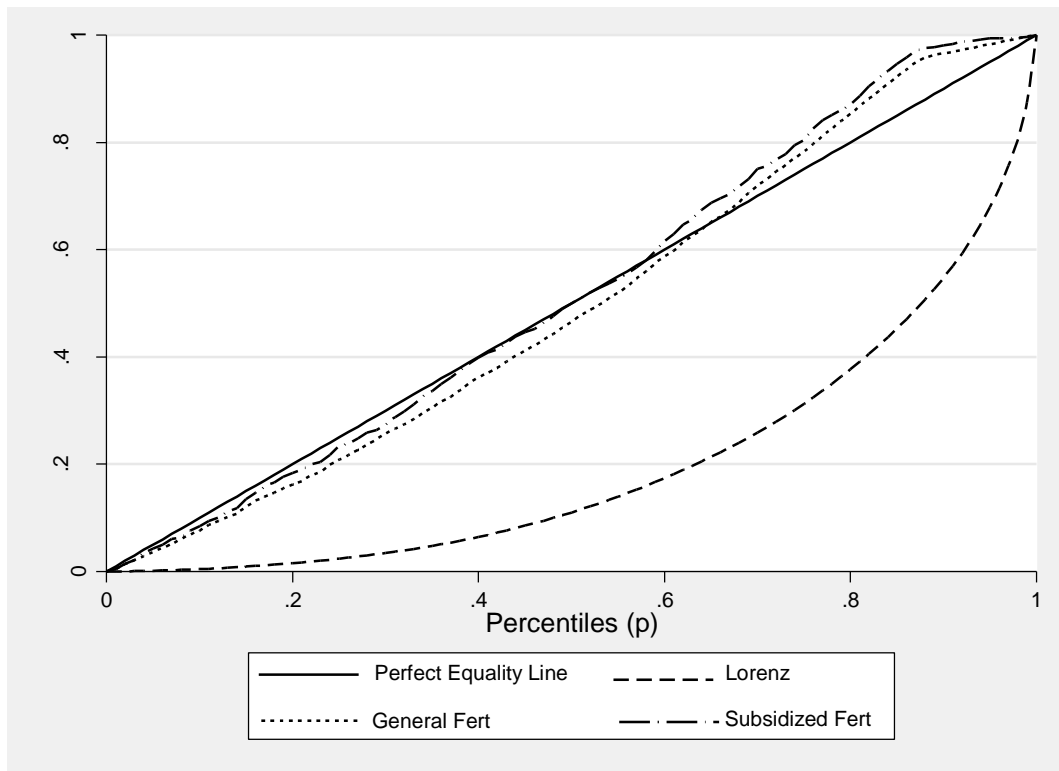
Figure 3: Lorenz and Concentration Curves of Participation in Voucher Fertilizer Scheme in Nigeria



Source: Computed by the Authors

We compared the Lorenz Curve of farmland size with concentration curve of accessibility to E-wallet fertilizer subsidy scheme in 2012/2013 and General Fertilizer (subsidized fertilizer and fertilizer at the market price) in Figure 4. Figure 4 shows that although the concentration curves of accessibility to E-wallet fertilizer subsidy scheme and General Fertilizer lie above the Lorenz curve it is not far above the line of perfect Equality which is the condition that can make them pro-poor. The fact that they lie above Lorenz curve suggest that accessibility to fertilizer during E-wallet Subsidy Scheme is more evenly distributed than farmland in Nigeria. The observation that fertilizer subsidy is more pro-poor than farmland during Voucher and E-wallet Fertilizer Subsidy Scheme implies that farm size inequality is very real in Nigeria and should be given some consideration. For example, 2010/2011 dataset reveals that the mean farm size in 2010/2011 was 6156m² with standard deviation of 15852m². However, since the concentration curves cut across the Line of Perfect Equality, the final decision about their pro-poorness can only be taken using the concentration indices presented in Table 6.

Figure 4: Lorenz and Concentration Curves of Participation in E-wallet Fertilizer Scheme in Nigeria



Source: Computed by the Authors

As it has been previously indicated fertilizer subsidy has been central to the agricultural policy direction of Nigeria and is anchored on the ground of equity considerations (Crawford et al, 2005) and the Government felt that it can be used as a mechanism for dealing with skewed income distribution in Nigeria. In Table 6, we examined the benefit incidence of fertilizer (using the rate of farmer's participation in the fertilizer scheme) during different fertilizer subsidy policy regimes in Nigeria to check which of the income group benefited most than the others in fertilizer subsidy in Nigeria. The table shows that, based on concentration indices, fertilizer subsidy is more pro-poor during Fertilizer Voucher scheme (-0.1150) than during E-wallet Fertilizer scheme (-0.0304), which is more pro-poor than Non-Voucher Scheme (0.0099). This confirmed our earlier observations in Tables 2 to 4. Apart from concentration indices, the distribution of fertilizer subsidy across the income quintiles reveals that, while the poorest and richest income groups shared about 26% and 14% of fertilizer during Voucher Scheme respectively, the shares of the poorest and richest income groups in E-wallet fertilizer scheme were 18% and 13% respectively. The poorest and richest income groups shared 17% and 21% of fertilizer subsidy during Universal Fertilizer scheme. The fact that Universal Fertilizer scheme was not pro-poor may be the reason for its replacement with Voucher Programme as a Policy Instrument in Nigeria. The Advantage of Fertilizer Voucher Scheme over the universal fertilizer subsidy scheme in Malawi has been emphasized by Denning et al (2009). However,

Dorward and Chirwa (2011) showed that the use of voucher as smart subsidy had similar shortcomings just like the universal subsidy programme in Malawi.

In a specific case study of Kano and Taraba states in Nigeria, Liverpool-Tasie, et al (2010a) recorded that participating farmers in Voucher Fertilizer programme significantly increased the likelihood of receiving fertilizer and increased the quantity of subsidized fertilizer received compared to non-participants. They also indicated that the farmers participating in Voucher Fertilizer programme paid significantly lower prices compared to those who purchased directly from the market. However, they indicated that timeliness of fertilizer availability during the Voucher Fertilizer programme appears to be beyond farmer control. Banful (2010) revealed that Voucher Fertilizer programme in Ghana, though very innovative, has the potential to experience at least some of the significant pitfalls of Universal Fertilizer subsidy programme in Ghana. He concluded that current innovations(Voucher Fertilizer programme in Ghana) are not enough to make the new fertilizer subsidy programme(Voucher Fertilizer programme) economically and socially efficient.

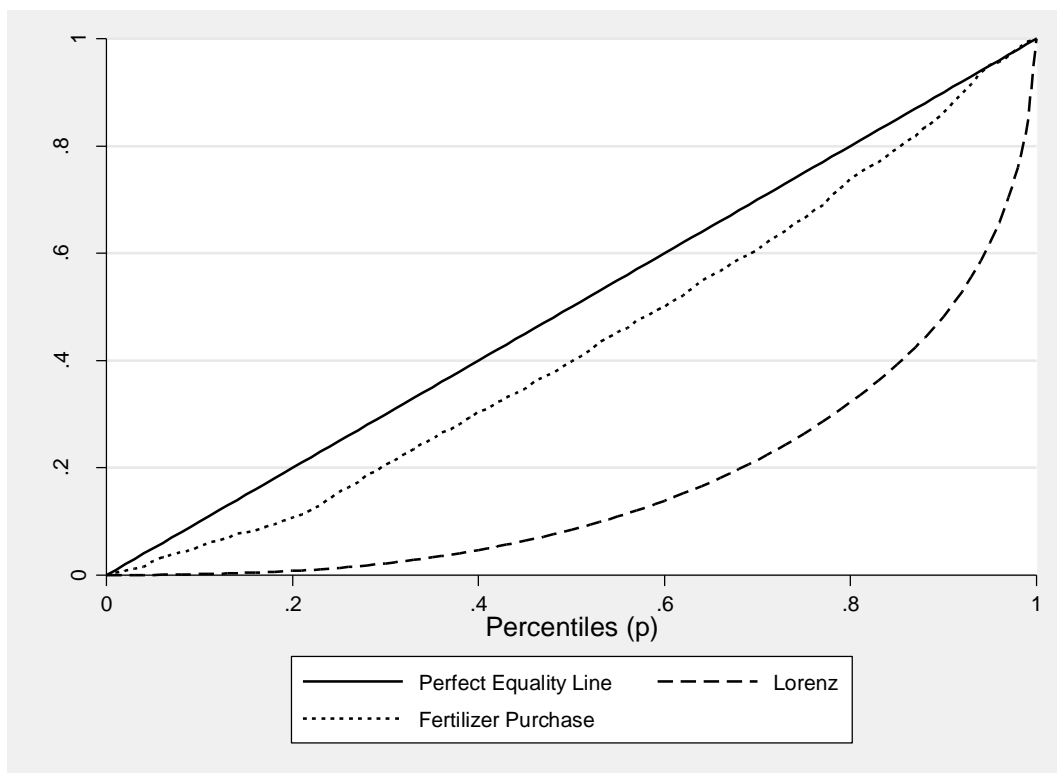
Table 6: Benefit Incidence of Fertilizer Subsidy (Participation Rate) During Fertilizer Policy Regimes in Nigeria

	Non- fertilizer 2004/2005	2010/2011	2012/2013
	Fertilizer Subsidy (Universal Fertilizer)	Fertilizer Subsidy (Voucher)	Fertilizer Subsidy (E-wallet)
Gini of Expenditure/ Farmland Size	0.4114	0.6581	0.6004
Concentration Index of Fertilizer Subsidy	0.0099	-0.1150	-0.0304
	Quintile Share (%)		
Poorest	16.90	26.20	18.30
Poor	19.60	20.80	21.50
Average	24.40	22.20	21.80
Rich	18.10	17.30	25.30
Richest	21.10	13.50	13.00
Total	100.00	100.00	100.00

Source: Computed by the Authors

Since accessibility to fertilizer subsidy may not translate to purchase of fertilizer if there are structural, market, credit and capital constraint that hinder the purchase of the fertilizer(Zoe and Barreiro-Hurle, 2012). It is in the light of this we examined the pro-poorness of Voucher and E-wallet Fertilize Subsidy Scheme using quantity of farmers that purchased fertilizer during the regimes. We compared the Lorenz of farmland size with concentration curve of quantity of fertilizer purchased during Voucher Fertilize Subsidy Scheme in 2010/2011 in Figure 5. Figure 5 shows that the concentration curves of quantity of fertilizer purchased during Voucher Fertilize Subsidy Scheme lies above the Lorenz curve but it is below the line of Perfect Equality, which means that Voucher Fertilize Subsidy Scheme is not pro-poor if we consider the quantity of fertilizer purchased by the farmers during the regime. This finding about the pro-poorness of Voucher Fertilize Subsidy Scheme will be confirmed using its concentration index presented in Table 7.

.Figure 5: Lorenz and Concentration Curves of Using Voucher Fertilizer Scheme in Nigeria

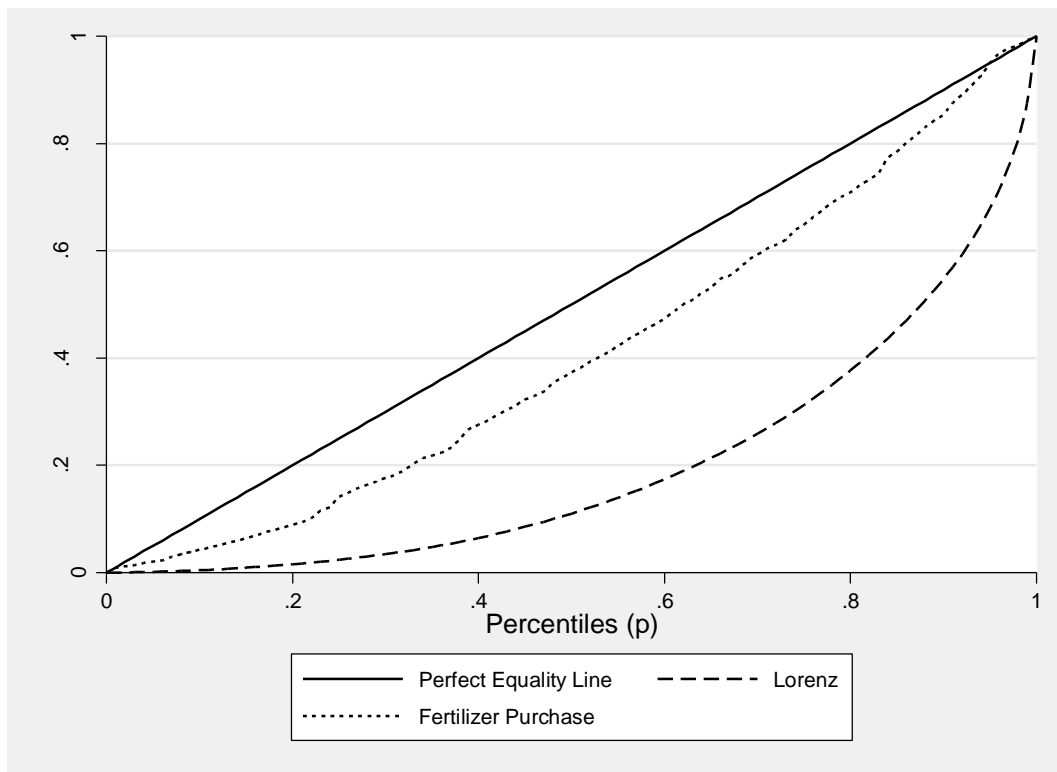


Source: Computed by the Authors

In the case of E-wallet Fertilizer Subsidy Scheme, we compared the Lorenz of farmland size with concentration curve of quantity of fertilizer purchased during E-wallet Fertilizer Subsidy Scheme in 2012/2013 in Figure 6. Figure 6 shows that the concentration curves of quantity of fertilizer purchased during E-wallet Fertilizer Subsidy Scheme lies above the Lorenz curve but it is below the line of Perfect Equality, which means that E-wallet Fertilizer Subsidy Scheme also is not pro-poor if we consider the quantity fertilizer purchased by the farmers during the regime. This

finding about the pro-poorness of E-wallet Fertilizer Subsidy Scheme will be confirmed using its concentration index presented in Table 7.

Figure 6: Lorenz and Concentration Curves of Using E-wallet Fertilizer Scheme in Nigeria



Source: Computed by the Authors

In Table 7, we went further to compare the pro-poorness of Voucher Fertilizer Subsidy Scheme (using the quantity of Fertilizer farmers purchased) with the newly introduced system that administer fertilizer subsidy using E- wallet. Generally, fertilizer subsidy schemes during the two policy era were not pro-poor but based on concentration indices which confirmed the observations made from Figures 5 and 6. Table 7 suggests that fertilizer subsidy is slightly more pro-poor during Fertilizer Voucher scheme (0.1143) than during E-wallet Fertilizer scheme(0.1813), Apart from concentration indices, the distribution of fertilizer subsidy across the income quintiles reveals that middle income group(22.40%) and the rich (24.10%) benefited slightly more in E-wallet system than during the Fertilizer Voucher regime. The share of the middle income group and the rich during Fertilizer Voucher scheme were (21.80%) and (24.00%) respectively. Middle income earners who are mostly government workers can include their names as small scale farmers during the registration exercise during E-wallet Fertilizer Subsidy Scheme.

We also considered the share of the poor and non-poor in government expenditure on fertilizer subsidy in 2010/2011 and 2012/2013 in Table 7. The table reveals that the share of the rich(N6090 million) and the richest(N8070million) income group in government expenditure on fertilizer subsidy were 3 and 4 times higher than the share of the poorest quintile(N1979 million)

respectively. The same trend is evident in 2012/2013 as the share of the rich (N6813 million) and the richest (N8735 million) income group were 3 and 4 times higher than the share of the poorest quintile (N2262 million) respectively. The implication of this is that the rich and richest farmers are the immediate beneficiaries of fertilizer subsidy scheme that are designed to assist poor small-scale farmers.

The major shortcoming of E-wallet over that of Voucher scheme is the use of mobile phone, which may add to the cost profile of the farmers. Majority of the farmers may not own mobile phones and if they have may not have electricity to charge them or lack mobile network especially in the rural areas. In fact, relating purchase of subsidized fertilizer with accessibility to mobile phone in 2012/2013 dataset, revealed that 79% of those that purchased subsidized fertilizer owned mobile phone. Low accessibility to mobile phone may affect the pro-poorness of E-wallet Fertilizer Scheme and its effectiveness. FMARD has also underscored the importance of this finding in its recent review of the scheme and proposed to improve on it. According to FMARD Scorecard (2014), limited coverage of the rural areas by mobile phone networks continued to plague the redemption and reconciliation process in E-wallet Fertilizer Scheme. The FMARD claimed that this problem is being resolved through the pilot of a smart card technology that does not require network in the rural areas.

Table 7: Benefit Incidence of Fertilizer Subsidy (Quantity Purchased Fertilizer) Used During Fertilizer Policy Regimes in Nigeria

	2010/2011		2012/2013	
	Fertilizer Subsidy (Voucher)		Fertilizer Subsidy (E-wallet)	
Gini of Farmland Size	0.6581		0.6004	
Concentration Index of Fertilizer Subsidy	0.1443		0.1813	
	Quintile Share (%)	Share in Fertilizer Expenditure (Nm)	Quintile Share (%)	Share in Fertilizer Expenditure (Nm)
Poorest	7.80	1979.31	8.00	2261.59
Poor	14.60	3704.85	14.60	4127.42
Average	21.80	5531.95	22.40	6332.45
Rich	24.00	6090.19	24.10	6813.04
Richest	31.80	8069.51	30.90	8735.39
Total	100.00	25375.81	100.00	28269.89

Source: Computed by the Authors

Table 8 reveals that gender bias is not a serious problem in fertilizer subsidy schemes during different fertilizer subsidy schemes in Nigeria. The share of the women in fertilizer subsidy declined from about 50% during the Fertilizer Voucher scheme to 48% in E-wallet Fertilizer Scheme. Many of the researchers on fertilizer subsidy did not isolate gender bias as a major problem in accessing subsidized fertilizer in Nigeria (Olomola et al, 2014). However, wealth and education were distinguishing factors associated with participation in fertilizer subsidy. This indicates that the poorest and least educated farmers might have been excluded either due to cumbersome program requirements or limited resources (Liverpool-Tasie, et al, 2010a). Table 8 confirms that education correlates positively with accessibility to fertilizer in the two regimes. The table shows that those that attended formal schools shared about 70% and 64% of fertilizer subsidy during Fertilizer Voucher and E-wallet Fertilizer Schemes respectively. Education may be positively correlated with income and awareness of the farmers on the need to apply fertilizer and these will increase the possibility of the educated farmers purchasing and applying fertilizer. This is consonance with the findings of Liverpool-Tasie, et al (2010a) who observed that the participants in the voucher program in Kano were mainly farmers who had used subsidized fertilizer in the past and were formally educated.

Table 8: Share of Fertilizer Subsidy According to Gender and Literacy Levels During Fertilizer Policy Regimes in Nigeria

	2010/2011	2012/2013
	Fertilizer Subsidy (Voucher)	Fertilizer Subsidy (E-wallet)
	Gender Share (%)	
Male	50.49	51.78
Female	49.51	48.22
	Literacy Levels (%)	
Literate	57.36	53.46
Non-Literate	42.64	46.54
	Formal School Attendance (%)	
Attended School	70.60	63.72
No School Attendance	29.40	36.28

Source: Computed the Authors

Poverty is pervasive across Nigeria with 61 percent of the population estimated to live on less than a dollar a day and 69 percent living below the relative poverty line (NBS, 2012c). Poverty is not equally distributed, with the highest proportion of poor in the North East and North West zones. Poverty is also higher in rural areas than urban. Therefore, a pro-poor fertilizer scheme should favour North East, North West zones and rural area that has the highest concentration of the poor in Nigeria. It is in the light of this we examined the distribution pattern of fertilizer subsidy based on location and regions in Nigeria in Table 9. The table shows the share of the rural in fertilizer subsidy declined from

about 55% to 49% during Fertilizer Voucher and E-wallet Fertilizer Schemes respectively. This implies that Fertilizer Voucher subsidy scheme benefited rural areas more than E-wallet Fertilizer subsidy scheme in Nigeria. It has been indicated that rural area may be at disadvantage in participating in E-wallet Fertilizer subsidy scheme because of poor quality of mobile phone infrastructure in Nigeria (FMARD Scorecard, 2014).

The regional distribution of fertilizer subsidy during Fertilizer Voucher and E-wallet Fertilizer Schemes favoured North East and North West zones. The shared of North East and North West zones in Fertilizer Voucher schemes were 30.60% and 38.10% respectively. The shared of North East and North West zones increased to 30.90% and 46.90% respectively in E-wallet Fertilizer subsidy scheme respectively. The FMARD(2014) has also shown that more farmers in North East and North West zones were served with subsidized fertilizer using E-wallet than any other regions in Nigeria. This maybe one of the reasons that E-wallet Fertilizer subsidy scheme is being praised in the Northern part of Nigeria.

Table 9 : Location and Regional Share of Fertilizer Subsidy (Quantity) During Fertilizer Policy Regimes in Nigeria

	2010/2011	2012/2013
	Fertilizer Subsidy (Voucher)	Fertilizer Subsidy (E-wallet)
	Location Share(%)	
Rural	54.85	48.62
Urban	45.15	51.38
	Regional Share(%)	
North Central	21.40	15.70
North East	30.60	30.90
North West	38.10	46.90
South - East	6.30	4.20
South-South	3.60	2.00
South-West	0.80	0.30
Total	100.00	100.00

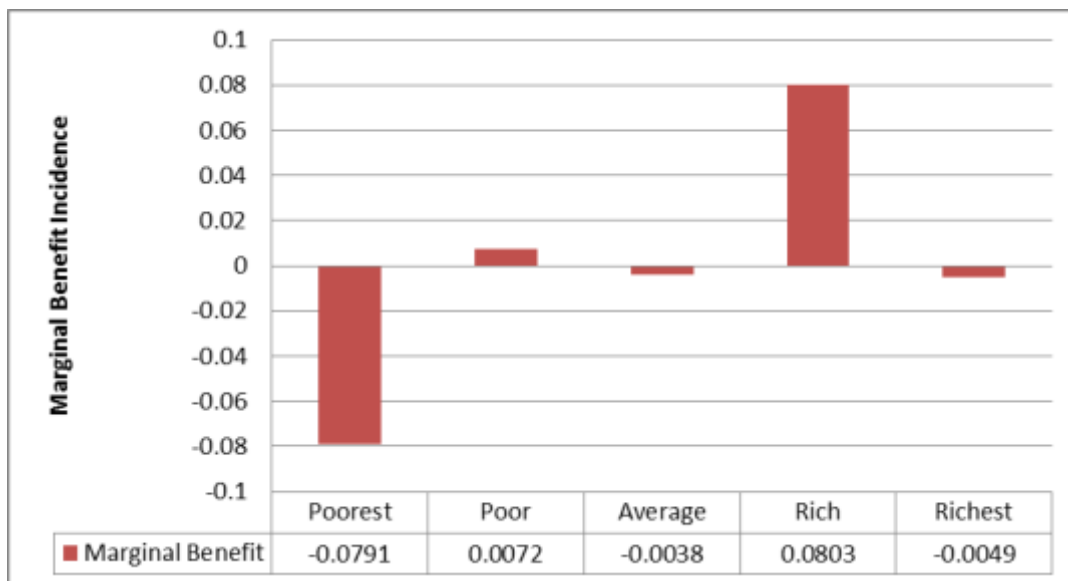
Source: Computed the Authors

4.4 Preliminary Results and Discussion of Analysis of Marginal Benefit of Fertilizer Subsidy in Nigeria

The benefit incidence analysis reported so far will be a useful guide in an efforts to redistribute current subsidy among the poor and non-poor, but did not indicate what we happen if there is cut or increase in fertilizer subsidy. We conducted marginal benefit incidence to answer the question of impact of cut or increase in fertilizer subsidy expenditure on the poor and non-poor in

Nigeria. Figure 7 reveals that if fertilizer subsidy expenditure increased by 100% (double) the share of the poorest (core poor which is the target of E-wallet fertilizer subsidy), will decline by about 8% (-0.0791) and the share of the rich will increase by 8% (0.0803). It has been indicated that only about 16% of the farmers participated in E-wallet fertilizer scheme. The accessibility (participation) rate in E-wallet fertilizer scheme were 15%, 18%, 18%, 21% and 11% for the poorest, poor, average, rich and richest quintile respectively as presented in Table 10. The table indicates that marginal benefit in E-wallet fertilizer scheme increases with accessibility to E-wallet Fertilizer subsidy. The poorest income group that has the lowest accessibility rate (15%) to E-wallet has the lowest marginal benefit (-0.0791), while the rich quintile with highest accessibility rate (21%) has the highest marginal benefit (0.0803). The finding suggests that the poor's initial rate of access to fertilizer subsidy may determine the relative extent to which the poor will be benefit from the expansion of fertilizer subsidy. Alabi and Admas (2014) has also reported that the poorest group only benefits more than the richest group from extra spending on public services in Nigeria in which they already have relatively high access or participation rate. The structural constraints that limit the participation of the poor in fertilizer subsidy will also hinder their share of the subsidy if there is expansion of fertilizer scheme in Nigeria.

Figure 7: Marginal Benefit Incidence of Fertilizer Subsidy in Nigeria



Source: Computed by the Authors

Table10 :Marginal Benefit and Accessibility to E-wallet Fertilizer Subsidy by the Farmers

Quintile	Marginal Benefit	Accessibility Rate
Poorest	-0.0791	15
Poor	0.0072	17
Average	-0.0038	18
Rich	0.0803	21
Richest	-0.0049	11
Average		16

Source: Computed by the Authors

5.0 Preliminary Conclusion and Recommendations

The study indicates that the proportion of farmers that applied fertilizer in Nigeria is low. It ranged from about 16% in 2004/2005 to 38% in 2012/2013. The percentage of farmers that used subsidized fertilizer is even lower. It ranged from about 5% in 2004/2005 to 21% in 2010/2011 and then declined to about 16% in 2012/2013. We also observed that accessibility to fertilizer in Nigeria can be worst off in the absence of fertilizer subsidy scheme, if the structural, market, credit and capital constraints that hinder accessibility to fertilizer are not eliminated in Nigeria. The low usage of other inputs is also noticed in the study. This was attributed to capital and credit constraints that Nigerian farmers are confronted with.

The pro-poorness analysis suggests that while Voucher Fertilizer Subsidy Scheme seems to be more pro-poor than E-wallet Fertilizer Scheme on the basis of accessibility, none of them was pro-poor when the analysis is done on the basis of quantity of fertilizer purchased. The study observed that the major shortcoming of E-wallet over that of Voucher scheme is the use of mobile phone, which may add to the cost profile of the poor farmers. In fact, relating purchase of subsidized fertilizer with accessibility to mobile phone in 2012/2013 dataset, revealed that 79% of those that purchased subsidized fertilizer owned mobile phone. Low accessibility to mobile phone may affect the pro-poorness of E-wallet Fertilizer Scheme and its effectiveness.

On that basis of the share of the poor in Government expenditure on fertilizer subsidy, the study shows that the share of the rich (N6090 million) and the richest (N8070million) income group were 3 and 4 times higher than the share of the poorest quintile(N1979 million) respectively in 2010/2011 in Government expenditure on fertilizer subsidy . The same trend was noticed in 2012/2013, as the share of the rich (N6813 million) and the richest (N8735 million) income group were 3 and 4 times higher than the share of the poorest quintile(N2262 million) respectively. The implication of this is that the rich and richest farmers are the immediate beneficiaries of fertilizer subsidy scheme that are designed to assist poor small-scale farmers in Nigeria.

Apart from income profile, the study shows that education was a distinguishing factor associated with purchasing fertilizer during fertilizer subsidy scheme in Nigeria. This study confirms

that education correlates positively with accessibility to fertilizer during Fertilizer Voucher and E-wallet Fertilizer Schemes. It shows that those that attended formal schools shared about 70% and 64% of fertilizer subsidy during Fertilizer Voucher and E-wallet Fertilizer Schemes respectively.

The marginal benefit analysis reveals that if fertilizer subsidy expenditure increased by 100% (double) the share of the poorest (core poor which is the target of E-wallet fertilizer subsidy), will decline by about 8% (-0.0791), while the share of the rich will increase by 8% (0.0803). The study also indicated that the marginal benefit in E-wallet fertilizer scheme increases with initial accessibility to E-wallet Fertilizer subsidy. The finding suggests that the poor's initial rate of access to a fertilizer may determine the relative extent to which the poor will be benefit from the expansion of the fertilizer subsidy scheme. The conclusion is that any constraints that limit the accessibility of the poor farmers to fertilizer subsidy will also hinder their share of the fertilizer subsidy even the government spend more on fertilizer subsidy scheme in Nigeria.

All these findings may cast doubt on the ability of E-wallet Fertilizer Scheme to significantly increase fertilizer application among farmers in Nigeria. Based on these findings we recommend that the Federal Government should phase out fertilizer subsidy gradually. After 2016, which is the final year of E-wallet, fertilizer subsidy be replaced with virile fertilizer market that will sell fertilizer at cheaper price. This can be made possible by encouraging local production of organic and inorganic fertilizer by private fertilizer firms. All the fertilizer importing firms should be mandated to open their fertilizer manufacturing firms between now and next year. In 1980s Nigeria has produced more than 50% of total domestic fertilizer supply, hence, the country can produce more than 1980s using the considerable resources available in Nigeria.

Capital constraint is a limiting factor to accessibility to fertilizer in Nigeria. About N25376 Million and N28270 Million spent on fertilizer subsidy in 2010 and 2012 respectively (Appendix 5) can be converted to farming input soft loan scheme for the farmers as the farmers need fertilizer other inputs to increase their productivity.

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APPENDIX 1: INFORMATION IN THE QUESTIONNAIRE: POST PLANTING VISIT.

SECTION	TOPIC	RESPONDENT	DESCRIPTION
COVER	COVER	FIELD STAFF	Household identifier variables, enumerator, supervisor and data entry, clerk identifiers, date and time of interview and data entry, and observation notes by enumerator regarding the interview.
1	Roster	Household head or spouse	Roster of individuals living in the household, relationship to the household, gender, year of birth, age, marital status, spouse identification, parental status and place of birth.
2	Education	Individuals 5 years and above	Educational attainment, school characteristics and expenditures for 2009-10 academic year.
3	Labour	Individuals 5 years and above	Labour market participation during the last seven days, wage work and domestic activities within the home.
4	Credit and savings	Individuals 15 years and above	Savings made, loans or credit received, insurance and remittances by the household during the last six months and conditions of the transaction.
5	Household assets	HOUSEHOLD head	Ownership of assets and value
6	Non-farm enterprises	Owner or manager of enterprise.	Enterprise ownership, status, labor, value of stock, sales, and business costs.
7A	Meals Away from Home	Most Knowledgeable person	Naira value of food consumed outside the home during the last seven days.
7B	Household food Expenditure	Person responsible for food purchases	Quantity and value of food consumed within the household during the last seven days.
8	Household Non-food Expenditures	Person responsible for household purchases	Non-food expenditure during the last week/last month/last six months/last 12 months
9	Food Security	HOUSEHOLD head or eligible adult	Food security status of households in during the past 7 days/12 months.

10	Other Income	HOUSEHOLD head or eligible adult	Other sources of household income since the new year.
Cover	Cover	To be completed by field staff. HOUSEHOLD ID must be copy from HOUSEHOLD to Agriculture Questionnaire	This section contains household location and identification data as well as administrative data as regards administering and managing the questionnaire.
11a	Plot Roster	Owner or manager of plot	Information on all post owned and/or managed by the Household. This section includes data on estimated area, GPS measured area and the GPS measured location of the plot.
11b	Land Inventory	Owner or manager of plot	Data on plot acquisition, tenure and use
11c	Input Costs	Owner or manager of plot	Use and cost of pesticide, herbicide, animal labor and use of machinery
11d	Fertilizer acquisition	Owner or manager of plot	Access to, use and cost of seeds used on the plot
11e	Seed acquisition	Owner or manager of plot	Data on source, quantity and costs of seeds used on the plot
11f	Planted field crops	Owner or manager of plot	Data on crops planted on the plot, amount of crops planted and expected harvest
11g	Planted tree crops	Owner or manager of plot	This section collects details on tree crops
11h	Marketing of agricultural Surplus	Owner or manager of plot	Marketing of agricultural Surplus. Quantities Sold, value and information on purchaser
11i	Animal holdings	Farmer or caretaker of animals	Data on farm animals owned by the household and commercial activity with these animals
11j	Animal Costs	Farmer or caretaker of animals	Livestock farmer caretaker activities and costs

11k	Agriculture by-product	Farmer or caretaker of animals	Trading activity in agricultural by-products
111	Extension	Owner or manager of plot	Access to and utilization of technical support from various sources (government and non-government)
12	Network Roster	Farmer, owner or manager of plot	Roster of places or business where the household sells and purchases agricultural produce and /or supplies

Source: Computed From Panel Datasets of 2010/2011 and 2012/2013

APPENDIX 2: INFORMATION IN THE QUESTIONNAIRE: POST HARVEST VISIT

Section	Topic	Respondent	Description
Cover	Cover	To be completed by field Staff. HOUSEHOLD ID must be copy from HOUSEHOLD to Agriculture Questionnaire.	This section contains household location and identification data as well as administrative data as regards administering and managing the questionnaire
A1	Land and Dry Season planting	Farmer, owner or manager of plot	Follow-up on use of land for in post-planting visit and data on any subsequent planting or other use of the plot. Also information collected on new plots (I.e. added since post-planting visit.
A2	Harvest Labor	Farmer, owner or manager of plot	Data on labor that was used for crop harvesting, both from household and hired.
A3	Agricultural production Harvest of field and tree Crops	Farmer, owner or manager of plot	Quantity and value of field crops produced
A4	Agricultural Capital	Farmer, owner or manager of plot	Ownership and value of agricultural machinery and tools owned by the household

A5 (A and B)	Extension services	Farmer, owner or manager of plot	Access to and utilization of technical support from various sources (government and non-government)
A6	Animal Holdings	Owner or caretaker of animals	Data on farm animals owned by the household and commercial activity with these animals
A7	Animal costs	Owner or caretakers of Animals	Expenditure on livestock
A8	Other Agricultural Income	Farmer or caretaker of animals	Income from sale of Agricultural products and not capture, previous section under crops and livestock.
A9 (A and B)	Fishing, Capital and revenue	Owner of fishing operations	SectionA9a: Data on fishing activities, includes capture, harvesting and processing Section9b: Data on boat usage and the use of hired labor
A10	Network Roster	Farmer, owner or manager of plot	Roster of places or businesses where the household sells and purchases agricultural produce and/or supplies

Source: Computed From Panel Datasets of 2010/2011 and 2012/2013

Appendix 3: The Nigeria Agricultural Policies and Agriculture Transformation Agenda

Past Agriculture Policy Objectives	Agriculture Transformation Agenda (ATA) Focus
The achievement of self-sufficiency in basic food supply and the attainment of food security	Focusing on agriculture as a business instead of a developmental project
Increased production of agricultural raw materials for industries	Utilising the transformation of the agricultural sector to create jobs, create wealth and ensure food security
Increased production and processing of export crops, using improved production and processing technologies	Focusing on value chains where Nigeria has comparative advantage
Generating gainful employment	Sharp focus on youths and women Growth Enhancement Scheme (GES)
Rational utilization of agricultural resources, improved protection of agricultural land resources from drought, desert encroachment, soil erosion and flood, and the general preservation of the environment for the sustainability of agricultural production	Nigeria Incentive-Based Risk Sharing for Agricultural Lending (NIRSAL)
Promotion of the increased application of modern technology to agricultural production	Development of Staple Crops Processing Zones
Improvement in the quality of life of rural dwellers.	Development of Private Sector Driven, Public Sector Enabled Marketing Corporation

Sources: FMARD (2012).

Appendix 4: Distribution of Growth Enhancement Scheme Redemption Centres in 2012 and 2013

	2013				2012			
	Total Redemption Centres	Active Redemption Centres	Non Active Redemption Centres	% of Active Redemption Centres	Total Redemption Centres	Active Redemption Centres	Non Active Redemption Centres	% of Active Redemption Centres
North-Central Region								
BEN	36	36	0	100	15	23	-8	153
FCT	23	23	0	100	17	6	11	35
KOG	60	59	1	98	38	21	17	55
KWA	32	32	0	1	20	16	4	80
NAS	29	29	0	1	22	13	9	59
NIG	51	51	0	1	32	23	9	72
PLA	60	57	3	95	15	17	-2	113
TOTAL	291	287	4	99	159	121	40	72
North-East Region								
ADA	32	16	16	50	-	-	-	-
BAU	68	58	10	85	42	20	22	48
BOR	27	26	1	96	27	14	13	52
GOM	35	34	1	97	19	11	8	58
TAR	65	56	9	96	33	8	25	24
YOB	17	17	0	100	4	10	-6	250
TOTAL	244	207	37	85	125	76	62	61

North-West Region								
JIG	56	48	8	86	40	27	8	68
KAD	69	54	15	78	20	23	15	115
KAN	41	25	16	61	21	44	16	210
KAS	33	31	2	94	33	14	2	42
KEB	40	32	8	80	4	14	8	350
SOK	65	56	9	86	35	23	9	66
ZAM	18	15	3	83	4	5	3	125
TOTAL	322	261	61	81	157	150	61	96
South-East Region								
ABI	47	47	0	100	10	17	0	170
ANA	55	55	0	100	23	21	0	91
EBO	20	20	0	100	20	13	0	65
ENU	33	33	0	100	13	17	0	131
IMO	27	27	0	100	18	19	0	106
TOTAL	182	182	0	100	84	87	0	104
South-South Region								
AKW	37	37	0	100	31	17	0	55
BAY	25	25	0	100	8	3	0	38
CRO	48	48	0	100	37	18	0	49
DEL	58	58	0	100	17	25	0	147
EDO	30	30	0	100	14	18	0	129

RIV	14	14	0	100	6	6	0	100
TOTAL	212	212	0	100	113	87	0	77
South-West Region								
EKI	26	26	0	100	19	16	0	84
LAG	11	11	0	100	19	6	0	32
OGU	35	35	0	100	21	21	0	100
OND	23	23	0	100	10	11	0	110
OSU	32	32	0	100	30	6	0	20
OYO	65	65	0	100	67	33	0	49
TOTAL	192	192	0	100	166	93	0	56
GRAND TOTAL	1443	1341	102	94	804	614	163	76

Source: Computed from FMARD (2012).

Appendix 5: Federal and States Government Fertilizer Subsidy Allocation in 2010 and 2012 in Nigeria(Million Naira)

Year	Total for the Federal	Total for all the States	Total Fertilizer Subsidy
2010	13310	14065.81	25375.81
2012	15670	12599.89	28269.89

Source: FMARD, 2014