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A vector Error Correction Model Approach to Government Agricultural Expenditure on Agricultural Growth in Nigeria Under the Period of Uninterrupted Democracy. (1999-2020)

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ABSTRACT
This study examined government agricultural expenditure and agricultural growth in Nigeria from 1999-2020. Annual time series data on agricultural GDP growth rate, government agricultural expenditure, inflation, rate, exchange rate, population growth rate, interest rest, export rate, private investment, public investment and foreign direct investment collected from the records of Central Bank of Nigeria (CBN) publications and annual reports, National Bureau of Statistics (NBS) database, Federal Ministry of Agriculture and Rural Development, Food and Agriculture Organization Statistics (FAOSTAT) and World Bank database were analysed using inferential statistics such as unit root, Johansen co-integration and vector error correction model (VECM). The result of Augmented Dickey Fuller tests showed that all the variables were stationary at first difference and they co-integrate. The result also revealed that agricultural expenditure had positive statistical significant impact on agricultural GDP growth at 1% probability in both short run and long run with coefficients of 0.02270 and 0.003055 respectively Inflation (0.890787), public investment (0.004469) and private investment (0.004469) were both positive and significant. Acceleration in these variables will lead to acceleration in agricultural expenditure in the short and long run. The study concluded that Government agricultural expenditure will have statistical positive significant impact on agricultural GDP in both short run and long run. Thus, the government should improve on her expenditure on agriculture, in order to boost the growth of this sector, as well as its contribution to the growth of the domestic and national economy, and government expenditure also needs to be closely monitored to ensure its proper full implementation.

Keywords: Agricultural Expenditures, Agricultural GDP, Augmented Dickey Fuller, VECM

Introduction

One of the major challenges facing mankind is to provide an equitable standard of living, adequate food, clean water, safe shelter and energy, a healthy and secured environment, an educated public and satisfying job for this and future generations (Ewubare and Eyitope, 2015). It is not an overstatement to assert that the growth and development of any nation depend, to a large extent, on the development of agriculture. The saying that "agriculture is the mainstay of the Nigerian economy may have become a cliché. It nevertheless underscores the emphasis placed on agriculture as the engine of growth in the Nigerian economy. Generally, the sector contributes to the development of an economy in four major ways-product contribution, factor contribution, market contribution and foreign exchange contribution (Ewubare and Eyitope, 2015). In realization of this, the government has embarked on various policies and programmes aimed at strengthening the sector in order to continue performing its roles, as well as measures for combating poverty. Notwithstanding the enviable position of the oil sector in the Nigerian economy over the past three decades, the agricultural sector is arguably the most important sector of the economy.

The agricultural sector had traditionally been expected to fulfill such roles as providing food for the growing population, generate foreign exchange earnings, provide employment, and provide income for farmers. Similarly, the role of government expenditure was to accommodate the expanding economic development or stimulate and induce expansion in the growth rate of the Nigerian economy (Abdellah, 2010). In terms of contribution to GDP, available statistics from the Central Bank of Nigeria (CBN, 2013) shows that the agricultural sector's share of GDP increased from 28% in 1985 to 32% in 1988, dropped to 31% in 1989, rose to 37% in 1990 but fell significantly to 24% in 1992, it increased again to 37% in 1994. It was 32% in 1996 and rose to 40% in 1998, dropped again to 27% in 2000, increased to 37% and fell to 31% in 2002

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and 2006 respectively. The percentage contribution of the agricultural sector to GDP fell persistently from 0.37 in 2009 to 0.22 in 2012 and to 0.20 in 2014 (Matthew and Mordecai, 2016).

Nigeria is predominantly an agricultural society. Approximately 70% of the population engages in agricultural production at a subsistence level. Agricultural holdings are generally small and scattered. Agriculture provided 41% and 30% of Nigeria's total Gross Domestic Product (GDP) in 1999 and 2012 respectively (Haruna, 2015). This percentage represented a normal decrease of 24.7% and 35.7% from its contribution of 65.7% to the GDP in 1957. Nigerian is blessed with a wide range of climate variations, which allows it to produce a variety of food and cash crops. The staples food crops include cassava, yams, corn, cocoyam, cowpea, beans, sweet potatoes, millets, plantains, bananas, rice, sorghum, and a variety of fruits and vegetables. The leading cash crops are cocoa, citrus, cotton, groundnuts (peanut), palm oil, palm kernel, benniseed, rubber and ginger. They were also Nigeria major export crops in the 1960s and early 1970s, until petroleum surpassed them in the 1970s. Chief among the export destination for Nigerian agricultural exports are Britain, the United States, Canada, France, and Germany (Abdellah, 2010).

The Food and Agriculture Organization (FAO) (2017) recommended that 25% of developing countries' budgetary expenditure be channeled to agriculture for agricultural sector development. This has not been achieved by the various administrations in Nigeria, thereby affecting government programmes and policies for the agricultural sector. Over the past years, oil prices have continued to fall, plunging the country into recession with states unable to pay salaries or execute capital projects. These figures are far cry from the 2003 AU-Maputo Declaration's Comprehensive Africa Agriculture Development Programme (CAADP) that requires African countries to allocate at least 10% of their annual budgets to agriculture and achieve six percent annual growth in agricultural GDP. CAADP is Africa's policy framework for agricultural transformation, wealth creation, food security and nutrition, economic growth and prosperity for all, which Nigeria is a signatory.

Agricultural expenditure as a percentage of total government expenditure increased from 3% in 1980 to a height of 16.8% in 1985 (Central Bank of Nigeria, 2015). The spending on agriculture remained unstable with averaging 4.5% yearly between 1994 and 1998 and 3.5% between 1999 and 2005 while the average ratio of government recurrent spending on agriculture as a proportion of total government expenditure from 1981 to 2008 was 2.5% (Central Bank of Nigeria, 2019). Nevertheless, the unprecedented increase in crude oil prices witnessed between 2010 and 2015 gave the government an apt opportunity to increase investment in agriculture thereby, achieving relative stability in expenditure pattern between 2010 and 2015 (Central Bank of Nigeria, 2019).

Nigeria is endowed with vast agricultural land which supports both food and cash crops but majority of the populace are starved due to low productivity and high price of imported foods, this has made government agencies at all level (Federal, State and Local) to introduce various agricultural policies to boost agricultural productivity. However, the economy has failed to respond to these unending policies due to the inconsistent nature of the policies. The policy makers points accusing fingers to the citizens linking the failure of the policies to over-dependence on foreign goods and neglect of the agricultural sector by the citizens in search for white-collar jobs (Demenongu *et al.,* 2014). The citizens points accusing fingers to the government linking the failure of policies to high rate of corruption, embezzlement and wrong policies by the leaders. All these made the agricultural sector stagnant and the economy is faced with problems such as unemployment, inflation, recession, low price of local produce, over-dependence on one sector, low agricultural productivity. Large percentage of Nigeria's farmer seems not to benefit from government expenditure in the agricultural sector. Thus, the intended objectives and goals of government expenditure have been largely defeated (Demenongu *et al.,* 2014).

Nigeria consistently had spending over the years without equivalent rate of economic growth. Data show that output of Nigeria agricultural production has been fluctuating for some years and the sources of these shocks may not be clear (Adeyemi, 2018). This has led to heavy importation of food crops to meet up with the country consumption over the years. In 2018, the federal government spent ₦172.8 billion on agriculture, representing 2% of its total budget of ₦8.6 trillion for the year. ₦53.8 billion was for recurrent,

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while ₦118.9 billion was for capital votes. In 2017, of the ₦7.3 trillion budgets for the year, the federal government voted only ₦123 billion (1.6%) for agriculture. The central government spent ₦75.8 billion (1.26%) on agriculture in 2016 out of its total budget of ₦6 trillion. ₦29.6 billion of the amount was for bureaucratic expenses, leaving N46.17 billion for agricultural service (Nurudden, 2018). Agriculture, which accounted for 25% of GDP in 2017, grew by 4.23% in Q4 2017; the Federal Government estimated 3.5% growth in 2018 is quite achievable (Adeyemi, 2018). It is expected that as the public expenditure expands, output is expected to expand also, because public expenditure should be translated into output growth. In Nigeria, the key challenge for the government has been to increase productivity of all agricultural and horticultural crops in the country to keep pace with the growing need of the population. However, efforts on the part of agricultural sector have not yet produced the desired outcome; this is partly due to the inconsistency in agriculture policies, low expenditure on agriculture and problem of food insecurity among others.

Some works have been carried out on government expenditures and agricultural growth in Nigeria, for instance; Uremadu *et al.* (2018) studied the effect of government agricultural expenditure on agricultural output using time series data from 1981 to 2014. Furthermore, Richard *et al.* (2019) studied the effects of fiscal policy on real sector growth in Nigeria, focusing on government capital expenditure and its effect on the growth of the agricultural sector in Nigeria, and covering the periods between 1980 and 2017. Okezie *et al*. (2013) conducted an assessment of Nigeria expenditure on the agricultural sector and its relationship with agricultural. However, little or none of these research efforts were directed at the impact of government expenditure on agricultural growth during the period of uninterrupted democracy in Nigeria. This was the focus of this study as it sought to fill the gap. The study was guided by the following objectives; evaluate the short-run impact of government agricultural expenditure on agricultural GDP growth and determine the long-run effects of government expenditure on agricultural GDP growth. It was hypothesized that government expenditures have no significant impact on agricultural GDP growth in the short and long run.

Literature Review

Neo-classical growth theory

Neo-classical growth theory such as Solow and Swan model (1956a) stated that all things being equal, savings/investment and population growth rates are important determinants of economic growth (agricultural growth in particular) (Ewubare and Eyitope, 2015). The most popular theory of economic growth is the Solow model. This theory was put together by Solow and Swan (1956). Solow and Swan (1956b) postulated that Ceteris paribus (all things being equal), economic growth is determined by many factors which includes amongst others, scarcity assumptions, capital stock, labour and growth rate of population. Solow model further postulated that Capital accumulation per worker can only be achieved with increased saving/investment rates. Hitherto, the increased capital per worker will consequently leads to more output per worker (Romer, 2010).

They expressed that increased population or high population growth will exert negative effect on economic growth. This submission is based on the fact that higher population growth will mean that saving in the economy will be shared by the higher population, thereby depleting the savings which is needed in order to keep the capital-labour ratio at a steady state. If there is no change in technology, research, development and innovation, a rise in capital for each worker would not be facilitated by a comparing addition in yield per labourer as an after effect of unavoidable losses. The deepen capital would cut down the rate of profit for capital.

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Review of related empirical studies

There have been a number of studies on the impact of government expenditure on agriculture and general wellbeing of a group of people; however, they got different results depending on the sample or methods used. Megbowon*et al.* (2019) studied the impact of government expenditure on agricultural productivity in South Africa using annual time series data from 1983 to 2016. The Bounds Co-integration test and ARDL model were used in this study. The study found government expenditure on agriculture to be of significance effect on agricultural productivity. It showed that there is a long-run positive relationship between government expenditure on agriculture and agricultural productivity.

Dkhar and De (2018) examined the impact of public expenditure on agriculture on economic growth in Meghalaya. Annual time series data for the period 1984-85 to 2013-14 were obtained from *Reserve Bank of India Publications,* Directorate of Economics and Statistics and RBI publications- *State Finances: A Study of Budgets*. OLS, ADF unit root test and granger causality methods were used for data analysis. Regression results show that there is a significant positive impact of expenditure through crop husbandry on GSDP and a significant negative impact of expenditure through forestry and irrigation. The expenditure on dairying and agricultural research does not have a significant impact.

Chandio *et al.* (2016) studied the impact of Government expenditure on agricultural sector and economic growth in Pakistan with time series data covering the period between 1983 and 2011 which were collected from Pakistan Statistical Year Books and Economic Survey of Pakistan 2015. The study applied Augmented Dickey–Fuller (ADF) and Phillip Perron unit root tests, Johansen Co-integration test and Ordinary Least Square (OLS) technique. The Johansen Co-integration test revealed that there is a long-run relationship between Government expenditure on agriculture, agricultural outputs and economic growth. The results of the regression analysis discovered that agricultural outputs and Government expenditure have significant impact on economic growth.

Okezie *et al.* (2013) analyzed the relationship between Nigeria government expenditure on the agricultural sector and its contribution to economic growth using annual time series data from 1980 to 2011, collected from the Central Bank of Nigeria, Journal of Food Research and Federal Office of Statistics. The study employed the Engle-Granger two step model (EGM), Error Correction Model and Granger Causality tests. The analysis showed that agricultural contributions to GDP and government expenditure on agriculture are co-integrated. The results of granger causality indicated very weak causality between the GDP and government expenditure on agriculture.

Adofu *et al* (2012) in their work the effects of government budgetary allocation to agricultural output in Nigeria covering the periods between 1995-2009 showed that the percentage, degree or amount of budgetary allocation to agricultural sector has a positive relationship with the total agricultural production in the country. This implies that the more the government spends on agricultural sector, the more the improvements in the performance of the agricultural sector. Therefore, budgetary allocation to agriculture has a large impact on agricultural output.

Oluwatoyese *et al.* (2015) examined some macroeconomic variables influencing agriculture in Nigeria, using annual time series data from 1981 to 2013 which were obtained from World Bank Database and Central Bank of Nigeria. The ADF and Phillips Perron unit root tests, vector error correction model (VECM), granger causality test and Co-integration tests were adopted for data analysis. The results showed that commercial bank loan on agriculture, interest rate and food import valve are significant variables that influence agricultural output, while exchange rate, inflation rate and unemployment rate are insignificant.

Ewetan *et al.* (2017) investigated the long-run relationship between agricultural output and economic growth in Nigeria for the period 1981 to 2014 using annual time series data obtained from Central Bank of Nigeria, National Bureau of statistics, International Monetary Fund and World Bank Development Index. Phillip Perron unit root test, Johansen Co-integrated test, Vector error correction model and granger causality testing were adopted for data analysis. The co-integration results showed that there is a long run

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relationship between agricultural output and economic growth. The long run parameters for agricultural output, inflation rate and exchange rate show statistically significant relationship with economic growth but interest rate has no significant relationship with economic growth.

Richard et al. (2019) studied the effects of fiscal policy on real sector growth in Nigeria, focusing on government capital expenditure and its effect on the growth of the agricultural sector in Nigeria, and covering the periods between 1980 and 2017. The study made use of Autoregressive Distributed Lag Models. The results of the study showed that there is a significant effect of government capital expenditure on the growth of the agricultural sector in Nigeria.

Kenny (2019) investigated the role of agricultural sector performance on economic growth in Nigeria. The study utilized the ADF unit root test, co-integration test and vector error correction model. The study revealed that agricultural credit guarantee scheme fund has a positive but insignificant impact on the agricultural domestic production and public spending on agriculture have significant effects on the domestic agricultural production.

Research Methods

The study area is Nigeria. Nigeria is a West African country lying between longitudes 3^0E and 15^0E and latitudes 4^0 and 14^0N. The capital of the country is Abuja, which is geographically located in the North Central part of the country. Nigeria, which is the most populous country in Africa, has an estimated population of over 170 million (Udeh *et al.,* 2015). It is situated in the Gulf of Guinea and it is bordered by Benin Republic to the West, Republic if Cameroon and Chad to the East and Niger Republic to the North. The lower course of the Niger River flow southward part of the country in the Gulf of Guinea, with Swamps and Mangrove forest bordering the Southern part (Oyinbo and Rekwot, 2013). The country has a total area of 923,768 square kilometers with land occupying 910,768 square kilometers and water occupying 13,000 square kilometers (Oyinbo and Rekwot, 2013).

Nigeria has a tropical climate with two distinct seasons; the dry and the wet seasons. It comprises the following ecological Zones: Mangrove Swamp, Rainforest, Guinea Savannah, Sudan Savannah and Sahel Savannah. Its terrain is divided into the South low lands merging into Central hills and Plateau, mountains in the south and plains in the North. There are arable crops which occupy 33.02 percent of the total land cover; permanent crops occupy 3.14 percent, while others occupy 63.84 percent (Udeh *et al.,* 2015). Above 70 percent of Nigeria's population is engaged in agriculture (NBS, 2006). The major agricultural crops produced in the country include cocoa, cotton, palm-oil, maize, rice, sorghum, millet, groundnut, cassava, yam and rubber. The major livestock reared are cattle, sheep, goat, pig, and poultry.

Method of data collection

Data for this study were obtained from secondary sources. The data were obtained from the records of Central Bank of Nigeria (CBN) publications and annual reports, National Bureau of Statistics (NBS) database, Federal Ministry of Agriculture and Rural Development, Food and Agriculture Organization Statistics (FAOSTAT) and World Bank database. Variables for which data were collected include: agricultural GDP growth rate, government agricultural expenditure, inflation rate, exchange rate, population growth rate, real interest rest, export rate, private investment, public investment and foreign direct investment.

Data analysis technique

Data for this study were analysed using inferential statistics. Vector Error Correction Model (VECM) was used to captured the objectives. In order to obtain more meaningful insight, logarithmic transformation of these variables was adopted. The unit root test of all variables was carried out. The Augmented Dickey Fuller (ADF) method was used to test for the presence of unit root in each variable (an indication for non-stationarity). This was because the use of data characterized by unit roots might lead to serious errors in statistical inference and the Johansen procedure was employed to test for Co-integration in the model.

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Model specification

Augmented Dickey Fuller test (ADF): Following Oyinbo and Rekwot (2013) the Augmented Dickey Fuller (ADF) model with the constant term and trend can be specified as follows:

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \beta Y_{t-1} + \sum_{i=1}^{p} \delta_i \Delta Y_{t-i} + \varepsilon_1 \quad (1)$$

Where: Y is the value of the variable of government expenditure on agriculture, foreign direct investment, inflation, interest rate, export, private investment, public investment, population growth rate and GDP growth rate). $\alpha_0$is the constant, α_1 is the coefficient of the trend series, p is the lag order of the autoregressive process, Y_{t-i} is the lag value of order one of Y_{t-i} and$\varepsilon_1$is the error term.

Johansen Co-integration test: A linear combination of two or one I(1) series might be stationary of I(0), in which case the series are co-integrated. The null hypothesis for the Johansen Co-integration test (H!:r = 0) implies that co-integration does not exist, while the alternative hypothesis (H!:r > 0) implies that it does. If the null for non-co-integration is rejected, the lagged residual from the co-integrating regression is imposed as the error correction term in a Vector Error Correction Model (VECM) given below:

$$\nabla Y_t = \Pi Y_{t-1} + \sum \binom{k-1}{i=1} \text{t}i \nabla Y_{t-1} + \mu + \varepsilon_t \quad (2)$$

Where:

∇Y_t First difference of a (n x n) vector of the n variables of interest

Π = (n x n) coefficient matrix associated with lagged values of the endogenous dependent variables, Y_{t-1} = lagged values of Y_t , $\text{t} = (nXk - 1)$ Matrix of short-term coefficients,μ = (n x 1) Vector of constant and ε_t = (n x 1) vector of White Noise Residuals

Vector Error Correction Model (VECM)

$\ln Gdr_{t-1} = \alpha_0 + \alpha_1 \ln Gea_{t-1} + \alpha_2 \ln Gdr_{t-1} + \alpha_3 \ln Fdi_{t-1} + \alpha_4 \ln Inf_{t-1} + \alpha_5 \ln Rir_{t-1} + \alpha_6 \ln Ex_{t-1} + \alpha_7 \ln Pri_{t-1} + \alpha_8 \ln Pi_{t-1} + \alpha_9 \ln Pop_{t-1} + \partial ECM_{4t} + \mu_{9t}$ ---------- (3)

$\ln Gea_{t-1} = \alpha_0 + \alpha_1 \ln Fdi_{t-1} + \alpha_2 \ln Inf_{t-1} + \alpha_3 \ln Rir_{t-1} + \alpha_4 \ln Ex_{t-1} + \alpha_5 \ln Gea_{t-1} + \alpha_6 \ln Pri_{t-1} + \alpha_7 \ln Pi_{t-1} + \alpha_8 \ln Pop_{t-1} + \alpha_9 \ln Gdr_{t-1} + \partial ECM_t + \mu_{1t}$ ---------- (4)

$\ln Fdi_{t-1} = \alpha_0 + \alpha_1 \ln Gea_{t-1} + \alpha_2 \ln Inf_{t-1} + \alpha_3 \ln Rir_{t-1} + \alpha_4 \ln Fdi_{t-1} + \alpha_5 \ln Ex_{t-1} + \alpha_6 \ln Pri_{t-1} + \alpha_7 \ln Pi_{t-1} + \alpha_8 \ln Pop_{t-1} + \alpha_9 \ln Gdr_{t-1} + \partial ECM_{2t} + \mu_{2t}$ ---------- (5)

$\ln Inf_{t-1} = \alpha_0 + \alpha_1 \ln Gea_{t-1} + \alpha_2 \ln Fdi_{t-1} + \alpha_3 \ln Inf_{t-1} + \alpha_4 \ln Rir_{t-1} + \alpha_5 \ln Ex_{t-1} + \alpha_6 \ln Pri_{t-1} + \alpha_7 \ln Pi_{t-1} + \alpha_8 \ln Pop_{t-1} + \alpha_9 \ln Gdr_{t-1} + \partial ECM_{3t} + \mu_{3t}$ ---------- (6)

$\ln Ir_{t-1} = \alpha_0 + \alpha_1 \ln Gea_{t-1} + \alpha_2 \ln Fdi_{t-1} + \alpha_3 \ln Inf_{t-1} + \alpha_4 \ln Ex_{t-1} + \alpha_5 \ln Pri_{t-1} + \alpha_6 \ln Rir_{t-1} + \alpha_7 \ln Pi_{t-1} + \alpha_8 \ln Pop_{t-1} + \alpha_9 \ln Gdr_{t-1} + \partial ECM_{4t} + \mu_{4t}$ ---------- (7)

$\ln Ex_{t-1} = \alpha_0 + \alpha_1 \ln Gea_{t-1} + \alpha_2 \ln Fdi_{t-1} + \alpha_3 \ln Inf_{t-1} + \alpha_4 \ln Rir_{t-1} + \alpha_5 \ln Pri_{t-1} + \alpha_6 \ln Pi_{t-1} + \alpha_7 \ln Ex_{t-1} + \alpha_8 \ln Pop_{t-1} + \alpha_9 \ln Gdr_{t-1} + \partial ECM_{5t} + \mu_{5t}$ ---------- (8)

$\ln Pri_{t-1} = \alpha_0 + \alpha_1 \ln Gea_{t-1} + \alpha_2 \ln Fdi_{t-1} + \alpha_3 \ln Inf_{t-1} + \alpha_4 \ln Rir_{t-1} + \alpha_5 \ln Ex_{t-1} + \alpha_6 \ln Pi_{t-1} + \alpha_7 \ln Pop_{t-1} + \alpha_8 \ln Pri_{t-1} + \alpha_9 \ln Gdr_{t-1} + \partial ECM_{6t} + \mu_{6t}$ ---------- (9)

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$\ln Pi_{t-1} = \alpha_0 + \alpha_1 \ln Gea_{t-1} + \alpha_2 \ln Fdi_{t-1} + \alpha_3 \ln Inf_{t-1} + \alpha_4 \ln Rir_{t-1} + \alpha_5 \ln Ex_{t-1} + \alpha_6 \ln Pri_{t-1} + \alpha_7 \ln Pop_{t-1} + \alpha_8 \ln Gdr_{t-1} + \alpha_9 \ln Pi_{t-1} + \partial ECM_{7t} + \mu_{7t}$ ---------- (10)

$\ln Pop_{t-1} = \alpha_0 + \alpha_1 \ln Gea_{t-1} + \alpha_2 \ln Fdi_{t-1} + \alpha_3 \ln Inf_{t-1} + \alpha_4 \ln Rir_{t-1} + \alpha_5 \ln Pop_{t-1} + \alpha_6 \ln Ex_{t-1} + \alpha_7 \ln Pri_{t-1} + \alpha_8 \ln Pi_{t-1} + \alpha_9 \ln Gdr_{t-1} + \partial ECM_{8t} + \mu_{8t}$ ---------- (11)

Where:
Gdr_{t-1} = agricultural GDP growth rate (%)
Gea_{t-1}= Govt. Total Expenditure on Agricultural Sector (in dollars and converted to NGN naira)
Fdi_{t-1}= Foreign Direct Investment (in dollars and converted to Nigeria naira)
Inf_{t-1}= Inflation (%)
Rir_{t-1}= Real Interest Rate (%)
Ex_{t-1}= Export (in dollars and converted to Nigeria naira)
Pri_{t-1}= Private Investment (in dollars and converted to Nigeria naira)
Pi_{t-1}= Public Investment (in dollars and converted to Nigeria naira)
Pop_{t-1}= Population Growth Rate (%)
∂ECM_t =error correction term
μ_t= error term.

Results and Discussion

Unit root test for stationarity

Table 1 presents test of stationarity using Augmented Dickey-Fuller test (ADF) for government agricultural expenditure, foreign direct investment, inflation rate, interest rate, export, private investment, public investment, and population growth rate. The ADF test result indicates that all variables were not stationary at level but stationary on first difference, that is they co-integrated of order one [1(1)]. The result implies that the level forms of these variables exhibited random work or have multiple means of co-variances or both. However, first difference of variables is integrated or stationary.

Table 1: Augmented Dickey-Fuller Unit Root Test Result

Variables	Level		First difference		Decision
	t-statistic	Probability	t-statistic	Probability	
GDPGA	-1.792838	0. 8980	-5.399702	0.0001***	1(1)
EXPD	-2.451872	0. 2460	-5.054892	0.0001***	1(1)
FDI	-1.957173	0. 6600	-5.810594	0.0000***	1(1)
INF	-3.307748	0. 3420	-4.625983	0.0002***	1(1)
IR	-3.715150	0. 1680	-6.269987	0.0001***	1(1)
EXPT	-2.426603	0. 3050	-5.172579	0.0001***	1(1)
PRI	-1.746005	0. 9790	-5.651239	0.0000***	1(1)
PBI	-2.910730	0. 4930	-6.217134	0.0000***	1(1)
PGP	-1.527636	0.1461	-4.691889	0.0003***	1(1)

***, ** and*indicate stationary at 1%, 5% and 10% level of significance respectively

Source: Author's computation, 2021

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Johansen co-integration test

The results of the co-integration tests are shown on Table 2. Co-integration test investigation was carried out on the series properties of 1(1) variable through the Johansen Co-integration test to determine whether long run linear combination of non-stationary variables is stationary. Using both traced and maximum Eigen statistics, the result revealed that combination of these variables has one co-integrating equation and this means that linear combination of these variables has a single long run linear combination of relationship. Thus, based on the trace statistics value (63.27485) which is greater than the critical value (47.85613), and maximum Eigen value (36.91170) which is also greater than the critical value (27.58434) a long run relationship exists among government agricultural expenditure, foreign direct investment, inflation rate, interest rate, export, private investment, public investment and population growth rate in Nigeria within the period under cover, with one co-integrating equation at 5% critical value.

Table 2: Results of Johansen's Co-integration Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistics	Critical Value at 5% (Prob.**)	Maximum Eigen statistics	Critical Value at 5% (Prob.**)
None *	0.856687**	63.27485	47.85613 (0.0010)	36.91170	27.58434 (0.0024)
At most 1	0.504909	26.36315	29.79707 (0.1182)	13.35724	21.13162 (0.4199)
At most 2	0.412628	13.00591	15.49471 (0.1146)	10.10983	14.26460 (0.2048)
At most 3	0.141377	2.896082	3.841466 (0.0888)	2.896082	3.841466 (0.0888)

Trace and Max-eigenvalue tests indicate 1 cointegrating eqn (s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values
Source: Author's computation, 2021

Short-run effects of government agricultural expenditure on agricultural (GDP) growth

The short run result from the Error Correction Model is presented in table 3. The Error correction Term (ECT) is statistically significant and negative -0.06707which indicates a moderate speed of adjustment of variable towards equilibrium. This implies that 6.7% deviation from equilibrium position is corrected within the year.

The coefficient of determination (R^2) is 0.887341, indicating that 88.7% of the variation in agricultural GDP was explained by agricultural expenditure and foreign direct investment in previous year respectively.

The result revealed that the coefficient of agricultural expenditure was positive and significant (0.002270) at 1%probability level in the short run. This means that acceleration of agricultural expenditure would lead to acceleration in agricultural GDP in the short run. This short-run result follows the *a priori* expectation. The result is in agreement with the findings of Lawal (2011) who reported that government spending does not follow a regular pattern and that the contribution of the agricultural sector to the GDP is in direct relationship with government funding to the sector. However, the result disagrees with thus of Aina and Omojola (2017), Akanbi *et al*. (2019) and Keji and Efuntade (2020) who found that government agriculture expenditure contributes negatively and significantly to the Nigerian agricultural output growth in the short run, while contributing positively and significantly to long run agricultural output growth.

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The coefficient of foreign direct investment was positive and significant (0.014561) at 1% probability level in the short run. This means that acceleration in foreign direct investment would lead to acceleration of agricultural GDP in the short run. The study disagrees with Udoh (2011) who examined the relationship between public expenditure, private investment and agricultural output in Nigeria over the period 1970 - 2008 and found that foreign investment has insignificant impact on agricultural output in the short run. It is interesting to note that the subject of interest (Agricultural expenditure) has positive and significant influence on Agricultural GDP.

With these results, the hypothesis that government expenditure on agriculture does not have significant impact on agricultural GDP growth in Nigeria in the short run is therefore rejected.

Table 3: Estimates of Short-Run Effect of Government Agricultural Expenditure on Agricultural (GDP) Growth

Error Correction:	D(GDPGA)	D(EXPD)	D(FDI)
CointEq1	-0.06707	7.837924	33.75363
	(0.22399)	(9.77675)	(13.8363)
	[-0.02994]	[0.80169]	[2.43950]
D[GDPGA(-1)]	0.183352	-3.909131	-28.49197
	(0.26966)	(11.7703)	(16.6577)
	[0.67994]	[-0.33212]	[-1.71044]
D[GDPGA(-2)]	0.570874	-1.708873	-31.02553
	(0.29186)	(12.7393)	(18.0289)
	[1.95599]	[-0.13414]	[-1.72087]
D[EXPD(-1)]	0.002270***	0.148744	0.645163
	(0.07572)	(0.29509)	(0.41763)
	[3.33572]	[0.50406]	[1.54484]
D[EXPD(-2)]	0.001116	0.100031	0.743878
	(0.00635)	(0.27726)	(0.39238)
	[0.17577]	[0.36079]	[1.89582]
D[FDI(-1)]	0.01456***	0.059913	-0.723211
	(0.03870)	(0.23904)	(0.33830)
	[2.65771]	[0.25064]	[-2.13780]
D[FDI(-2)]	0.000997	0.178616	-0.518728
	(0.00470)	(0.20529)	(0.29053)
	[0.21192]	[0.87006]	[-1.78543]
C	-0.272507	3.567162	-6.476973
	(0.89072)	(38.8788)	(55.0223)
	[-0.30594]	[0.09175]	[-0.11772]
R-squared	0.887341	0.346368	0.515567
Adj. R-squared	0.739154	0.111174	0.176464
Sum sq. resids	140.0074	266742.8	534248.8

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S.E. equation	3.741756	163.3226	231.1382
F-statistic	8.494094	0.757020	1.520384
Log likelihood	-44.00280	-111.9739	-118.2251
Akaike AIC	5.778089	13.33043	14.02501
Schwarz SC	6.173810	13.72616	14.42073
Mean dependent	-0.144444	4.058889	9.351667
S.D. dependent	3.670586	154.9371	254.7009
Determinant resid covariance (dof adj.)		1.64E+10	
Determinant resid covariance		2.81E+09	
Log likelihood		-272.4383	
Akaike information criterion		33.27093	
Schwarz criterion		34.60648	

Source: Author's computation from E-view (2021)

Long-run effects of government agricultural expenditure on agricultural (GDP) growth

The equilibrium relationship between the variables in the long run motivated the construction of the Error Correction Mechanism (ECM). The application of ECM was necessary because of the existence of co-integration among variables. The result of the ECM is presented in table 4. The result shows the long run impact of agricultural expenditure on agricultural GDP. The coefficient of determination (R^2) of the model 0.887, indicating that 88.7% variation in agricultural GDP was explained by agricultural expenditure and foreign direct investment in the previous years. The result further shows that in the long run, agricultural expenditure and foreign direct investment significantly affected agricultural GDP.

Specifically, the coefficient of expenditure (0.003055) was positive and significant at 1% level of probability. This implies that a unit increase in expenditure would increase agricultural GDP by 0.003055. This equally means that Nigeria government was always kin about the amount to be expended in agricultural sector with focus on the commensurate increased change in the agricultural GDP, more attention should be channeled towards modalities and techniques on how to make judicious utilization of the available resources for acceleration of the agricultural GDP. This result is in agreement with the findings of Okezie *et al*. (2013) who found that any reduction in government expenditure would have a negative repercussion on agricultural output in Nigeria. However, the result is in disagreement with the findings of Iganiga and Unemhilin (2011) who found in their study that investment in the agricultural sector is very imperative and should be complemented with monitored credit facilities.

The coefficient of foreign direct investment (0.007335) was positive and significant at 5% level of probability. This implies that a unit increase in foreign direct investment would increase agricultural GDP by 0.007335. The result shows that FDI is very beneficial to the agricultural sector and as such government must continually work and make attractive policies for investors in Nigeria. Several authors have confirmed the fact that FDI has a positive impact on economic growth, e.g Umoh *et al*. (2011), Oyatoye *et al*. (2011), Adeleke *et al*. (2014), Muhammed and Ehikioya (2015), Udeaja and Onyebuchi (2015) and Uwakaeme (2015).

From these results, the hypothesis that government expenditure does not have significant impact on agricultural GDP growth in Nigeria in the long run is therefore rejected.

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Table 4: Estimates of Long-Run Effects of Government Agricultural Expenditure on Agricultural (GDP) Growth

Variables	Coefficients	Standard error	t-statistic
GDP (-1)	1.000000	-	-
Expenditure (-1)	0.003055***	0.01713	2.78345
FDI (-1)	0.007335**	0.00725	1.01120
Constant	23.99384	-	-

Note: * and ** denote rejection of null hypothesis at 1% and 5% significant level, respectively.

Source: Author's computation from E-view, 2021

Conclusion

Government agricultural expenditure had statistical positive significant impact on agricultural GDP in both short run and long run. Thus, government should not only increase agricultural sector budget allocation, but should properly monitor its expenditure in the sector as the backbone of the economy. Agricultural GDP growth experienced deceleration during the period under the study which could probably be attributed to lack of focus, sign of less attention given to the agricultural sector by government and high level of corruption in the society. Based on these, Federal government should improve its budgetary allocation to agriculture in order to track enormous progress in the sector. For government expenditure to exhibit the desired results in the economy, government expenditure needs to be closely monitored. This will help ensure that budget allocations are channeled into the required targets that will help improve the economy. Since government revenue is a key factor in determining the size of public sector, the revenue base should be expanded beyond oil sector to include other unexploited solid minerals, agricultural exports and other avenues that could increase the revenue base.

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