Agricultural Science Research Journal
ISSN 2026-6073
Femi Ogundele, Volume (10) Issue (9): 245 – 253 September – 2020. RESEARCH PAPER

Input subsidy policy and agricultural productivity dynamics in smallholder farming in Nigeria

Femi Ogundele

Associate Research Professor, Economic Policy Research Department, Nigerian Institute of Social and Economic Research, P.M.B. 5 UI Post Office, Ibadan

Author's Email: olorunfemiogundele@gmail.com, olorunfemiogundele@yahoo.com, Tel: +234-7030574305

*Author

Femi Ogundele

Associate Research Professor, Economic Policy Research Department, Nigerian Institute of Social and Economic Research, P.M.B. 5 UI Post Office, Ibadan

*Author Email: olorunfemiogundele@gmail.com, olorunfemiogundele@yahoo.com, Tel: +234-7030574305

Abstract

This study reviews the agricultural input subsidy policy within the framework of input use efficiency and food security (measured in physical output) as well as examines the implication for productivity growth among the rice and maize growing households in Nigeria. The study engaged farm-level panel data obtained from two surveys conducted by NISER in collaboration with Lund University, Sweden in Kaduna and Osun state in 2007 and 2012. Data analysis involved the use of both descriptive statistics and econometric estimation of productivity change over the two periods. The results underscored the negative impact of frequent changes in fertilizer subsidy and the inefficiency of government in handling procurement and distribution of the input. The adoption of improved variety was seriously hindered by physical availability and consequently, the improvement in yield level of rice and maize recorded over the period could only be attributed to area expansion as the Total Factor Productivity (TFP) declined for the two crops. The study, therefore, recommends complete liberalization of the agricultural input market and a subsidy programme targeted at output in form of price support or guaranteed minimum price as preferable policy options.

Keywords: Inputs, Subsidy, Productivity, Smallholder, Farming

Introduction

What usually appears as one of the major drawbacks of policy formulation and implementation in Nigeria is the fact that most of the policies are not usually based on empirical facts. While efforts are always on to craft new policy or reform agenda, very little is done to examine the performance of the previous policy and to highlight the constraints and inhibiting factors before embarking on another one. Evaluation of past policy is particularly desirable in the agricultural sector where both human and non-human factors constitute the risk of production.

Aside, policy response in the agricultural sector always take some time as it is not very easy to adjust production structure within a very short time as can be done in other sectors like manufacturing. Therefore, given the spade of economic reforms in Nigeria between 2002 and 2012 and some of the policy developments in the agricultural sector in particular and specifically in the area of fertilizer input subsidy; it is not clear whether these reforms are been driven by empirical knowledge of the performance of the previous policies or they are merely responding to shift in the power structure or political transformation. For example, when the National Economic Empowerment Development Strategies (NEEDS) was introduced as a home grown poverty reduction strategy, was there a comprehensive empirical evaluation of the performance of previous policies in the various sectors? In the agricultural sector, one of the major programmes implemented by government to engender pro-poor growth and poverty reduction in the sector during this time is the Presidential Initiatives on

some major crops which was initiated in 2003. Highlights of fertilizer subsidy policies embedded in the programme include

- The continuation of subsidy on fertilizer and other agro-inputs by the Federal Government. Fertilizer subsidy remained at 25%, seed subsidy at 50%, agro-chemical subsidy at 25%, tractors/ equipment at 25% and processing equipment at 25%.

Just as farmers were adjusting to the newly introduced policy reforms, in 2007, the Seven Point Agenda was initiated without a proper diagnosis of the response of farmers to the previous policy. The seven point agenda set aside some of the earlier policies in the former economic reform programme while some relevant ones were modified. During this period, the input subsidy policies were encapsulated in the Food Security Programme which one of the seven points of the ageda (FMAWR, 2008). The seven point agenda was short lived as it soon gave way to the current economic transformation now refers to as Nigeria Vision 20: 2020 in 2009. The main issue that remained unresolved, however, is to what extent are the past and current reform efforts guided by empirical findings. Where this empirical information are not readily available, policy makers are left with no other alternative than to base their strategies on mere guesstimates. Earlier attempts by researchers such as Ogundari (2009), Oni et al, (2009) and Onyenwaku (2010) have examined factors that can influence agricultural productivity levels and growth rates without specific focus on input subsidy policy such as fertilizer and their approach mainly adopted partial productivity measurement. It is against this backdrop that this study seeks to provide empirical connects between various agricultural input subsidy policies implemented between 2007 and 2012 and productivity growth in the sector using a cross sectional panel data for rice and maize growing households.

Objectives of the Study

The main objective of this study is to evaluate the agricultural input subsidy policies and their implications for productivity growth among rice and maize growing households in Nigeria between 2007and 2012 for the purpose of drawing policy implications to support the implementation of the current agricultural promotion policy agenda in the country.

The specific objectives are to:

1. Review agricultural input subsidy policies implemented in the country between 2007 and 2012;
2. Analyse input use and crop production dynamics among maize and rice growing households within the period under review
3. Determine productivity change for rice and maize growing households during this period.

Conceptual Framework

Conceptual Framework for Policy Assessment

Policies are government actions intended to change behaviour of producers and consumers while analysis consists of the evaluation of government decisions to change economic behaviour. According to Monke and Pearson (1989) four major component of policy framework can be identified. These include; the objectives, constraints, policies and strategies.

Objectives are the desired goals of economic policy as defined by policy makers.
Constraints are the economic realities that limit what can be accomplished.
Policies are the instruments that governments can use to change economic outcomes.
Strategies are the sets of policy instruments that government officials can use to achieve their objectives.
The **policy framework** is represented by a circular (clockwise) set of causal linkages among the four components as shown in Fig 1.
The **strategies** of policy makers consist of sets of **policies** that are intended to improve economic outcomes. The selected **policies** work through the **constraints** set by economic parameters. The **constraints** set by supply, demand, and world price conditions, either further or impede the attainment of **objectives.** An assessment of the impact on **objectives** permits an evaluation of the appropriateness of given **strategies**. It is against this backdrop that this study set to evaluate the appropriateness of agricultural input supply policies in Nigeria between 2007 and 2012.

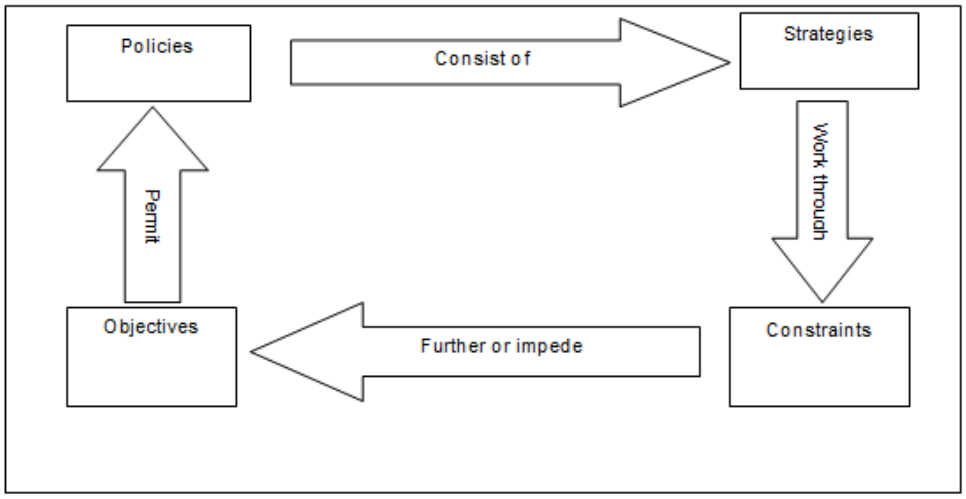

Fig 1: A Policy Framework
Source: *Adapted from Peter Timer, 1975 and Scott Person, 2002*

Methodology

Method of Data Collection

This study engaged mainly secondary data for the evaluation implementation of agricultural input subsidy policies and change in productivity growth for rice and maize growing households in Nigeria between 2007 and 2012. The secondary data were derived from a household survey panel data which was collected by NISER in collaboration with Lund University, Sweden under the Afrint I and II projects. This is a panel data collected at household levels in Kaduna and Osun states in 2007 and 20012.

Method of data Analysis

The methodology that will be employed in this study will be in two folds. The first will involve a trend analysis of the area, output and yield data using moving averages and other inferential statistics. The second method will involve a descriptive analysis of the change in the structure of input use between Afrint I and Afrint II period as well as change in the structure of production. Econometric analysis was engaged to measure the productivity growth between two periods.

Analytical Procedure for Measuring Productivity Growth

The Malmquist Total Factor Productivity Measure

The Malmquist TFP index gives a measure of productivity growth by comparing two data points (periods 1 and 2) in which there are observed inputs and outputs. This TFP index measures productivity by comparing the observed outputs in periods 1 and 2 with the maximum level of outputs that can be produced using the inputs x1 and x2 under a reference technology. The Malmquist index makes use of a radial distance of the observed outputs and inputs in the two periods with respect to a reference technology. The distance measure could either be input orientated or output orientated, such that the index depends on the orientation used. This study made use of the input orientated Malmquist TFP index.

Input Orientated Malmquist TFPI

The input orientated index focuses on the levels of inputs, x1 and x2 that can be used to produce the observed levels of outputs, y1 and y2 relative to the reference technology. Given that period 1 is the reference technology, the index is given as:

$$m_i^1(y_1,x_1,y_2,x_2) = \frac{d_i^1(q_2,x_2)}{d_i^1(q_1,x_1)} \quad \ldots\ldots 1$$

Assume that there is technical efficiency in both periods, , i.e $d_i^1(y_1x_1)=1$, then

$$m_i^1(y_1,x_1,y_2,x_2) = d_i^1(y_2,x_2) \quad \ldots\ldots 2$$

This can be similarly done if the reference technology is period 2. Therefore, the input orientated malmquist index is:

$$m_i(y_1,x_1,y_2,x_2) = \left\{ m_i^1(y_1,x_1,y_2,x_2).m_i^2(y_1,x_1,y_2,x_2) \right\}^{0.5} \quad \ldots\ldots 3$$

The above is a measure of productivity growth when technical efficiency is assumed in the two periods. However, if there is technical inefficiency, which is the most probable case, the observed productivity change can be given as follows:

$$m_i(y_1.x_1,y_2,x_2) = \frac{d_i^2(y_2,x_2)}{d_i^1(y_1,x_1)}\left[\frac{d_i^1(y_2,x_2)}{d_i^2(y_2,x_2)} \times \frac{d_i^1(y_1,x_1)}{d_i^2(y_1,x_1)}\right]^{0.5} \quad \ldots\ldots 4$$

Eq 4 is composed of two ratios: the ratio on the outside is the measure of Efficiency change, while the ratio in the brackets is the technical change.
The results of the DEA measure of the Malmquist give the following change measures

i) Efficiency change
ii) Technical change
iii) Allocative (price) change
iv) Scale efficiency change
v) Total Factor productivity change

The efficiency change is equivalent to the ratio of the Farell technical efficiency in period 2 to the Farell technical efficiency in period 1, (Coelli et al, 2005). The technical change is the geometric mean of the shift in technology between the two periods under study. A value greater than 1 implies a technical progress from period 1 to 2. The allocative /price efficiency change measures the ratio of input prices between periods 1 and 2.
Scale efficiency change measures the change in productivity as a result of the change in the scale of production of the farms and their movement towards the Technologically Optimum Scale. The numerical value of this change is bounded by 0 and 1. However, a value greater than 1 means that the farm is nearer the optimum scale of technology in the period under consideration as opposed to the reference period.

Results and Discussions

Review Agricultural Input Subsidy in Nigeria 2007-2012

Government attention of agricultural Input policies during the above period focused mainly on chemical fertilizer. Fertilizer policy in Nigeria continued to be very unstable. For example, procurement and distribution of agricultural inputs particularly fertilizer which was hitherto liberalized started witnessing government intervention by 2001 and 2002, resulting in re-introduction of fertilizer subsidy to the tune of 25 per cent and continued in 2007. Consequently, most farmers could not access the commodity. Besides, subsidized fertilizer did not get to intended beneficiaries-the smallholders particularly in the rural areas. In the financial year 2007 a total of 124,029.5 tonnes of assorted fertilizers, 4,200 tonnes of agricultural lime and 56,000 litres of micro nutrients, all valued at N9 billion were procured and distributed to the 36 states, the FCT, the River Basin Development Authorities (RBDAs) and the National Special Programme for Food Security (NSPFS) at 25 per cent subsidy. Meanwhile between 2002 and 2007 various subsidy rates were adopted by both Federal and State governments in Nigeria. While the Federal Government continued to subsidise fertilizer by 25 per cent, additional subsidy by state governments varies between 25 and 50 per cent across the country. The immediate consequent of subsidy in Nigeria is shortfall in supply. The shortfalls in the supply often result in prices being higher than the approved prices by government. For example, a 50 kg bag of fertilizer in 2007 which is offered at a subsidized price of US$150 was sold in the market between US$300 – 350 in most parts of the country (CBN, 2008).

Aside fertiliser subsidy policy, other inputs the also received adequate attention during this period is seed/seedling supply. The presidential initiative on rice and maize was targeted at providing improved seeds to farmers at various subsidy levels. In the case of rice, emphasis was on provision of R-Box technology which was distributed to farmers at 50 per cent. The R-Box is a package consisting of different farm management practices with emphasis on minimum tillage and provision of adequate and appropriate production input. At the inception of the Initiative on rice, a sum of one billion naira (N1 billion) was released by FGN for the multiplication of NERICA and other improved varieties while 90,505 R-Boxes were acquired and distributed to all the states of the federation and FCT. The target of the Initiative for maize is about 5000 metric tonnes of improved maize seed and 60,000 litres of agro-chemicals to be distributed to farmers. The presidential Initiative on rice and maize was terminated in 2007 due to introduction of the Seven Point Agenda. One of the seven poits of the reform agenda is food security which was implemented through the National Food Security Programme (NFSP) (FMARD, 2008).

The NFSP thrust for seed development and distribution recognised the need to strengthen the National Seed Council (NSC) in order to ensure significant transformation of production base of the agricultural sector. Towards this end, the research and partnership framework for the council is such that; state governments will subsidize the supply of the certified seed/seedlings to farmers.

The policy thrust for fertilizer production and distribution is to ensure that national production capacity for fertilizer improved significantly with the objective of achieving 100 per cent local production by 2011. To support the fertilizer initiative, the FGN will provide 25 per cent subsidy of the cost of the fertilizer while states are urged to further subsidize their fertilizer procurement to ensure that the farm gate prices are indeed reasonable. There was no specific policy thrust articulated for other agro-chemicals such as pesticides and herbicides.

The policy intervention on machinery and other farm equipment focused on private sector-led agricultural mechanisation services with equity participation in the ratio of 15:25:60 for Federal Government, state governments and private sector respectively. The interventions also include provision of tractor and bulldozer services in bush clearing and land preparation.

The t economic transformation agenda “Nigeria Vision 20:2020” which kicked off in 2009 put emphasis on research and extension, development and dissemination of appropriate technologies (NPC, 2009). The reform, however, recognised the need to adequately produce the needed inputs for agro-allied and agro-based industries. For agricultural production specifically, the strategies include

- Rehabilitation of existing irrigation projects and completion of new ones
- Facilitating acquisition of farmland and title holdings for agricultural production

- Enhancing level of production, adoption and utilization of appropriate technology and mechanisation for small, medium and large scale farmers and;
- Promoting the use of "green technology" to ensure sustainable agricultural production, a safe and clean environment.

The current reform did not overtly emphasise subsidy on fertiliser and other agricultural production inputs. It is, however, assumed that government at various levels still continue with the various subsidy policies initiated under the NFSP of the Seven point Agenda.

Input use Dynamics among Farming Households

The input subsidy policy on seed and seedlings implemented during the period under review was to promote increased use of improved seeds. As such, improved and hybrid maize as well as NERICA and other improved varieties of rice were raised and distributed to farmers at various subsidy levels. Analysis of the distribution of households by change in variety of crop planted between 2007 and 2012 presented in Table 1 show that, though, there was a decline in the proportion of households growing traditional varieties of rice and maize in 2012 compared to 2007, the decline was not very significant as about 43 per cent of the maize growing households and 59 per cent of the rice growing households are still cultivating traditional varieties of crops in 2007. As a matter of fact, the proportion of households planting improved variety of maize dropped by about 11 per cent in 2012 while that of rice growing households increased by about 22 per cent. Since NERICA is a newly introduced variety of rice, none of the rice growing household cultivated the variety in 2007. This variety was aggressively promoted under the presidential initiative on rice and by 2012 about 29 per cent of the households planted the variety.

Table 1: Percentage Distribution of Households by Change in Variety of Crop Planted

Crop variety	2007	2012	Difference
Maize			
Traditional	58.6	42.5	-16.1
Improved (OPV, composite)	33.6	29.2	-4.4
Hybrid	7.6	18.3	10.7
Rice			
Traditional	80.6	58.7	-21.9
Improved	19.4	41.3	21.9
Any NERICA or descendants	0.0	28.5	28.5

Source: Field Survey, 2012

The households were also evaluated on their perception of change in input use in 2012 when compare to 2007. The result is presented in Table 2 for change quantity of fertilizer use indicated that due to one reason or the other, about one-fifth of the farming households did not use fertiliser in 2007 and the proportion is higher for maize growing households compared to rice growing households. While about one-fifth of the households claimed that the use of the input actually decreased since 2007 about a quarter believed that the use of fertiliser has virtually remained unchanged. About 35 per cent of the households, however, claimed that the quantity of fertilizer applied on their farms has actually increased since 2007. This result, again puts into question the effectiveness of fertilizer subsidy in promoting the use of the input by farming households in Nigeria.

Table 2: Percentage Distribution of Households by Perception of Change in Fertilizer Usage

Change in Use	**Rice**	**Maize**	**Av**
No fertilizer applied in 2007	11.1	29.6	20.35
Amount decreased since then	24.0	14.9	19.45
Amount unchanged	40.0	11.3	25.65
Amount increased since then	24.9	44.1	34.5

Source: Field Survey, 2012

In respect of the use of other farm tools and equipment for land preparation, attempt was made to analyse change in the proportion of farming households using a particular farm implement in 2007 compared to 2002. It is obvious from Table 3 that a highly significant proportion (71%) of the farming households still rely on the use of crude implement like cutlasses and hoe for land preparation. The proportion was as high as about 80 per cent for rice growing households. The use of Oxen ploughing was very pronounced among maize growing

households while the use of tractors was very limited as less than 10 per cent of the households engaged the equipment on their farms in 2007 compared to 2002. The use was, however, higher for rice growing households.

Table 3: Percentage Distribution of Households by Change in Use of Equipment for Land Preparation

Equipment	Rice	Maize	Average
Cutlasses/Hoe	79.9	61.8	70.85
Oxen ploughing	5.6	31.9	18.75
Tractors ploughing	11.5	6.5	9.0
Others	3.0	0.0	1.5

Source: Field Survey, 2007

The change in proportion of households in the use of other inputs such as pesticides/herbicides as well as animal or organic manure is presented in Table 4. the proportion of households using pesticides/herbicides increased by about 17 per cent in 2012 compared to 2007 while the proportion of households using animal or organic manure only increase marginally by 1.3 per cent. The use of pesticides/herbicides was higher for rice growing households while the use of animal or organic manure was marginally higher for maize growing households. The low uses of these inputs are mare reflection of the ineffectiveness of the subsidy policy.

Table 4: Percentage Distribution of Households by Change in the use of Other Inputs

Year	Rice	Maize	Average
Use of pesticides/herbicides			
2007	31.8	16.3	24.1
2012	49.3	32.5	40.9
Difference	**17.5**	**16.2**	**16.9**
Use of Animal Manure			
2007	18.3	32.1	25.2
2012	19.4	33.5	26.5
Difference	**1.1**	**1.4**	**1.3**

Source: Field Survey, 2012

Trend in Crop Production

Input subsidy, particularly on fertilizer where it is well targeted and implemented is expected to promote the cultivation of crops with high rate of response to fertilizer and other agro-chemicals. In effects it is expected that the proportion of households that will engage in the cultivation of such crops as rice and maize will increase over time from 2007 to 2012 due to the various subsidies on agricultural input. The distribution of households by type of crop grown reported in Table 5 However, indicated that while there was appreciable increase in the proportion of households cultivating both crops between 2007 and 2012, the annual increase between 2010 and 2012 was less than one percentage point for each of the crops. This indicates that the subsidy effects of change in proportion of households growing these crops which was very pronounced during the early years of implementation started to fissile out over time probably due poor targeting.

Table 5: Percentage Distribution of Households by Type of Crop Grown

Season	Rice	Maize
2012	33.5	95.2
2010	32.9	94.7
2007	26.8	84.3

Source: Field Survey, 2012

Investigation of the major reasons why households have to change the type of crop grown during the period under investigation revealed that for those who abandon rice agronomic reason predominates while for those who abandon maize economic reason of high cost of inputs and low prices of output predominates. The agronomic reasons include farm management practices, high incidence of pest and diseases, and soil nutrient depletion. In the case of the adopters, 48 per cent of the rice growing households and about 59 per cent of maize growing households indicated economic reason of increased output prices as the main drivers of change in the type of crop grown as shown in Table 6.

Table 6: Percentage Distribution of Households by Reasons for Change in Crop Grown

Crop/Reasons	Abandon	Adopt
Rice		
Economic	22.2	48.1
Agronomic	55.5	46.2
Labour	22.2	5.8
Maize		
Economic	97.9	58.5
Agronomic	2.1	40.4
Labour	0.0	1.1

Source: Field Survey, 2012

Aside changes in types of crop grown by households, this study also investigate changes in area, output and yield of these two crops among the growing households between 2007 and 2012. Table 7 indicates that average area cultivated to rice among the rice growing households almost stagnated at 2.0 ha over the period. Nevertheless, the output of rice which witnessed significant improvement in 2010 suffered drastic decline in 2012 with corresponding decline in yield. The situation was a little different in the case of maize in which average area cultivated which rose marginally between 2007 and 2010 suffered significant decline in 2012. Conversely, however, output of maize which suffered decline between 2007 and 2010 recorded an impressive increased in 2007 with the average yield rising about three times in 2012 above what was recorded in 2010. This probably explained why majority of the households who adopted cultivation of maize over this period have chosen economic reasons as the main driver.

Table 7: Change in Crop Production Characteristics by Households

Crop/Reasons	2012	2010	2007
Rice			
Area (ha)	2.1	1.9	2.0
	3298.2	4769.2	3435.6
Output (kg)	1570.6	2510.1	1717.8
Yield (kg/ha)			
Maize			
Area (ha)	2.5	3.2	3.0
	3643.0	1532.5	2587.8
Output (kg)	1457.2	478.9	862.6
Yield (kg/ha)			

Source: Field Survey, 2007

In addition to quantitative estimation of the change in household's production structure over time, the study further investigates the perception of the households in terms of changes in area and yield of crops compared to the situation in 2007. The result was only interpreted for those households who cultivated the crops in 2007 as a small fraction of the households did not cultivate them as shown in Table 8. In the case of change in average area cultivated, almost equal proportion (about 46%) believed that average area cultivated have either remained unchanged or increased since 2007 for both crops. However, only about 38 per cent of the rice growing households and about half of the maize growing households claimed that average area cultivated has increased since 2007. The proportion of households who believed that area cultivated remained unchanged was about 54 and 31 per cent respectively for rice and maize growing households.

Table 8: Percentage Distribution of Households by Perception of Change in Area and Yield

Description of Change in Area	Rice	Maize	Average
Did not grow crop in 2007	7.3	9.6	8.45
Area decreased	1.6	10.5	6.1
Area unchanged	54.3	30.9	42.6
Area has increased since then	36.7	49.0	42.9
Description of Change in Yield			
Did not grow crop in 2007	11.9	11.0	11.5
Yield decreased	9.4	21.9	15.7
Yield unchanged	29.4	8.2	18.8
Yield has increased since then	43.3	58.9	51.1

Source: Field Survey, 2012

In the case change in yield level during this period, about half of the households (51%) agreed that the yield level of both crops has increased since 2007. This category of household was higher for maize growing household with about 59 per cent than rice growing households with 43 per cent. While 29 per cent of the rice growing households claimed that yield of rice remained unchanged during the period, about 22 per cent of maize growing households reported that yield of maize suffered decline significant decline.

Agricultural Productivity Change 2002-2007

Construction of the Panel Data

The sample data used for this analysis consist of cross sectional data set for a two year period (2007 and 2012). The data include quantity and prices of maize output as well as quantities and prices of inputs used in production. Four inputs were used in this analysis, namely, land, labour, seed and fertilizer. After accounting for missing data, we were left with 314 observations, of which 174 was for period one (2007) and the 140 for period two (2012). Both outputs and input variables were normalized with the land variable to bring them to a common level, which is on a per hectare basis. This was necessary to correct for scale differences. The data description and the units of measurements are presented below.

- Land is measured in area used in cultivation of pure stands of crop (ha)
- Labour is number of adults working on farm per ha
- Seed is quantity sown per plot in kg/ha
- Fertilizer is quantity used per plots in kg/ha
- Output is quantity of crop harvested for the given technology of production kg/ha
- Output price is average price per kg of crop sold Naira/kg
- Rent is price paid per unit of land used for cultivation N/ha
- Wage is price per unit of labour use for cultivation N/person
- Seed price is amont paid per kg of seed planted Naira/kg
- Fertilizer price is amount paid per kg of fertilizer used on farm plot Naira/kg

Productivity Growth Measures

The Malmquist TFP index measure was used to examine the productivity changes from period 1 to period 2 for the rice and maize growing households. The analysis was accomplished using the linear programming model of the DEA. The assumptions made for this analysis include constant returns to scale of production technology and input orientation. To assess the multifactor productivity levels in the two periods the Fisher and Tornquist total productivity index were computed and used. In several analyses Fisher's index is preferred over Tornquist due to the fact that Fisher index exhibits self-duality function and is able to handle zero quintiles in data sets. However, for this analysis it was found that both indexes gave the same numerical values. Tables 4 and 5 presents productivity growth and total productivity (multifactor productivity) measures of rice and maize growing households for the two periods under study.

From Table 9 it can be observed that there was a negative growth in productivity between the two periods for both crops with a value of 0.723 for rice and 0.677 for maize, suggesting that relative to period1 productivity declined in period 2 by about 0.28 and 0.33 respectively for rice and maize respectively. Productivity growth can be decomposed into four major components which include – Technical Change, Efficiency Change, Scale Efficiency Change and Input (or Output) mix effect. The combination of these factors gives the total factor productivity change. The decomposition of the total factor productivity change into the four components is also shown in Table 4.13. The table shows that beside the scale efficiency, all other factors were below unity (1), suggesting that relative to period 1 households in period two were less efficient. Notwithstanding the result show that both rice and maize growing households were more scale efficient in period 2 than period 1. The decline productivity growth between the two periods puts to question the much desired improvement in input use and food security expected to be occasioned by the various input subsidies implemented during this period.

Table 9: Productivity Growth between 2002 and 2007

Year(1 is base technology)	Efficiency change	Technical change	Price efficiency change	Scale efficiency change	Total factor productivity change
1 Rice	1.00	1.00	1.00	1.00	1.00
2 Rice	0.634	0.826	0.487	1.062	0.723
1 Maize	1.00	1.00	1.00	1.00	1.00
2 Maize	0.734	0.922	0.584	1.257	0.677

The result of the total factor productivity measure obtained by Fisher index shown on Table 10. is consistent with that obtained with the Malmqist TFP estimates which reveals a reduction in efficiency and productivity from period 1 to 2. The TFP in period 1 was found to be 'Unity' (it is assumed that the period 1 is the reference technology, i.e the farming period on the best practice Frontier), while in period two, it was 0.759 and 0.847 for rice and maize respectively. Thus with respect to all the inputs of production they led to about 75 and 85 per cent productivity in period 2, implying that rice and maize growing households in period 2 have a gap of 25

and 15 per cent respectively to match the technology of best production to be on the frontier.

Table 10: Multifactor Productivity Measures

Period	Multifactor Productivity
Period 1 Rice	1.000
Period 2 Rice	0.758
Period 1 Maize	1.000
Period 2 Maize	0.847

Conclusion

Policy review revealed that government attention on agricultural input policies focused mainly on fertilizer subsidy. Another input that also received adequate attention during this period is seed/seedlings which was implemented through the Presidential Initiative programme with seed/seedling supply to farmers at the rate of 50 per cent while other inputs that received less attention include agrochemicals such as pesticides and herbicides. The transformation agenda assumed that government at various levels still continue with the various subsidy policies initiated under the NFSP. Nevertheless, these policy oscillations do affect input use dynamics, output as well as productivity growth.

Analysis of change in area, output and yield showed that area cultivated by households either stagnated or increased marginally while output generally recorded significant improvement during the period. Consequently, yield of maize, particularly in 2007 almost triple the yield level recorded by households in 2002. The change in TFP between 2002 and 2007, however, indicated that productivity level declined respectively for both rice and maize growing households by 0.28 and 0.33. This decline, therefore, implies that the much desired improvement in input use efficiency and increased food supply (food security) expected to be brought about by the various input subsidies implemented during the period was not achieved. This study concluded by recommending a liberalized market driven input supply mechanism that can ensure physical availability of the input to farmers. While subsidy programme should be targeted at output in form of price support. This will produce more desirable results and generate positive effects in improving productivity of farmers in the country.

References

Central Bank of Nigeria (2008). “Annual Report and Statement of Account”. CBN Abuja, Nigeria

Coelli, T.J.; Rao, D.S.P.; O'Donnell, C.J.; Battese, G.E. (2005). An Introduction to Efficiency and Productivity Analysis, 2nd Edition. Springer, ISBN 978-0-387-24266-8

Federal Ministry of Agriculture and Water Resources (2008). National Food Security Programme. Abuja, Nigeria. May, 2008.

Monke Eric A. and Scott R. Pearson (1989). *The Policy Analysis Matrix for Agricultural Development*, Chapter 13, pp. 255-257.

National Planning Commission (2009). “Agricultural Transformation Agenda “NPC Abuja, Nigeria

Ogundari Kolawole (2009). “A Meta-Analysis of Technical Efficiency in Nigerian Agriculture”. *Contributed Paper prepared for presentation at the International Association of Agricultural Economists Conference,* Beijing, China, August 16-22, 2009.

Oni, O., E. Nkonya, J. Pender, D. Phillips and E. Kato (2009). Trends and Drivers of Agricultural Productivity in Nigeria. International Food Policy Research Institute, NSSP Report 1, 243bv009.

Onyenweaku, C.E, I.N. Nwachukwu and T.C. Opara (2010). Productivity Growth in Food Crop Production in Imo State, Nigeria, African Crop Science Journal, Vol. 18, No. 3, pp. 119 - 131 ISSN 1021-9730/2010