POLICY BRIEF

The Impact of Agricultural Public Expenditure on Agricultural Productivity in Nigeria

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Abstract

This study analyzes the impact of agricultural public expenditure on agricultural productivity in Nigeria. The relevant time series data for the study were obtained from secondary sources. The data ranged from 1981 to 2014. An instrumental variable two-stage least squares (IV-2SLS) econometric model was employed to investigate the endogeneity of public agricultural expenditure, and the autoregressive distributed lag (ARDL) econometric technique was used to determine the long and short-term effects of public agricultural expenditure on agricultural productivity. The study shows that 20% of agricultural public budgets

were not implemented in Nigeria. On average, agricultural public capital expenditure comprised 55% of total agricultural public expenditure in Nigeria, which is lower than the recommended 60% for effective agricultural sector performance. The study also reveals that while public agricultural capital expenditure and agricultural public total expenditure are strong determinants of agricultural productivity, agricultural public recurrent expenditure maintains a weak relationship with agricultural productivity in Nigeria. Finally, the study demonstrates that agricultural public spending on irrigation has the highest impact on agricultural productivity, while agricultural public spending on subsidies has the least impact on agricultural productivity. Among other recommendations, it is suggested that the agricultural public expenditure pattern should be realigned to favour investments in irrigation, research and development, and rural development, which currently attract lower budgetary allocations in Nigerian agricultural budgets.

Introduction

Historically, agriculture was the most important sector in Nigeria, but now accounts for just more than 20% of gross domestic product (GDP) (CBN, 2018). The sector employs more than 48% of the labour force (Odozi et al., 2018), while 60% of those employed in the agricultural sector are women (Action Aid, 2015). The food crop sub-sector contributed about 76% of the share of the agricultural sector in GDP, livestock contributed 10%, with the remainder made up by the forestry and fisheries sub-sectors (CBN, 2018). Prior to the 1970s, agriculture produced adequate food to feed the population. It served as a major foreign exchange earner for the country and was a major source of raw materials for the agro-allied industries (Alabi et al., 2016). In periods immediately following independence, the agricultural sector performed the aforementioned roles to such an extent that the regional development and growth cycles witnessed during this time were directly linked to agricultural development (Eluhaiwe, 2010). Development economists have attributed the economic problem in Nigeria to the poor performance of the agricultural sector (Olomola et al., 2015).

One of the factors that is deemed to have contributed to the poor performance of the agricultural sector in Nigeria is low agricultural budgetary allocation (Islam, 2011; Alabi, 2014). Mogues et al. (2008) and Olomola et al. (2014) indicated that less than 2% of total federal government expenditure was allocated to agriculture over the years in Nigeria. This was lower than the 10% agricultural budgetary allocation recommended in the Maputo Declaration of 2003 for effective agricultural performance (Badiane et al., 2016).

A measure of agricultural sector performance is agricultural productivity (FAO, 2018). Agricultural productivity can be defined as the ratio of agricultural outputs to agricultural inputs; a higher ratio is associated with better agricultural performance. Productivity is a key issue in Nigeria's agricultural sector due to its importance as

a strategy for agricultural development and its impact on economic and social development. Improving agricultural productivity is necessary to ensure food security and increased farm income. Productivity growth in agriculture can allow food to become more abundant and cheaper (FAO, 2018). However, the inherent problems in Nigeria's agricultural sector span all types of agricultural productivity. For example, considering single factor productivity such as land productivity, Table 1 reveals that average cereal land productivity (yield) grew only by 2.57% between 1981 and 2019, while the average cereal land productivity in Africa and the world grew by 36.90% and 56.62%, respectively, over the same period. Likewise, Table 1 indicates further that agricultural labour productivity in cereal production in Nigeria, which grew at 26% between 2011 and 2019, is lower than Africa's and the world's averages of 28% and 34%, respectively, during the period. More importantly, agricultural labour productivity in cereal production in Nigeria, which was estimated at 259kg per labour between 2011 and 2019, was only 32% of the world average agricultural labour productivity in cereal production, estimated at 822kg per labour during the same period. Further evidence of lower agricultural productivity in Nigeria is revealed in Figure 1, which suggests that agricultural value added per labour ranks among the lowest in the world. In fact, agricultural value added per labour in Nigeria was only 29%, 34% and 43% of that of Algeria, South Africa, and Mauritius, respectively.

There is also ample evidence that based on total factor productivity (TFP), which is a composite measure of agricultural productivity that takes into accounts all the factors of agricultural production used in the production process, the agricultural productivity growth rate in Nigeria is lower than the global average. For example, the GAP Report (2019) indicates that while the agricultural TFP grew by 1% in a country such as Nigeria, agricultural TFP globally grew at an average of 1.63% in 2019. The decline in agricultural productivity in Nigeria is not nearly adequate for the 6.5% growth rate in the annual demand for food in Nigeria (Action Aid, 2015). This may be one of the reasons for the increase in the rate of food Insecurity in Nigeria and the decline in the agricultural sector contribution to GDP (CBN, 2018).

Kalibata (2010) posited that improved public expenditure in agriculture will help to provide farmers with improved inputs. Well-managed public spending in agriculture can be used to provide rural infrastructure such as road that will link farmers to markets. Public financial resources will enable farmers to access agribusiness credit and storage facilities to reduce their estimated 50% post-harvest losses (Oguntade, 2014). These resources are important to boost agricultural productivity, which can accelerate economic growth, raise incomes, and improve standards of living. It is expected that the Maputo Declaration of 2003, which targets 10% of public expenditure for agriculture, will boost agricultural productivity in Nigeria. Likewise, following the Maputo Declaration of 2003, the Abuja Declaration of 2006, and the Malabo Declaration of 2013, aimed at increasing farm input use and investment in Nigeria, can ultimately increase agricultural productivity (NEPAD, 2014).

To convince the ministry of agriculture to increase the agricultural budget allocation for the Nigerian agricultural sector, evidence of the impact of this expenditure on agricultural productivity in Nigeria is required. Moreover, the impacts of public expenditure on agricultural productivity may differ by type of expenditure (Mogues et al., 2012a; Mogues et al., 2012b). Therefore, an analysis of the heterogeneous impacts of different types of public agricultural investments is imperative. This study pays close attention to these heterogeneous impacts of different types of agricultural public expenditure on agricultural productivity in Nigeria, which could guide agricultural public expenditure policy decisions. Economists have shown that public sector finance alone may not be enough to finance the agricultural sector (Benin, 2017; FAO, 2013). There is a need for a study of this nature that recognizes the complementary role of official development assistance (ODA) in agricultural public expenditure discourse and analysis.

Some questions continue to dominate recent debates and discussions regarding government spending on agriculture. Some of these questions are: What is the structure of agricultural public expenditure in Nigeria? Is the impact of agricultural public capital expenditure on agricultural productivity relatively greater than that of agricultural public recurrent expenditure in Nigeria? Do the various components of agricultural public capital expenditure have differential impacts on agricultural productivity? This study aims to provide answers to these questions and make recommendations based on the empirical findings.

The broad objective of the study is to analyze the long and short-run impacts of agricultural public expenditure on agricultural productivity in Nigeria. Specifically, the study aims to:

(i) examine the structure of agricultural public expenditure.

(ii) determine the relative impacts of agricultural public capital and recurrent expenditure on agricultural productivity; and

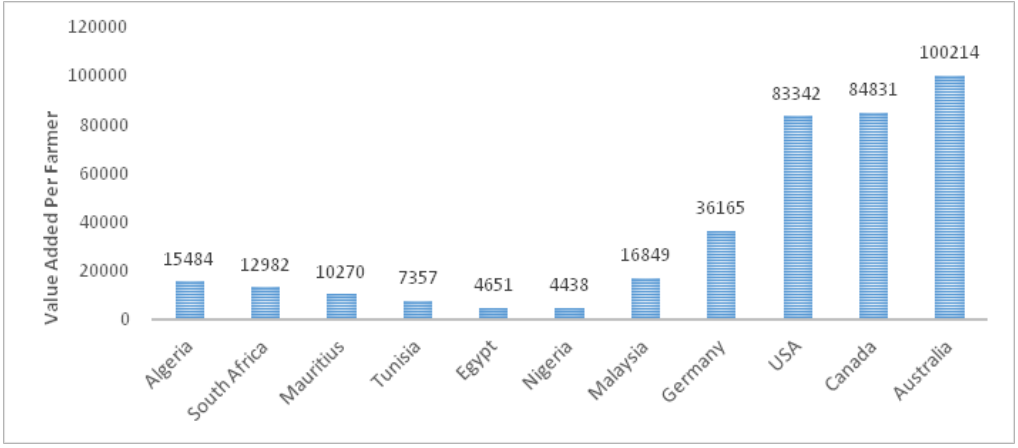
(iii) compare the impacts of different components of agricultural public capital expenditure on agricultural productivity.

Table 1: Average land and labour productivity in cereal production in Nigeria, Africa, and the World (1981–2019)

Period	Land productivity			Labour productivity		
	Nigeria (kg/ha)	Africa (kg/ha)	World (kg/ha)	Nigeria (kg/labour)	Africa (kg/labour)	World (kg/labour)
1981–1990	1339.5	1145.5	2489.6	206.1	207.6	613.8
1991–2000	1176.9	1206.8	2895.8	284.8	221.4	628.5
2001–2010	1415.7	1396.9	3329.0	289.4	239.4	686.2
2011–2019	1373.9	1568.2	3899.1	259.2	266.4	822.0
% change (1981–2019)	2.57	36.90	56.62	25.76	28.32	33.92

Source: Computed from FAOSTAT (2019).

Figure 1: Agriculture value added per labour, Nigeria and other countries (US$, 2010 prices)



Source: Computed from FAOSTAT (2021).

Data sources

The current analysis utilized the agricultural production function based on the conceptual framework indicated in Figure 2. In the analysis, AGP was proxied by agricultural value added per farmer. Agricultural value added per farmer was derived by dividing agricultural GDP by the number of farmers. The benefit of using agricultural GDP as the measure of agricultural total output is embedded in the fact that the value of all agricultural commodities produced are aggregated in the agricultural GDP. Agricultural GDP is also expressed in monetary terms in order to aggregate different agricultural commodities produced in different forms into a single measure (FAO, 1980). The agricultural value added per farmer as a measure of productivity has been shown to enable the measurement of the returns to factors of production such as land, labour, and capital (FAO, 2018). Moreover,

according to the FAO (2018), agricultural value added per farmer as an example of a single-factor productivity indicator can easily be interpreted, understood, and calculated, due to the fact that both the numerator and denominator can be expressed in terms of physical units. Several studies, for example by Kelly et al. (1996), Prasada (1993) and the FAO (FAO, 2018), have indicated that the lack of accurate agricultural statistics in developing countries will hamper the estimation of TFP, which is a better measure of productivity because it considers all the factors of production used in the production process. Moreover, the measurement of TFP is demanding in terms of data requirements, because disaggregated and specific information on quantities and prices is required for all the outputs and the major inputs included in the production process. The number of farmers considered as denominator in estimating the agricultural value added per farmer is an important unit to be accounted for in measuring agricultural productivity because the number of farmers is the pull from which labour supplies are derived. Labour is an important input in agricultural production, especially in Africa where agriculture remains labour intensive. GSARS (2016) has proved that labour expenses represent about 60% of the total cost of agricultural production if family labour is adequately accounted for in Africa, which also depends on the agricultural products under consideration.

The relevant data for this study is secondary data that range from 1981 to 2014. The agricultural public expenditure is divided into two main categories: capital and recurrent expenditure. Information provided by Mogues et al. (2008) and Olomola et al. (2015) was used to divide agricultural public capital expenditure into different components. Farmers' private capital on the farm is proxied by gross fixed capital formation (GFCF). Farm labour supply is modelled as the ratio of farmers' population to total population in Nigeria.

Agricultural GDP, agricultural public expenditure (recurrent, capital, and total) and rainfall were obtained from the Central Bank of Nigeria (CBN) *Statistical Bulletin.* GFCF, arable land per farmer, labour supply and ODA were extracted from the FAOSTAT website (FAOSTAT, 2019). The summary of relevant variables and units of measurement are presented in Table A1, while Table 2 indicates their measurement. All monetary values were deflated (GDP deflator) using 2010 constant prices to exclude the influence of inflation, other temporary monetary and fiscal trends.

Table 2: Measurement of relevant variables used in study.

Variables	Measurement
Recurrent agriculture expenditure per farmer	Recurrent agriculture expenditure/number of farmers (number)
Capital agriculture expenditure per farmer	Capital agriculture expenditure/number of farmers (Naira)
Total agriculture expenditure per farmer	Total agriculture expenditure/number of farmers (Naira)
Farmer-population ratio (labour)	Number of farmers/total population (number)
Agricultural GDP	Sum of all agricultural produce in Nigeria expressed in local currency (Naira)
Agricultural value added per farmer	Agricultural GDP/number of f armers(Naira)
Agricultural ODA	Amount of ODA allocated to agriculture (Naira)
Farmers' private investment (depreciated value)	$GFCF_{year}$) X δ(depreciation rate) (Naira)
Arable land per farmer	Arable land/number of farmers (number)

Source: Computed by authors.

Conclusion

This study analyzed the short and long-run impacts of agricultural public expenditure on agricultural productivity in Nigeria. Initial findings show that about 20% of agricultural budgets were not implemented in Nigeria. On average, agricultural public capital expenditure constituted a share of 55% of agricultural public total expenditure in Nigeria, which is lower than the recommended 60% for the agricultural sector to perform effectively. The estimated share of agricultural public expenditure in total government expenditure in Nigeria is 1.52%, which is far lower than the 10% recommended in the Maputo Declaration. The study shows that, in the long run, if past public agricultural capital expenditure and farmers' private capital had increased by 100%, agricultural productivity would have increased by 15.66% and 12.83%, respectively. The estimated negative elasticity for labour supply in the long and short runs, one of the findings from the study, is a confirmation of declined agricultural labour productivity in Nigeria. The estimates also reveal that rainfall has a significant and positive relationship with agricultural productivity in the short and long runs. This reinforces the importance of water provision for agricultural production activities. The study also indicates that while public agricultural capital expenditure and agricultural public total expenditure are strong determinants of agricultural productivity, agricultural public recurrent expenditure maintains a weak relationship with agricultural productivity in Nigeria. In the agricultural productivity equation, where agricultural public total expenditure is the explanatory variable, significantly declined land productivity was revealed.

The elasticity of farmers' private capital with respect to agricultural public total expenditure in the long run, which is estimated to be -0.709,1 reflects the possible "crowding out" effect of total agricultural public expenditure on farmers' private capital investment. By comparing the crowding out effect of farmers' private capital with different components of agricultural public capital expenditure, it is revealed that the crowding out effect is higher regarding subsidy expenditure than any other component of agricultural public capital expenditure. The study reveals that ODA has a positive and significant relationship to agricultural public capital expenditure. Relating ODA to the components of agricultural public capital expenditure, it is evident that ODA crowds in more rural development expenditure than any other component of agricultural public capital expenditure.

It is evident that the coefficient of the Maputo variable is not significant in all relevant equations estimated in this study. This confirms that agricultural public expenditure has not increased significantly in Nigeria since the Maputo Declaration of 2003. The causality result shows that there is a bidirectional causality between public agricultural capital expenditure and agricultural productivity, which reflects the endogeneity of agricultural public capital expenditure. The examination of the impacts of different components of agricultural public capital expenditure on agricultural productivity demonstrates that expenditure in irrigation facilities will have a greater impact on agricultural productivity in Nigeria than public investment on agricultural subsidy schemes and programmes. Comparing this finding with the agricultural public capital expenditure allocation in Nigeria reveals a misallocation of agricultural public capital expenditure, as the allocation is not aligned with the estimated impacts of the components of agricultural public expenditure.

Based on the above findings, the following recommendations may increase agricultural productivity in Nigeria:

- The government and ministry of agriculture should make efforts to improve the level of agriculture budget implementation in Nigeria. Without full implementation of the agricultural budget, it will be difficult to justify the need to increase the agricultural budget.

- The share of agricultural public capital should be increased from the estimated 55% in the study. This is imperative because agricultural public capital expenditure does not only increase agricultural productivity, but also tends to crowd in ODA.

- Attempts to increase and promote activities that will increase farmers' private capital will be a move in the right direction. The formation of cooperative societies and access to microcredit schemes can improve farmers' private capital formation.

- The decline in agricultural labour and land productivity in Nigeria deserves urgent attention. This can be done by improving the human capacity of farmers through extension services and adult education. Extension services and adult education will expose farmers to the best agricultural practices and improve the adoption of innovation. Likewise, a decline in land productivity can be addressed through the adoption of soil improvement and land fertility restoration practices.

- The crowding out effect of agricultural public expenditure on farmers' private capital in Nigeria can be ameliorated if agricultural public expenditure patterns are structured in a way that encourages private entrepreneurship in related agricultural projects and schemes. Agricultural public expenditures on irrigation, R&D and rural development are good examples of projects that can crowd in farmers' private capital and encourage private entrepreneurship in agriculture.

- As ODA has a positive and significant relationship with agricultural public capital expenditure, conditions that are conducive to ODA reception should be promoted. This includes good governance and transparency in public expenditure management.

- Finally, agricultural public expenditure should be realigned to favour investment in irrigation, R&D and rural development, which currently attracts lower budgetary allocations in Nigerian agricultural budgets. This public investment in irrigation systems can be made more efficient and sustainable if they are small-scale and designed in a manner that will encourage farmers' participation and entrepreneurship.

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