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# Public and private investments and agricultural sector performance in Nigeria, 1981-2016

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Agriculture remains the backbone of any developing economy and the foundation for rapid and sustainable growth and development of any Nation. To this end, the study investigates how private and public investments in agricultural sector have contributed to the growth of the sector in Nigeria. To achieve the objective, data on public spending on agriculture, banking sector lending to agriculture, Foreign Direct Investment (FDI) inflow to agriculture and interest rate on credit to agriculture were sourced from 1981-2016. Descriptive and inferential statistical as well as econometric techniques were applied to analyze the collected data. The study found that a negative relationship exists between public investment in agriculture and performance of the agricultural sector and a positive relationship between banking sector credit and the performance of agricultural sector. Findings also revealed a negative and insignificant relationship between foreign direct investment in agriculture and the performance of the sector while interest rate was found to be negatively related to the sector performance. Based on this findings, the study recommends increased banks' lending to agriculture, addressing the problems associated with public funding of agriculture, particularly in terms of misappropriation of agricultural funds, reforms in the agriculture sector in order to attract foreign investment and a reduction in interest rate in order to spur investment and stimulate growth in the agriculture sector in Nigeria.

**Key words:** Agricultural performance, public investment, private investment

JEL Classifications: E22; N57; Q14; Q18

## INTRODUCTION

Though the share of GDP in agriculture has declined rapidly in much of the world, the sector still dominates employment in a number of the poorest countries, (Clunies-Ross et al., 2009). In addition to providing employment, agricultural sector provides food for consumption by the citizenry, provides raw materials for industrial production, mobilizes foreign exchange earnings to the government and generates employment for the working population. The sector also provides the ingredient for development of other sectors of the economy because of its linkage capacity with key sectors. Based on these critical roles that the sector plays in the development process, the Nigerian

government since independence drew its development plan with emphasis on agriculture. Some of the programmes and projects like Operation Feed the Nation (OFN), the Green Revolution (Gr), Agricultural Development Programme (ADP), National Fertilizer Company of Nigeria (NAFCON), School-To-Land Programme, the River Basin Development Authority (RBDA), National Accelerated Food Production (NAFP), establishment of institutions like the Directorate for foods, Roads and Rural infrastructure (DFFRRI) and institution of financial measures such as the establishment of agricultural credit scheme fund (ACGSF) were introduced by successive government to tackle the problem of poor

financing of the agricultural sector in Nigeria.

The poor growth of the sector emanates mainly from variation in agricultural export earnings caused by yearly production oscillations and vagaries in commodity prices at the international market. Instability in exchange rate became much less of a problem consequent upon the introduction of a liberal exchange rate system in 1986, but the productivity of agricultural sector continued to decline due to the government and the organized private sector inability to make the needed investment to enhance the competitiveness and productivity in the sector. The low productivity of agriculture sector could be traced to the steady decline in exports of agricultural products. Though substantial fund has been appropriated to the sector over the years, productivity of agriculture in Nigeria still remains poor and its operations largely underdeveloped. The output of the sector remains uneven over the years. Therefore, the study seeks to analyze the trend in public sector funding, banking sector credit, foreign direct investment and cost of funds (interest rate) to agricultural sector in Nigeria, to examine the extent to which private and public sectors have contributed to the performance of agriculture in Nigeria during the period under review. To this end, the study aims at examining the extent to which investments in agriculture by public and private sectors of the economy have impacted on the sector's productivity.

The rest of the paper is structured as follows: Section two, following the introduction, briefly reviews relevant literature on the subject matter. Section three explains the theoretical framework of the study. Section four contains the methodology adopted in the study.

## Literature Review

### Conceptual and Theoretical Literature Review

Clunies-Ross et al. (2009) defined agricultural sector as "the part of the economy which is engaged in the cultivation of food and cash crops, besides other activities based on animals and plants including grazing, forestry, fishing and hunting". They defined agricultural productivity as "the average agricultural value added per worker". Agricultural development involves activities aimed at enhancing agricultural productivity and hence boosting agricultural output. According to Evbuonwan et al. (2003), "the main thrust of agricultural development efforts has been to enhance and sustain the capacity of the sector to play its assigned role to attain sustainable level of production of basic food commodities" Although, Todaro and Smith (2009) are of the view that the ability of agricultural production to keep pace with world population growth has been impressive, Evbuonwan et al. (2003) observed that despite these laudable efforts, Nigeria's agricultural sector is still characterized by low yields. Udoh (2011) examined the nexus between public spending and private investment on the growth of agriculture in Nigeria during 1970 to 2008 using the ARDL model. The result of the investigation revealed that government funding played a serious role in

agricultural sector growth and development. He opined that constraints to agricultural growth could easily be addressed by the government. Through increase in public funding, government would enhance the marginal productivity of private capital in the sector.

In a related study, Ibe (2014) examined the impact of banks' and public sector's financing activities on agricultural output in Nigeria and found that the joint action of commercial banks' credit to the agricultural sector, government financial allocation to agriculture and agricultural products prices are significant factors that can influence agricultural production in Nigeria. The study, therefore, recommended that banks should be encouraged to assist such institutions that are engaged in agricultural financing and that agricultural financing should be given paramount attention in policy formulation.

In the same vein, Matthew and Mordecai (2016), examined the impact of investment in agricultural output in Nigeria during 1981-2014, using the co-integration and error correction model. The result shows that a long-run relationship exists between agricultural output, public agricultural expenditure, commercial bank loans to the agricultural sector and interest rates in Nigeria. However, the result of the parsimonious error correction model indicate that public agricultural expenditure has a significant negative impact on agricultural output while commercial bank loans to the agricultural sector and interest rate have insignificant positive impacts on agricultural output in Nigeria. The result also indicates that agricultural output adjusts speedily to previous changes in public agricultural expenditure, commercial bank loans to the agricultural sector and interest rate by over 75 percent.

Osa-Afiana and Kelikume (2015) investigated the impact of banking sector reforms and credit allocation on agricultural sector in Nigeria using VECM method. The result reveals that banking sector reforms and credit supply to agriculture have positive implications on the performance of agricultural sector in Nigeria. The result further indicates that the impact of agricultural credit supply to the agricultural sector is insignificant and low as evidenced in the variance decomposition result. The findings of the study demonstrate a weak relationship between the rate of agricultural output and aggregate credit supply to the sector. Hence, the study suggests caution in formulating the financial policy for the transformation agenda of the agricultural sector in order to enhance optimal productivity gains in the agricultural sector.

Udoka et al. (2016), investigated the impact of banks' loan on agricultural sector performance in Nigeria. The findings reveal a positive and significant nexus between agricultural credit and agricultural performance. This implies that a rise in agricultural funding by banks spurs agricultural performance in Nigeria. In like manner, a positive and significant nexus was found between agricultural credit guarantee scheme and agricultural sector performance in Nigeria. Nnamocha and Eke (2015) use the Error Correction model to investigate the relationship between banking sector credit agricultural sector performance in

Nigeria over the period 1970-2013. Their findings reveal that, bank credit and industrial output contributed a lot to agricultural output in Nigeria in the long-run while the industrial output was found to impact significantly on agricultural output in the short-run. Oloyede (2014), on his part, examined the impact of foreign direct investment (FDI) on the agricultural sector development of the Nigerian economy and found that FDI positively impacted on agriculture not only in the short run but also in the long run.

**Theoretical Framework**

The theoretical foundation of this study is premised on the production function, Harold-Domar Growth model formulated by Harrod (1939) and Domar (1946) and the Two-Gap model. Production function expresses the relationship between output and inputs thus;  $Q = f(L, K)$ , where  $Q$  = output,  $L$ = labour and  $K$  = capital. In this context, output represents the performance of the agricultural sector; labour represents workers employed in the agricultural sector, while  $K$  represents investment in the agricultural sector. The Harrod-Domar growth and Two-Gap models by Chenery and Strout (1966) also provide justification for the critical role of capital (investment) in the growth process. The theories argued that due to low income and savings, investment in less developed countries are inadequate in stimulating the expected output or growth. To them, this short coming can be remedied by the intervention through funding from either private or public sources. It is important to note that, most times, capital which plays critical role in enhancing output in agricultural sector falls short of requirement due to low income of farmers which results in low savings and investments (savings investment gap) and hence, the need for both organized private and public sectors funding. The study, however, incorporates the foreign component of foreign investment in agriculture into this study and extends the period of investigation from 1981-2016.

**METHODOLOGY**

**Formulation and Specification of the Model:**

Based on the theoretical framework explained above and incorporating foreign investment into the agricultural sector in Nigeria, the study specifies a functional relationship between output of agriculture and funding as follows;

$$AOP = f(PSFA, BSCA, INC, FDIA).....(1)$$

In the process of estimation, parameters and stochastic term “U” are incorporated into the model to take care of variables that may influence the dependent variable but are not included in the model. Hence, equation 4.1 could be transformed as follows

$$AOP_t = \alpha_0 + \alpha_1GEAS_t + \alpha_2PSEA_t + \alpha_3INC_t + \alpha_4 (FDIA_t) + e^{ut}.....(2)$$

To enhance the estimation of equation 4.2 using ordinary least squares, it is transformed into a log-linear form by taking the natural log of the variables thus;

$$\ln AOP_t = \alpha_0 + \alpha_1 \ln GEAS_t + \alpha_2 \ln PSEA_t + \alpha_3 \ln INC_t + \alpha_4 \ln FDIA + U_t.....(3)$$

$\ln$  = natural logarithms

$\alpha_0$  = autonomous component of agricultural output.

$\alpha_1 - \alpha_4$  = parameter estimates

AOP = agricultural output (measure of agricultural output performance).

GEAS = Government expenditure on the agricultural sector

PSEA = Private sector investment in the agricultural sector (measured by the total banking sector credit to the agricultural sector)

INC = Interest rate on credit by the banking sector

FDIA = Foreign direct investment in agriculture

U = Disturbance term.

**Apriori Theoretical Expectation**

$\alpha_1, \alpha_2, \alpha_3$  and  $\alpha_4$  are elasticities of public funding to agricultural sector, banking sector credit to agricultural sector, interest rate on credit and foreign direct investment to the agricultural sector in Nigeria. Hence,  $\alpha_1 > 0, \alpha_2 > 0, \alpha_3 < 0,$  and  $\alpha_4 > 0.$

**The data**

Time series data were collected for the period 1981-2016 denoting a period of 35 years. The sources of data are (1) Central Bank of Nigeria statistical bulletin (various volumes), (2) Central Bank of Nigeria annual reports and statement of accounts (2016), and (3) National Bureau of statistics annual Abstract of statistics (2016).

**Methods of Data Analysis**

In order to satisfactorily generate the parameters of the above model, we undertake a descriptive analysis of our data sourced using mean, mode; minimum, maximum, standard deviation and line graphs for us to have an idea of the trend and behaviour of the series. In order to establish the stationarity status of the series, we applied the Augmented Dickey Fuller (ADF) the Philip-Perron procedures. Thereafter, we applied the ordinary least squares (OLS) to the first difference of the series since all the variables were found to be stationary at first difference: I(1). Meanwhile, diagnostic and stability tests (serial correlation, heteroscedasticity, normality, structural breaks, specification error among others) were conducted to ensure they conform to the assumptions of the ordinary least squares Regression Analysis. The Engle Granger Co-integration Test and Error correction procedure were also used to analyze the short and long run relationship between private and public sectors investment on the performance of agricultural sector in Nigeria.

**Table 1.** Descriptive Statistics

Statistic	AOP (%)	GEAS (Nbn)	PSEA (Nbn)	FDIA (Nbn)	INC (%)
Mean	21.25454	14.58639	94.14444	2.408022	17.59528
Median	19.96208	4.615000	32.15000	1.209000	17.54500
Maximum	26.99481	65.40000	494.9000	19.37101	29.80000
Minimum	15.49594	0.010000	0.600000	0.117300	7.750000
Std.Dev.	3.217922	18.68870	139.8361	4.151904	4.757283
Skewness	0.166144	1.155554	1.742968	2.820300	0.186892
Kurtosis	1.793471	3.251311	4.785181	10.44818	3.475984
Probability	0.308944	0.017365	0.000010	0.000000	0.759795
Sum	765.1633	525.1100	3389.200	86.68878	633.4300
Sum Sq. Dev.	362.4258	12224.36	684394.5	603.3407	792.1111
Observations	36	36	36	36	36

Source: Author's Computation, 2018

**Table 2.** Short run Result of Agriculture Performance Model

Variable	Coefficient	Std.Error	t-Statistic	Prob.
C	2.787437	0.165604	16.83195	0.0000
LOG(GEAS)	0.023022	0.015501	1.485168	0.1474
LOG(PSEA)	0.101720	0.030859	3.296246	0.0025
LOG(FDIA)	-0.102289	-0.027474	-3.723104	0.0008
LOG(INC)	-0.030883	0.047706	-0.647371	0.5222

R<sup>2</sup> = 0.81; R<sup>2</sup> adjusted = 0.79; F-stat=33; Prob (F-stat) = 0.000; DW=1.4

Source: Computed Result, 2018

## RESULTS AND DISCUSSION

The following present the results of the analysis carried out using the collected data:

The descriptive statistics result reported in Table 1 indicates that average contribution of agriculture to GDP was 21.3 percent, government spending in the agricultural sector stands at ₦14.6billion on an average. During the period under review, banking sector credit to agricultural sector has mean value of ₦94.14billion, foreign direct investment in the agricultural sector stands at ₦2.4billion on the average while interest rate on lending averaged 17.6 percent. Agriculture contribution to GDP has lowest value of 15.5 percent and highest value of 27 percent. Government expenditure in agricultural sector grew from ₦0.01billion to ₦65.4billion, banking sector credit to the agricultural sector rose from ₦0.12billion to ₦19.4billion while interest rate on lending by the financial sector rose from 7.75 percent to 29.8 percent over the period under investigation. Our analysis shows that all the variables under focus has increasing trend.

The short run agricultural performance result reported in Table 2 shows that government expenditure on agriculture and banking (private) sector funds positively impacted on agricultural sector performance. This implies that increases in these variables spurred agricultural sector performance in Nigeria. Foreign direct investment inflow into agricultural sector and interest rate retarded agriculture

performance given their negative coefficients. This implies that increases in foreign investment in agriculture and interest rate reduced performance of agriculture sector. The result also shows that private sector funds and foreign direct investment in agriculture significantly affected output of agricultural sector while government spending and interest rate impact is insignificant in the short run. The goodness of fit measure reveals that about 79 percent of the total variation in agriculture performance is explained by the independent variables in the short run.

The unit roots tests result reported in Table 3, using the Augmented Dickey fuller Procedure indicates that agriculture contribution to GDP, government spending to agriculture, bank lending to agriculture, and interest rate on credit were all stationary at first difference while FDI inflow to agriculture was stationary at second difference or order two  $i(2)$ . But, as shown in Table 4 below, the Philip – Perron Technique indicate that all stationary at first difference or order one  $I(1)$ . The confirmation of stationarity in the variables and their conformity to the basic assumptions of the ordinary least squares estimation given credence to the examination of long run dynamics among the variables.

The long run dynamics amongst the variables was carried out using the Engle and Granger. Usually, the Engel and Granger (1987) and the Johansen and Juselius (1990) tests are the two methods of co-integration test. The Engel and Granger test is apt in situation of single equation models

**Table 3.** Unit Root Test Result – ADF Procedure

Variable	ADF Statistic	1%	5%	10%	Order of integration	Remark
Log(AOP)	-6.571704	-3.639407	-2.951125	-2.614300	1(1)	Stationary
Log(GEAS)	-8.249617	-3.639407	-2.951125	-2.614300	1(1)	Stationary
Log(PSEA)	-6.692147	-3.639407	-2.951125	-2.614300	1(1)	Stationary
Log(FDIA)	-12.50566	-3.653730	-2.957110	-2.617434	1(2)	Stationary
Log(INC)	-5.343738	-3.646342	-2.954021	-2.615817	1(1)	Stationary

Source: Author's Computation, 2018

**Table 4.** Unit Root Test-Result – Philip-Perron Procedure

Variable	ADF Statistic	1%	5%	10%	Order of integration	Remark
Log(AOP)	-6.571704	-3.639407	-2.951125	-2.614300	1(1)	Stationary
Log(GEAS)	-8.822600	-3.639407	-2.951125	-2.614300	1(1)	Stationary
Log(PSEA)	-7.200908	-3.639407	-2.951125	-2.614300	1(1)	Stationary
Log(FDIA)	-8.417358	-3.639407	-2.951125	-2.614300	1(1)	Stationary
Log(INC)	-8.736918	-3.639407	-2.951125	-2.614300	1(1)	Stationary

Source: Author's Computation, 2018

**Table 5.** Engel and Granger Residual Based Cointegration Test Result

Variable	ADF Statistic	1%	5%	10%	Order of integration	Remark
Residual	-4.337314	-4.385839	-3.632900	-2.612874	1(0)	Co-integrated

Source: Author's Computation, 2018

**Table 6.** Long run Result of Agricultural Sector Performance Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.027914	0.011242	2.482994	0.0201
DLOG(GEAS(-1))	-0.013854	0.012278	-1.128375	0.2699
DLOG(GEAS(-2))	-0.040614	0.012047	-3.371321	0.0024
DLOG(PSEA)	0.028091	0.033795	0.831218	0.4137
DLOG(FDIA)	-0.034288	0.018314	-1.872200	0.0729
DLOG(FDIA(-2))	-0.031211	0.622258	-1.402245	0.1731
DLOG(INC(-2))	-0.027270	0.040795	-0.668468	0.5100
ECM(-1)	-0.488624	0.133587	-3.657716	0.0012

R<sup>2</sup> = 0.55; R<sup>2</sup> adjusted = 0.42; F-stat=4.34; Prob (F-stat) = 0.003; DW=1.79

Source: Author's Computation, 2018

while the Johansen and Juselius co-integration test is used for system equation models. Given the nature of stability in the variables I(1), the Engle and Granger co-integration method is used. The result of the test as reported in Table 5 shows that the residual series is significant at 1%, 5% and 10% critical levels. The significant of the residual series is a conformation of long run relationship (co-integration) among the variables.

The establishment of co-integration is a prerequisite for conducting the error correction model. The ECM done at a lag length of 2. The parsimonious error correction result reported in Table 6 was achieved after adjustments in the over parametrised result.

The parsimonious error correction result reported in Table 6 indicates that government expenditure in agriculture, foreign direct investment inflow into agriculture sector, and interest rate are negatively related to performance of agricultural sector measured by (agriculture share of GDP). This implies that these variables retarded performance of agriculture sector in the long run. Private sector investment proxy by banking sector credit to agriculture sector positively impacted on agricultural sector performance in Nigeria over the period. This implies that private sector funding spurred performance of agriculture sector in the long run.

The negative sign of the error correction model and its

significance at 5 percent level, implies that variables in the agricultural performance model adjust speedily to changes in long run dynamics. This implies that, it takes a shorter period for the variables in the agricultural output model to affect agricultural performance. The result also indicates that only 42 percent of the total change in agricultural performance model is determined by government spending to agriculture sector, banking sector credit to agriculture sector, FDI to agriculture sector and interest rate on loans.

### Conclusion and Recommendations

Based on the results and findings of this study, the study concludes that public investments in agriculture do not have a clear effect on the performance of agricultural sector. This is evidenced by its positive effect on agricultural sector performance in the short run and negative effect in the long run. On the other hand, private sector investments in agriculture (especially bank credit) positively impacted on agricultural sector performance both in the short and long run. It was however, observed that FDI inflow into agriculture retarded performance of the sector. Also, interest rate has consistent negative implications on the performance of agricultural sector. Therefore, the study recommends 1) an improvement in the banking lending to agriculture 2) reforms in the agriculture sector in order to attract foreign investment and 3) a reduced interest rate in order to spur investment and stimulate growths in the agricultural sector in Nigeria.

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