EBR
Economic & Business Review

Volume 3 number 3, 2022

Impact of fertilizer subsidy on farmers' productivity: case study of rural farmers in lapai communities of Niger State, Nigeria

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Abstract

This study investigates the extent to which access to fertilizer subsidy enhance farmers' productivity in Lapai rural communities. A cross-sectional data were obtained through a structured questionnaire from 142 farmers and multiple regression analysis was applied on fertilizer subsidy, micro credit and farmers' productivity. Finding shows that fertilizer subsidy and microcredit contributes to farmers' productivity. Fertilizer subsidy contribution is more in rice than the maize productivity, as the rate of returns in rice is almost twice to that of maize production. The study therefore recommends further subsidy in the prices of fertilizers in order to ensure its affordability by all farmers, as well as, access to micro loans should be improved with removal of bureaucratic nature attached to obtaining loans in order to attract farmers to applying for loans.

Keywords: *Community, Farmers, Fertilizer Subsidy, Productivity*

Introduction

Over the years subsidy grants have been the major element used by most countries to improve the agricultural sector. This is done in order to guarantee the stabilization of food prices, ensuring mass production, improving farmers output and incomes. Subsidies are government expenditure to producers of agricultural commodities for the overall improvement and strengthening of the agricultural sector (Asfaw, Catania, Pallante& Palma, 2017). The expected effects include increased crop outputs, income and poverty reduction by implication (Eboh, Ujah&Ameachina, 2006). More productive agricultural activity would help close the country's enormous food gaps (Seck, 2016).

The major agricultural input subsidy used to instigate growth in the sector is the fertilizer subsidy. As opined by Ricker-Gilbert and Jayne (2017), there is a universal agreement that increased use of fertilizer is a requirement for rural productivity growth and reducing poverty and inequality. There is a clear perception that the use of input and the overall agricultural productivity can be improved by fertilizer subsidies (Seck, 2016). As more focus is placed on rural farmers to improve productivity in the sector, it is regrettable that most of these smallholder farmers' farm yields are usually low as compared to achievable yield (Allotey, Hamza & Zakaria, 2019). Agricultural input subsidies including fertilizers have been the widely used policy tool for raising the income of farmers and agricultural productivity (Binuomote&Odeniyi, 2016).

As one of the sectors of the economy in which different forms of subsidies are extensively used, the Nigerian government has however made efforts to improve and promote efficiency

in agriculture through fertilizer subsidy. The sector which has about four sub-sectors which includes Crop production, Forestry, Fishery and Livestock has more attention driven towards the crop production sub sector than the others. This may be due to the significance crop production has on the economy. Agriculture is agreed to be the largest economic activity of the population lives (Etumnu&Odetola, 2013). Attesting to this fact is the information contained in the National Bureau of Statistics [NBS] (2019), that crop production is largest and accounted for 91.6% of the sector in the first quarter. Generally agriculture contributed to real GDP growth of 29.25% in the third quarter of 2019, which is also the same as the contribution in the third quarter of 2018, but higher than the second quarter of 2019 which stood at 22.78%. This showed a decreased growth rate of 6.46% when compared to the growth of the third quarter of 2019 (NBS, 2019).

However, agriculture has taken a nose diving trend despite numerous fertilizer subsidy grants and programmes geared towards the realization of magnificent and commendable growth in the sector. These multifaceted programmes introduced to curtail these problems include National Accelerated Food Production Programme [NAFPP] of 1972, Agricultural Development Programme [ADP] of 1975, and Green Revolution [GR] introduced in 1980, National Fadama Development project [NFDP]. Few years back the Agricultural Transformation Agenda [ATA] was implemented. All these programmes and policies were implemented for the achievement of enhanced access to credit, provision and improvement of infrastructure, adequate availability of input subsidies such as fertilizer in order to boost agricultural productivity. In spite of the implementation of these policies and programmes, the sector is still militated by under development. Agricultural development initiative is attributed to different constraint that affect smallholder farming, which are predominantly economic, financial or political (Mgbenka& Mbah, 2016). Olomola and Nwafor (2018) are of the view that for achieving a positively transformed agricultural sector, programmes implemented should be adequately financed and politicization in the distribution input subsidies should be discouraged. The implementation of agricultural subsidy programmes, have recorded partial successes over the years.

However, several similar researches have been written relating to this study. Devadoss, Gibson and Luckstead (2016), investigated the impact of agricultural subsidies on corn market with farm heterogeneity as well as endogenous entry and exit. Nasrin, Bauer, Arman and Akhter (2021) assessed the impact of fertilizer subsidy on farming efficiency. Nevertheless, most research work focused on the effect of fertilizer on a particular commodity and also its effect on the general agricultural productivity. By filling the gap, this study aims at ascertaining the impact of fertilizer subsidy on rural farmers' productivity, as well as the determinants of rural farmers' productivity.

Literature Review

The Keynesian theory is used in this study and was developed by the British economist, John Maynard Keynes in the 1930s. He advocated for increase in government expenditure and lowering of taxes in order to stimulate output. In the model of income-expenditure, the equilibrium level of real GDP is equal to the level of real GDP that is consistent with the current level of aggregate expenditure. If there is insufficiency of the aggregate expenditure to purchase

all real GDP supplied, there will be a cut back in output until the level of real GDP equals the level of aggregate expenditure. In the light of this study, subsidy is granted by the government in form of expenditure, as a way of interfering in the running of the economy to ensure output stability.

Looking at empirical studies, early study like that of Ricker-Gilbert and Jayne (2017) examined the impact of government funded fertilizer subsidies on national level fertilizer use in Malawi. The study used a panel observation from 2006 to 2007 fertilizer subsidy program and found out a negative relationship between subsidy expenditure and agricultural output. Zhong, Chen and Xiao (2013) analyzed the effectiveness of agricultural subsidies policies in Wuhan, and their findings from ordered logistic model shows that agricultural labor supply and agricultural output can be promoted by agricultural subsidies. Similarly, Ochola and Fengying (2015) evaluate the impact of fertilizer subsidy programmes on vulnerable farmers in Kenya. The result obtained from 200 farmers showed a positive relationship between fertilizer subsidy programmes and farmers productivity. More recent studies by Nasrin and Arman (2018) assessed the impact of fertilizer subsidy on farming efficiency in Bangladesh. The result of Tobit model from 300 farmers shows that there is a significant and positive impact of fertilizer subsidy on the efficiency of farming. This was also supported by Alabi and Adams (2020) study as they tried to ascertain the impact of e-wallet fertilizer subsidy scheme on food security in Nigeria. They used Nigerian General Household Survey [GHS] panel data set of 2010/2011 and 2012/2013, containing 5000 farming households and realized that there is a positive impact between the variables researched upon. Contrarily, Azumah and Zakaria (2019) analyze the impact of fertilizer subsidy on rice productivity in Ghana. A sample size of 543 smallholder rice farmers in northern Ghana was used and the outcome showed a negative effect of fertilizer subsidy on rice productivity.

Aside fertilizer subsidy, other factors like farm size, labour, seedling and technology also enhance farmers' productivity. Shaikh, Hongbing, Khan and Ahmed (2016) examine the determinant of rice production in the district of Jaffarabad. The study used OLS and findings show that labor and farm size has positive effect on rice production. Amurtiya, Karniliyus, and Chinda (2018) investigated inputs subsidy in Nigeria. Their result entails that fertilizer, farm sizes, farmers' education had positive effect on rice farmers' productivity. Obike, Idu and Aigboke (2016) examined the productivity of labour and resource efficiency amongst smallholder cocoa farmers in Abia State, Nigeria. 60 cocoa farmers from 3 zones were selected through purposive random sampling technique. The data were analyzed through a log linear regression analysis and it indicated that labour productivity has a positive effect on small-hoarder cocoa farmers. Result by Dhakal (2016) from 385 farmers in syangja district of Nepal entails a positive relationship between financial credit and farmers' productivity. Ahmed, Maryoud, Elkhidir and Mahmoud (2013) identified the impact of improved seeds on small farmers' productivity, income and livelihood in Bara, and their result from 60 farmers indicates a positive effect of seeds on small farmers' production. Gebeyehu (2016) investigated the impact technology adoption on agricultural productivity and production in Ethiopia, and the study revealed a positive effect between improved technology and agricultural productivity. Similar result where obtained by Alfa (2021) in Nigeria, as technology adoption had a positive relationship with farmers' productivity.

Methodology

This study used a cross sectional data and well structured questionnaire from a population of 310 registered farmers in Lapai that register with All Farmers Association of Nigeria (AFAN) and a sample of 142 farmers were randomly collected using Saunders et al. (2007) sample size criteria (Bank of Agriculture, 2018). The variables used in this study consist of farmers productivity measured in terms of output per bag; Fertilizer Subsidy measured by cost of bags received per 50kg; farm size measured in hectares; labour measured by number of people employed; seed measured by number of bags planted; technology measured by access to farm implement as binary outcome, likewise microcredit measured in binary with one having access and zero otherwise (Pide, 2016; Saheed*et al*., 2018). This study employs the use of Ordinary Least Square (OLS) model in analyzing the data obtained and the model is specified below:

$$FP_i = \beta_1 + \beta_2 FS_i + \beta_3 FZ_i + \beta_4 LB_i + \beta_5 SD_i + \beta_6 TC_i + \beta_7 MC_i + \mu \ldots\ldots\ldots 1$$

Where FP is the farmers' productivity, FT is fertilizer, LB stands for labour, SD is the seed, TC denotes technology used in farm, MC indicates microcredit, βs are the coefficient with i representing individual observation and μ is the error term. However, the analyses were segregated base on the productivity of two categories of farmers, which are notably maize and rice farmers. The model was further expanded to include farmers characteristics which is written below

$$FP_i = \beta_1 + \beta_2 GN_i + \beta_3 AG_i + \beta_4 ED_i + \beta_5 FS_i + \beta_6 FZ_i + \beta_7 LB_i + \beta_8 SD_i + \beta_9 TC_i + \beta_{10} MC_i + \mu \ldots\ldots\ldots\ldots 2$$

Where GN stands for gender of the farmer, AG represents the farmers age and ED denotes farmers' educational attainment.

Result

Table 1 indicates the result for descriptive statistics. Given the farmers characteristics, it shows majority of the farmers are male with an average age of 38 years. Majority of these farmers have gained at least a secondary certificate, which enable them to communicate. With their level of education and their due registration with AFAN, their productivity was able to increase with majority having the average production of over 160 bags of their farm produce.

Table 1: Descriptive Statistics

Variable	Mean	Std. Dev.
Gender	0.8098	0.3938
Age	38.014	8.1510
Education	1.7323	0.8581
Farm productivity	160.91	74.373
Fertilizer Subsidy	4.9697	2.9437
Farm size	1.6577	0.9154
Labour	2.6626	1.6856
Seed	15.950	9.1056
Technology	0.7605	0.4282
Microcredit	0.0492	0.2172

Source: Author computation

Although, fertilizer subsidy has actually enhance productivity as an average farmers were able to get 5 bags to be used in the farm. Most of these farmers are large in nature with average size

of 1.7 hectares per farmer. This necessitate some farmers to employ more labour with an average number of 3 workers per farm, the labourers are engaged in various form of farm activities ranging from planting to harvesting. The large nature of these farms made number of bags to be planted to be much, as average of 16 bags are used the farmers, as well as use of technology especially at tiling stage. The farmers mostly have no access to microcredit as most of the interventions are geared towards farm implements.

Table 2: Result on Farmers Productivity

	Dependent Variable: Farmers' Productivity		
Variables	*All*	*Maize Farmers*	*Rice Farmers*
Fertilizer subsidy	0.1921**	0.4101**	0.8077***
	(0.0876)	(0.1951)	(0.1053)
Labour	1.3146***	1.4281	1.5200***
	(0.4159)	(0.9859)	(0.4780)
Farm size	3.8452***	6.3374**	3.4330***
	(0.9890)	(2.7912)	(1.0592)
Technology	5.6564	10.622	1.3751
	(8.1138)	(20.339)	(8.9710)
Microcredit	25.193*	24.715	22.809
	(13.453)	(31.265)	(15.127)
Seed	1.2668	-1.3437	1.3517
	(1.1718)	(3.3628)	(1.2734)
N	142	39	103

*Notes: Robust standard errors are in parentheses, P values: significance *10%; **5%; ***1%*

Source: Author computation

The result in Table 2 indicates three analyses with the first analysis have the entire farmers captured, while the other two analyses are segregated base on maize and rice farmers. The result shows fertilizer subsidy to positively enhance farmers' productivity, but the contribution is higher in rice than maize productivity, which is in conformity with the findings of Nasrin, Bauer, Arman and Akhter (2021). Labour is positive and significant in general farming and rice farming, with a contribution of 1.31 and 3.43 to productivity respectively. Though more labour is required in rice farming than any other cereal crop, because it system of farming involves many steps and technicality, and findings are in line with the study of Obike et al., (2016). Farm size are equally an important determinant to farmers' productivity, as its contribution were all significant at 1% and 5% significance level. Microcredit is positive and only significant for general farming, as a significant number of them were able to have access to the credit facility as seen in the study of Dhakal (2016). If the credit facility is broadening, it will be able to significantly improve specific farmers' productivity. However, technology and seed were positive but not significant to farmers' productivity in any farming category.

Table 3: Result on Farmers Productivity with Respondent Characteristics

	Dependent Variable: Farmers' Productivity		
Variables	*All*	*Maize Farmers*	*Rice Farmers*
Gender	8.0209	-16.476	12.25502*
	(6.2838)	(20.654)	(6.4949)
Age	-1.332**	-1.5660	-1.11421*
	(0.5724)	(1.5829)	(0.6157)
Education	18.994***	18.586**	18.47129***
	(3.2299)	(8.9417)	(3.5097)
Fertilizer	0.1914**	0.4860**	0.99469
	(0.0840)	(0.2175)	(0.0986)
Labour	1.0405***	1.6647	1.259895***
	(0.3948)	(1.3514)	(0.4290)
Farm size	5.8119***	8.8871***	5.247196***
	(0.9553)	(2.8288)	(1.0075)
Technology	42.061***	41.226	36.22338***
	(9.8552)	(27.100)	(10.769)
Microcredit	13.790	12.499	10.27582
	(12.340)	(31.842)	(13.632)
Seed	-0.3359	-3.7425	-0.22489
	(1.1382)	(3.5176)	(1.2217)
N	142	39	103

*Notes: Robust standard errors are in parentheses, P values: significance *10%; **5%; ***1%*

Source: Author computation

Controlling for farmers characteristics in Table 3, the gender result is positive and only significant for rice farmers, signifying being a male rice farmers enhance productivity. Age is negative and significant at 5% for all farmers and 10% for rice farmers. The implication is that, younger farmers are more energetic and have the ability to withstand more obstacles in farming than the aged farmers, because as the age increases the productivity decreases. Educational attainment is positive and significant at all categories, signifying an increase in the level of education of farmers increases their productivity. This concurs with the assumption that farmers with better educational qualification can influence their output, especially when they engage in training usually carried out by extension service workers. Incorporating other variables, fertilizer subsidy, labour, farm size and technology were found to be positive and significant to productivity at various categories. However, microcredit and seed were not significant, though positive and negative respectively.

Conclusion and Recommendation

The study examines the impact of fertilizer subsidy on rural farmers' productivity, as well as it determinant in Lapai community. The study concludes fertilizer subsidy positively and significantly enhance farmers' productivity, though the contribution of fertilizer subsidy is more in rice than maize productivity. So also, variables such as labour and farm size are among the key determinants of productivity, because most farms are large, and required a labour force for farming operations. Looking into farmers' characteristics, education and gender (to some

extent) significantly influence farmers' productivity, whereas age shows a negative and significant relationship with productivity.

This study therefore, recommends further subsidy in the prices of fertilizers in order to ensure its affordability by all farmers, as well as, subsidy should be granted in areas of hybrid seeds and farm implements. Since the subsidy in seeds and farm implements are not well pronounced when compared to that of fertilizer subsidy. Also access to micro loans should be improved with removal of bureaucratic nature attached to obtaining loans in order to attract farmers to applying for loans. Government should provide more training and orientation to farmers through the extension services workers in order to have more and adequate knowledge in farming techniques.

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