# Assessing the Agricultural Growth Potentials of Nigeria: What Role has Agriculture Public Finance Played?

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***Abstract***
*This study investigates the role of agriculture public financing in agricultural output growth in Nigeria for the periods of 1981 to 2019. The study utilizes the autoregressive distributed lag (ARDL) to estimate the parameters and Granger causality to establish the causal links between government agriculture expenditure and agricultural output growth. The ARDL bounds test reveals that there is a long run relationship between government agriculture expenditure and agricultural output growth in Nigeria. The study 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. This empirical short run evidence can be attributed to the loopholes in government agricultural financing. Meanwhile, public agriculture financing has tendency of enhancing agriculture output growth in the long run. Thus, there is need for the government to set up independent monitoring authorities that will ensure budgeted funds reach the target beneficiaries especially in the agricultural sector. Also, they should put in place stringent measures that will deter unsolicited diversion or misappropriation of such funds for personal aggrandizement. The causality test result showed that there is a one-way causality from public agriculture expenditure to agriculture output growth in Nigeria.*

***Keywords:*** *Government financing, agricultural output, investment, inflation, interest.*
***JEL Classification:*** *H50, Q10, Q14, E31*

## 1. Introduction

Over the years, the relevance of the agricultural sector cannot be relegated to the background as its benefits extend to every facets of the society, cuts across religious boundary and transcends ethnic limitations (Akinwale and Ayodele, 2019). Before the discovery of crude oil in commercial quantity in Oloibiri in the 1960s and subsequent oil boom experienced in the 1970s, agriculture was the mainstay of the Nigeria economy and this sector still remain a focal point in terms of economic development. Importantly, in the post independent era, over 80% of the rural population was actively involved in agricultural practices and agricultural sector's contribution to gross domestic product stood at 65% (Yesufu, 1996; Anyanwu *et al.*, 1997). In the same vein, agriculture served as the main source of food and employment of a handful of the working population, provided raw materials for the industrial and manufacturing sector and generates foreign exchange earnings and has high tendency of alleviating poverty (Okoh, 2015). However, the agricultural sector has been deficient in delivering these roles due to the dependence on the oil sector, inadvertent neglect of the agricultural sector owing to adverse balance of payments suffered by Nigeria in the 1980s therefore reducing government finances to the agricultural sector (Ijaiya and Ijaiya, 2003). The paradox of plenty is prevalent in the agricultural sector as the sector has witnessed unprecedented precipitous fall in its output and performance over the years due to inadequate

financing despite the increase in government revenue generated in the oil sector (Hammond, 2003; Oji-Okoro, 2011).

Accordingly, agricultural production in Nigeria has suffered many setbacks such as the existence of land tenure system, inadequate/improper irrigation system, limited research and development, high farm input cost, inaccessibility to credit facilities, and inefficient obtaining and allocation of fertilizers, insufficient storage facilities and improper access to market, all culminate into low agricultural productivity and performance with high post-harvest losses and waste. Correspondingly, in the agrarian sector, value-added per capita has increased by less than 1% per year over the previous 20 years. Nigeria is estimated to have lost $10 billion in annual export opportunities from cash crop alone owing to a steady decrease in these commodities' production (Asaleye *et al.*, 2020). Despite the efforts geared to increase in food production, the increase in the subsistence farming has not kept pace with population growth, resulting to increased food imports and decreasing domestic food self-sufficiency rates (FMARD, 2008). Although, the major factor identified for low economic performance in developing countries, among others, is inadequate investment (Lagakos and Waugh, 2013; Gollinn *et al.*, 2014; Asaleye *et al.*, 2019).

From the abovementioned information, the 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). Contrariwise, the sector's contribution to gross domestic product nosedived from an average of 30.7% during the period of 2006 and 2010 to an average of 21.7% between 2011 and 2015 (Central Bank of Nigeria, 2015). More so, the improved agriculture's expenditure performance of 224% from 2009 to 2010 that is ₦55 billion and ₦178 billion respectively was short-lived due to unanticipated fall in crude oil prices between 2015 and 2016 culminating into decreased government agricultural spending (Central Bank of Nigeria, 2019; NBS, 2016) as Nigeria witnessed a negative growth rate of -2.24% at the tail end of 2016 and this has mandated the present government to strengthen diversification efforts with agriculture at the forefront of its development efforts (Akanbi *et al.*, 2019).

Therefore, following the drawbacks experienced in the agricultural sector in terms of agricultural financing and undue concentration on the oil sector, various government have attempted to diversify the economy to other sectors which include manufacturing sector, travel and tourism sector, theatre and Arts sector among others. In a bid to achieve this feat, the Green Revolution and Operation Feed the Nation were adopted between 1976 and 1979 in order to change the direction of Nigerian economic outlook; however, these policies were short-lived due to military interventions (Shuaib, Igbinosun and Ahmed, 2015). Similarly, the adoption of the structural adjustment programme in 1986 which was perceived could revamp the agricultural sector failed to achieve its objectives and revamp the agrarian sector (Shuaib, 2010). In addition, through the passage of time, the country has adopted different policies and programmes to improve agricultural output and performance which include; Agricultural Credit Guarantee Scheme Fund (ACGSF), Small and Medium Enterprises Equality Investment Scheme (SMEEIS), Refinancing and Rediscounting Facility (RRF), Agricultural Credit Support Scheme (ACSS), Large Scale Agricultural Credit Scheme (LASACS) and Agricultural Transformation Agenda (Asaleye *et al.*, 2020). However, majority of these

policies, programmes and institutions lack the adequate finance and are also encumbered by maladministration of resources and red tapism.

This study is motivated by the inexcusable level of agricultural output and performance in Nigeria which can be traced to insufficient government financing and administrative loopholes as it becomes obvious that efforts geared by the government to revamp the agricultural sector and improve agricultural output have proved abortive over the years. Strands of literature exist that have examined the impact of government financing on agricultural output from different perspectives with little attention to the direction of causal relationship between government financing and agricultural output (see Keji and Efuntade, 2020; Asaleye *et al.*, 2020; Victor *et al.*, 2019; Akinwale and Ayodele, 2019; Eleojo and Eyo, 2019; Akanbi, Onuk and Umar, 2019; Onakoya, Khostly and Johnson, 2018; Aina and Omojola, 2017; Shuaib, Igbinosun and Ahmed, 2015; Iganiga and Unemhilin, 2011). In the light of this gap in literature, this study investigates (a) the impact of government financing on agricultural output, (b) examine the direction of causal relationship between government financing and agricultural output in Nigeria and (c) evaluate the long run relationship between government financing and agricultural output in Nigeria between 1981 and 2019 as this periods capture relevant agricultural and economic reforms in Nigeria.

Following the introductory aspect, section two provides brief review of literature while the major thrust of section three is data and methodology adopted in the study. Section four entails the empirical results and discussion and section five concludes with policy recommendation.

## 2. Brief Literature Review

Conceptually, agriculture can be described as an art of growing crops and livestock production coupled with the scientific method of processing crops and livestock in medium and large scale by utilizing modern technology. Agricultural practice has been in existence since time immemorial and stands as a means of subsistence hitherto. Interestingly, through the passage of time, agricultural practice had witnessed various transformation in terms, scope, form that dictate the type of crop(s) to be cultivated, livestock management and down to processing and marketing. Agriculture plays central role in economic freedom of many developing economy especially in Nigeria. According to Akinboyo (2008), agriculture involves the production of food, fiber and feeds through the systematic growing, nurturing and harvesting of plants and animals. It encompasses the science of utilizing land to raise both plants and animals.

On the other hand, government expenditure or government financing can be used to mean the disbursed and spent funds from the budgetary allocation usually within a year across all sectors of the economy in order to achieve macroeconomic objectives (Keju and Efuntade, 2020). Importantly, government financing can be capital financing which include undertaking expenses on projects whose benefits extends into the future and recurrent expenses which are spending incurred in order to meet day-to-day needs of the government. Hence, government expenditure on agriculture growth involve the total resources appropriated in the annual budgetary allocation which is meant to improve agricultural output, purchase of farm machineries and fertilizer, investment in research and development in order to achieve growth objectives.

In the theoretical front, various theories have been propounded that have lent credence to government expenditure among economists and researchers. Popular among these theories is the Rostow's stages of growth model, Wagner's law of increasing state activities, Wiseman-Peacock hypothesis, Musgrave and Musgrave hypothesis among others. However, the theoretical root of this study is based on the Wagner's law of increasing state activities (1876). This theory was propounded by German economist Adolph Wagner (1835-1917)

based on historical evidences in Germany. He opined that there is a natural tendency for the activities of the numerous sectors and sections (regional and federal units) of the government to skyrocket both intensively and extensively. Furthermore, he noted that there existed a functional relationship between a country's economic growth and government activities therefore concluding that the government sector's growth outpaces the economy. Ibok and Bassey (2014) suggested that government expenditure increased in a higher level relative to income. It further suggested that the income elasticity of demand for public services was fairly elastic in nature. Essentially, this theory suggests a direct relationship between government spending and income level and a one-way causal relationship from government spending to income. Over time, the Wagner's law has been divided along six different strands of thought in order to further peruse its suitability across different time horizons by various researchers (Henrekson, 1993; Anoke, Odo, Chukwu and Agbi, 2016). Wagner's law has been criticized on the premise that it lacks analytical explanation. Likewise, government is not a monolithic entity but encompasses a number of organs and multifaceted institutions. More so, households and business units in the private sector also do not observe government activities passively but proactively. Hence, government decision making has become a complex endeavor and has propensities to increase public expenditure.

On the empirical front, the searchlight beam on eclectic range of studies carried out by various researchers over time and cross the borders. Enrique *et al*. (2012) investigated the effect of public spending on agricultural growth in Indonesia between 1976 and 2006 by utilizing the ordinary least square method and generalized method of moment technique. Findings reveal that public expenditure on irrigation and agriculture showed a positive insignificant impact on agricultural growth. Likewise, Talknice and Mufaro (2014) examined the impact of agricultural expenditure on economic performance in Zimbabwe from 1980 to 2005 by employing the ordinary least square technique. Findings reveal the significant positive relationship existed between agriculture expenditure and economic growth. More so, Abbas et al. (2016) evaluated the impact of government expenditure on agricultural sector and economic growth between 1983 and 2011 utilizing ordinary least square approach. The result shows agricultural outputs and government expenditure had a significant positive impact on economic growth proxy by gross domestic product.

Similarly, empirical studies carried out on Nigeria have shown mixed results for instance, Iganiga and Unemhilin (2011) examined the impact of federal government agricultural expenditure on agricultural output in Nigeria between 1970 and 2008 using error correction model. The study reveals that agricultural expenditure had a positive insignificant impact on agricultural production while inflation is positive but not significant, total credit was significantly negative. Also, Shuaib *et al*. (2015) evaluated the impact of government agricultural expenditure on the growth of the Nigerian economy from 1960 to 2012 by employing the ordinary least square approach. The result revealed that government agricultural expenditure has a direct relationship with economic growth. Okoh (2015) investigate the effect of fiscal policy on the growth of agriculture sector in Nigeria between 1981 and 2013 by employing Error Correction Model. The empirical results therefore revealed the existence of long run relationship between fiscal policy and agriculture sector though with some serious concerns. Likewise, Aina and Omojola (2017) assessed the effect of government expenditure on agricultural output in Nigeria between 1980 and 2013 by utilizing the error correction model. The result shows that in the short run there exists significant positive relationship between government agricultural expenditure and agricultural output. More so, Onakoya *et al*. (2018) evaluated valued added agricultural output and macroeconomic dynamics in the Nigerian economy between 1971 and 2016 using the vector error correction model. The study reveals that in the long run, inflation rate, exchange rate and agricultural employment rates were positively related with value added agricultural

output and were significant in its forecasting. However, interest rate, external reserves, aggregate demand shock and oil revenue were significant but inversely related to value added agricultural output.

Furthermore, Eleojo and Eyo (2019) investigated the impact of financial sector reforms on agricultural output in Nigeria between 1981 and 2016. The results show that agricultural output of the crop sector was consistently higher than that of other agricultural subsectors in virtually all the reform periods. The volume of loan disbursed by bank to agricultural sector and the reforms had a significant impact on farmers' output. Akanbi *et al.* (2019) examined the effect of agricultural sector expenditure on economic growth in Nigeria between 1981 and 2015 by employing vector error correction model. The results reveal that in the long run, government agriculture expenditure has significant positive influence on economic growth while in the short run both government agriculture expenditure and agricultural output has positive and significant impact on economic growth. Also, Akinwale and Ayodele (2019) evaluated the effect of government expenditure components on agricultural productivity in Nigeria from 1981 to 2017 by employing autoregressive distributed lag (ARDL) approach. The empirical results show that various components of government expenditure have positive but insignificant impact on agricultural productivity. The results revealed that the government expenditures on health and infrastructure have little effect on agricultural productivity and expenditures on education have a reduction effect on agricultural productivity in both short and long run. Similarly, Victor et al. (2019) investigated agricultural financing and its impact on agricultural GDP from 1981 to 2016 using autoregressive distributed lag (ARDL) technique. The study found that government funding to agriculture and Agricultural Credit Guarantee scheme Fund (ACGSF) had a non-significant impact on agricultural contribution to GDP. On the other hand, the study found that commercial banks' credit, loans and advances to the agricultural sector had a positively significant impact on agricultural contribution to GDP.

In addition, Asaleye *et al.* (2020) assessed cash crops financing, agricultural performance and sustainability in Nigeria by employing vector error correction model. The empirical results show that impact of agricultural financing on agricultural performance is significant for palm oil, cocoa, cotton and groundnut while inflation shows a negative insignificant impact. Exchange rate shows a positive relationship with agricultural performance. Likewise, Keji and Efuntade (2020) evaluated agricultural output and government expenditure in Nigeria between 1981 and 2019 using autoregressive distributed lag (ARDL). The empirical results show that government spending has long significant effect on agricultural output performance in Nigeria. In the short run, gross capital formation, inflation rate shows positive insignificant relationship with agricultural output. Interest rate in the previous period was inversely related and significant and GDP was significantly positively related. In the long run, government expenditure, exchange rate was positive and significantly related while industrial value shows significant negative relationship.

## 3. Data and Methodology

### 3.1 Data

To carry out the empirical analysis of this study, the study utilizes a time series data spanning from 1981 to 2019. The data utilized and the measurements are agricultural output (₦'billion), government expenditure on agriculture (₦'billion), gross fixed capital formation (₦'billion), inflation rate (annual percentage change of consumer price index), and interest rate (lending interest rate %). The data were sourced from both Central Bank Statistical bulletin (2019) and World Development Indicators (2019).

### 3.2 Model Specification

Based on the theoretical root of this study which is Wagner's law of increasing state activities, the study draws insight from the empirical study of Keji and Efuntade (2020) with some modifications and employs an autoregressive distributed lag (ARDL) to analyse the parameter estimates. The implicit form of the model is written as:

$$AOUT_t = f(GEXPA_t, GFCF_t, INFR_t, INTR_t) \quad (1)$$

Where, *AOUT* represents agricultural output, *GEXPA* represents government expenditure on agriculture, *GFCF* represents gross fixed capital formation, *INFR* represents inflation rate proxied by annual growth of consumer price index, *INTR* represents interest rate proxy for bank lending rate, and *t* is time. Therefore, the econometric model is written as:

$$AOUT_t = \phi_0 + \phi_1 GEXPA_t + \phi_2 GFCF_t + \phi_3 INFR_t + \phi_4 INTR_t + \mu_t \quad (2)$$

Where: $\phi_0$ represents the constant parameter, $\phi_1$ is the coefficient of government expenditure on agriculture, $\phi_2$ represents coefficient of gross fixed capital formation, $\phi_3$ represents the coefficient of inflation rate, $\phi_4$ represents the coefficient of interest rate, , $t$ represents time dimension and $\mu$ represents stochastic term.

The theoretical expectations of the variables are as follows: government expenditure on agriculture and gross fixed capital formation are expected to show a positive relationship with agricultural output while interest rate and inflation rate are expected to show a negative relationship. This can be expressed symbolically as: $\phi_1, \phi_2 > 0$ and $\phi_3, \phi_4 < 0$.

### 3.3 Estimation Methods

Regarding the estimation technique, the autoregressive distributed lag (ARDL) developed by Pesaran and Shin (1997) is employed after the unit root test has been conducted. ARDL was preferred to other techniques because ARDL estimation yields consistent estimates of the parameters when some are I(0) and I(1) and a long run relationship exists (Pesaran and Shin, 1999). This means that the ARDL approach avoids the pretesting problems associated with standard co-integration, which requires that the variables be already classified into I(1) or I(0) (Pesaran *et al.*, 2001). According to Pesaran and Shin (1997), the ARDL approach requires two steps. In the first step, the existence of long term relationship among the variables is determined using F-test. The second step of the analysis estimates the coefficients of the long run relationship and determines their values, followed by the estimation of the short run elasticity of the variables with the error correction representation of the ARDL model. Also, the second step determines the appropriate lag length selection of the independent variables (Alimi, 2017; Mesagan, Ogbuji, Alimi and Odeleye, 2020).

Equation (2) represents only the long run equilibrium relationship among the variables. However, the short run adjustment of government agriculture expenditure to changes in agriculture output is crucial for further estimation in the dynamic error correction model. The error correction model is shown below:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{p-1} \alpha_i \Delta Y_{t-1} + \sum_{j=0}^{q-1} \beta_i \Delta X_{t-1} + \gamma ECT_{t-1} + \nu_t \quad (3)$$

Where: $\Delta$ represents the first difference operator and $ECT_{t-1}$ represents the error correction term estimated from the equation (3). $\gamma$ represents the speed of adjustment from the short run to the long run so as to obtain equilibrium in the case of shock on the system. $Y_t$ is the dependent variable, $Y_{t-1}$ is the lag value of dependent variable, $\sum$ represents summation, $X_t$ represents the explanatory variables, $\beta$ is the coefficient and $\nu_t$ is the error term. The first part represents the short run estimates of the model while the second part is the long run

relationship between the variables. Based on equation on the ECM specification, equation (3) can be re-represented as:

$$\Delta AOUT_t = \delta_0 + \sum_{t=1}^{p-1} \delta_1 \Delta AOUT_{t-1} + \sum_{t=0}^{q-1} \delta_2 \Delta GEXPA_{t-1} + \sum_{t=0}^{q-2} \delta_3 \Delta GFCF_{t-1} + \sum_{t=0}^{q-3} \delta_4 \Delta INFR_{t-1} + \sum_{t=0}^{q-4} \delta_5 \Delta INTR_{t-1} + \gamma ECT_{t-1} + e_t \quad (4)$$

When estimating ARDL, there it is vital to determine whether the variables are co-integrated or not. This is done by restricting all the estimated coefficients of the lagged level variables to be equal to zero (0). Hence, the null hypothesis of no co-integration is given as:

$$H_0 : \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0 \quad (5)$$

The above null hypothesis is tested against the alternative hypothesis that is the presence of co-integration among the variables:

$$H_1 : \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq 0 \quad (6)$$

This test is carried out by the means of F-statistics (Bound test) of ARDL and asymptotic non-standard distribution variables to determine whether the variables are I(0) or otherwise. If the computed F-statistics lies above the upper bound, then the null hypothesis is rejected and if otherwise, the null hypothesis is accepted. The hypothesis indicates that there is no long run relationship between dependent and the explanatory variables. Other diagnostic tests were conducted so as to validate the result obtained from the ARDL estimation.

## 4. Results and Discussion

This section presents the results and discussion of findings of the relationship between government financing and agricultural output growth in Nigeria. First, the descriptive statistics of the variables of interest are provided in Table 1. From the result, the average of agricultural output is ₦6, 938.8 billion, while the mean of federal government finance on agriculture is ₦17.932 billion. More so, the average of gross fixed capital formation is ₦ 4,512.9 billion, whereas the corresponding mean of inflation rate and interest are 19.14% and 17.69% for the period understudy. Further, this result shows that agriculture output, government expenditure on agriculture and gross fixed capital formation have their standard deviation greater than the average values, thus, indicating high variations in the datasets. All the variables are positively skewed while the Kurtosis statistics showed that the indicators are platykurtic except gross fixed capital formation which is leptokurtic.

**Table 1:** Descriptive Statistics

| Variables | Measurements | Mean | Std Dev. | Maximum | Minimum | Kurtosis | Skewness | Obs. |
|---|---|---|---|---|---|---|---|---|
| AOUT | Agriculture Output (₦'Billion) | 6938.8 | 8910.7 | 31904.1 | 17.052 | 0.6136 | 1.2610 | 39 |
| GEXPA | Government Agriculture Expenditure (₦'Billion) | 17.932 | 21.583 | 70.275 | 0.0128 | -0.2528 | 0.9933 | 39 |
| GFCF | Gross Fixed Capital Formation (₦'Billion) | 4512.9 | 8141.7 | 37015.5 | 8.7995 | 6.1637 | 2.3552 | 39 |
| INFR | Inflation, consumer prices (annual %) | 19.146 | 17.063 | 72.836 | 5.3880 | 2.4508 | 1.8557 | 39 |
| INTR | Lending Interest Rate (%) | 17.696 | 4.7934 | 31.65 | 8.92 | 1.0311 | 0.2561 | 39 |

**Note:** Std Dev. - standard deviation; Obs. - observation.

**Source:** Author's computation (2021).

The correlation matrix is presented in Table 2. The correlation coefficient of agriculture output and government agriculture expenditure is positive. It indicates a positive level of association between agriculture output and government agriculture expenditure. Similarly, gross fixed capital formation has positive correlation with agriculture output within the periods considered. Meanwhile, agriculture output has a negative relationship with inflation rate and interest rate. Further, the coefficients are low which indicate the absence of multi-collinearity. Moreover, the results are just preliminary analyses which are subject to validation in the empirical estimation.

**Table 2:** Correlation Matrix

| | *AOUT* | *GEXPA* | *GFCF* | *INFR* | *INTR* |
|---|---|---|---|---|---|
| Agriculture output (AOUT) | 1 | | | | |
| Government Agriculture Expenditure (GEXPA) | 0.7407 | 1 | | | |
| Gross Fixed Capital Formation (GFCF) | 0.8433 | 0.7578 | 1 | | |
| Inflation Rate (INFR) | -0.3216 | -0.3755 | -0.2387 | 1 | |
| Interest Rate (INTR) | -0.0916 | -0.0674 | -0.1186 | 0.3747 | 1 |

**Source:** Author's computation (2021).

Before checking if the series exhibit a long run relationship, the appropriate procedure is to examine their stationarity. Hence, this paper utilizes the Augmented Dickey Fuller (ADF) proposed by Dickey and Fuller (1979) unit root tests. The tests were estimated with both constant and trend terms of the series. Table 3 result shows that we accept the null hypothesis at their level form. Nevertheless, we reject the null hypothesis of unit root after integrating the series, indicating stationarity at their first difference form. Table 2 shows that at the 5 % significant level, the results of ADF test suggest a mixture of I(0) and I(1) process. Specifically, agriculture output, government expenditure on agriculture and interest rate are integrated of order one while gross fixed capital formation and inflation rate are integrated of order zero. Thus, the bound test analysis is appropriate for ascertaining if the variables exhibit a long run relationship.

**Table 3:** Unit root Test

| **Variables** | **Augmented Dickey Fuller** | | **Order of Integration** |
|---|---|---|---|
| | **At Levels** | **At First Difference** | |
| Agriculture output (AOUT) | -0.1314(0)[-3.5331] | -4.2882(0)[-3.5366]*** | I(1) |
| Government Agriculture Expenditure (GEXPA) | -2.1796(0)[-3.5331] | -6.5319(1)[-3.5403]*** | I(1) |
| Gross Fixed Capital Formation (GFCF) | -3.7762(0)[-3.5331]** | - | I(0) |
| Inflation Rate (INFR) | -4.0198(1)[-3.5366]** | - | I(0) |
| Interest Rate (INTR) | -2.2778(0)[-3.5331] | -5.6392(1)[-3.5403]*** | I(1) |

**Note:** ***, ** and * denote significance at 1%, 5% and 1% respectively. The null hypothesis ($H_0$) for ADF is unit root. The optimal lag order for ADF test is determined by AIC.

**Source:** Author's computation (2021).

After knowing the order of integration, the ARDL bound test for co-integration proposed by Pesaran *et al.* (2001) was employed to carry out the long-run relationship between government financing and agriculture output growth with the null hypothesis of no long-run relationship. The result presented in Table 4 indicates that we do not reject the null hypothesis as the F-statistics value of 36.703 is above the upper bound I(1) value of 3.49. For this reason, the result of the ARDL bound co-integration test suggests there exist a long-run relationship between government expenditure on agriculture and agriculture output growth in Nigeria.

**Table 4:** Bound Test of Co-integration using ARDL (1, 3, 0, 0, 0)

| **F-statistics** | **Critical value @ 5%** | | **Decision** |
|---|---|---|---|
| | **I(0)** | **I(1)** | |
| 36.703 | 2.56 | 3.49 | Co-integration exists |

Null Hypothesis: No long run relationship exist
**Source:** Author's computation (2021).

Table 5 applies the ARDL approach to examine the short run and long run impact of government agriculture expenditure on agriculture output growth in Nigeria. The empirical results reveal 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. This short-run result does not follow the *a'priori* expectation. This result is contrary to the findings of past studies like Aina and Omojola (2017), Akanbi *et al.* (2019) and Keji and Efuntade (2020). The coefficients of government agriculture expenditure at first and second lags in the short run are -0.1664 and -0.1490 respectively whereas the long run parameter stood at 0.7448. Regarding the short run estimates, the result implies that a 10% increase in the first and second lags of government agriculture expenditure will result into 1.66% and 1.49% fall in agriculture output growth corresponding. Concerning the long run estimate, a 10% changes in government agriculture finances will cause 7.45% increase in agriculture output growth. This empirical short run evidence can be attributed to the loopholes in government agricultural financing. More often than not, the resources earmarked for the agricultural sector are being diverted for personal aggrandizement and public officials in-charge of the ministry may purchase substandard agricultural machineries and fertilizers and these equipment do not get to the targeted beneficiaries who embark on agricultural activities on a large scale hence, this culminate into minimal level of agricultural output. Meanwhile, public agriculture financing has tendency of enhancing agriculture output growth in the long run.

**Table 5:** ARDL Short-run and Long-run Results of Agriculture Output Growth

Dependent Variable: LOG(AOUT)
Selected Model: ARDL(1, 3, 0, 0, 0)
Sample: 1981 2019
Included observations: 36

***Short-Run Estimates***

| **Variable** | **Coefficient** | **Std. Error** | **t-Statistic** | **Prob.** |
|---|---|---|---|---|
| Δ(AOUT(-1)) | -0.219928 | 0.076354 | -2.880386 | 0.0077 |
| Δ(LOG(GEXPA(-1))) | -0.166438 | 0.024679 | -6.744244 | 0.0000 |
| Δ(LOG(GEXPA(-2))) | -0.149011 | 0.022229 | -6.703561 | 0.0000 |
| Δ(LOG(GFCF(-1))) | 0.008534 | 0.030777 | 0.277290 | 0.7837 |
| Δ(INFR(-1)) | 0.005354 | 0.001036 | 5.167805 | 0.0000 |
| Δ(INTR(-1)) | -0.001194 | 0.005497 | -0.217272 | 0.8296 |

| | | | | |
|---|---|---|---|---|
| ECT(-1) | -0.219928 | 0.013613 | -16.15550 | 0.0000 |

| ***Long-Run Estimates*** | | | | |
|---|---|---|---|---|
| **Variable** | **Coefficient** | **Std. Error** | **t-Statistic** | **Prob.** |
| LOG(GEXPA) | 0.744829 | 0.107704 | 6.915516 | 0.0000 |
| LOG(GFCF) | 0.038804 | 0.130311 | 0.297783 | 0.7681 |
| INFR | 0.024345 | 0.009999 | 2.434694 | 0.0218 |
| INTR | -0.005430 | 0.023949 | -0.226754 | 0.8223 |
| C | 7.058633 | 0.895788 | 7.879799 | 0.0000 |
| R-squared | 0.784026 | Durbin-Watson stat | | 1.730338 |
| Adjusted R-squared | 0763778 | F-Statistics(Prob.) | | 307.3(0.000) |
| **Diagnostic Tests** | | | | |
| Normality test | 1.225(0.5420) | Heteroskedasticity test | | 0.805(0.6036) |
| Serial Correlation | 1.183(0.3231) | Ramsey RESET test | | 0.969(0.3416) |

**Source:** Author's computation (2021).

More so, gross fixed capital formation shows positive coefficients which are not significant statistically at 5% level. It means that gross fixed capital formation have direct impact on agricultural output both in short run and long run, although not significant at the conventional level. This result does conform to the theoretical expectation. The short run positive coefficient conforms to the findings of Keji and Efuntade (2020). The coefficients of gross fixed capital formation in the short run and long run are 0.0085 and 0.0388 respectively. This implies that 10% increase in gross fixed capital formation will enhance short run and long run agriculture output growth by 0.09% and 0.39% respectively. The insignificant impact of gross fixed capital formation can be attributed to government expenditure and investment in the agricultural sector which inevitably crowds out private investment and reduces agricultural output since government spending is not efficient in driving agricultural output in the short run.

As regards the control variables, inflation rate shows a significant positive relationship with agricultural output in Nigeria both in the short run and long run. This is not consistent with theoretical expectation and it negates the empirical findings of Asaleye *et al.* (2020). The coefficients of inflation are 0.0054 and 0.0244 in the short run and long run respectively. This implies that a 10% increase in inflation rate will increase agriculture output growth by 0.05% and 0.24% in Nigeria respectively. This empirical evidence can be traced to the fluctuations of the prices of consumer goods in the market which adversely affect the income of the farmers and hence on their agricultural productivity. Furthermore, interest rate shows an insignificant negative relationship with agricultural output growth in Nigeria both in short run and long run. This result conforms to the *a'priori* expectation and it corroborates the findings of Onakoya *et al.* (2018). The coefficients of interest rate are -0.0012 and -0.0054 in the short run and long run respectively. This implies that a 10% decrease in interest rate will lead to 0.012% and 0.054% increase in agricultural output in the short run and long run in Nigeria. This can be explained from perspective of return on investment. As the interest rate which implies the return on savings increase, savers will be induced to save more which will make credit and loans available for stakeholders in the agricultural sector.

In addition, the coefficient of the error correction term (ECT) which measures the speed of adjustment is negative and highly significant implying a long run equilibrium reversion from the short run economic shocks in Nigeria by 21.99% annually. This implies that it will take agricultural output growth about 3 months to fully adjust to momentary shock and be at equilibrium again in Nigeria. The coefficient of determination indicates that the explanatory variables explain about 61.83% total variation in agriculture output growth in Nigeria. Also,

the F-statistics result shows the overall significance of the control variables at 5% level. Further, the diagnostic tests showed that the error terms are normally distributed, uncorrelated, and constant variance. The model is well-specified as indicated by the Ramsey RESET test.

**Table 6:** Causality Test

| **Null Hypothesis:** **Sample:** 1981 2019 | **F-Statistic** | **Prob.** | **Decision** **Lag:** 2 |
|---|---|---|---|
| GEXPA → AOUT | 3.27575 | 0.0508 | Causality |
| AOUT → GEXPA | 1.60964 | 0.2157 | No causality |
| GFCF → AOUT | 0.02536 | 0.9750 | No causality |
| AOUT → GFCF | 3.66120 | 0.0370 | Causality |
| INFR → AOUT | 2.26932 | 0.1198 | No causality |
| AOUT → INFR | 2.80400 | 0.0755 | No causality |
| INTR → AOUT | 3.34223 | 0.0481 | Causality |
| AOUT → INTR | 0.81053 | 0.4535 | No causality |

**Source:** Author's computation (2021).

Table 6 presents the result of the Granger causality test. The null hypothesis of no causal relationship from government agriculture expenditure to agricultural output is not accepted as the p-value is significant at 5% level. However, the feedback result from agriculture output growth to government agriculture finance is not rejected at 0.05 critical value. This means that there is a one-way causality from public agriculture expenditure to agriculture output growth in Nigeria. Likewise, the causality test result show that interest rate Granger cause agriculture output growth with no feedback. However, agriculture output growth Granger cause gross fixed capital formation but there is no feedback report. As for inflation rate and agriculture output growth, there is no causal relationship between the variables at 5% significance level.

## 5. Conclusion and Policy Recommendations

This study examines the effect of public agricultural financing on agricultural output by focusing on the Nigerian economy. This is owed to the declining level of agricultural output and performance over the years. More so, this study seeks to investigate the direction of casual relationship between public agricultural financing and agricultural output. The study utilized annual data on Nigeria from 1981 to 2019 by employing different econometric techniques specifically the autoregressive distributed lag (ARDL) to ascertain the short run and long run impact of agricultural financing on agricultural output; and Granger causality test to unravel the causal links between the variables. The study 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. More so, gross fixed capital formation has direct impact on agricultural output both in short run and long run, although not significant at the conventional level. Inflation rate shows a significant positive relationship with agricultural output in Nigeria both in the short run and long run. Also, interest rate shows an insignificant negative relationship with agricultural output growth in Nigeria both in short run and long run. The causality result showed that there is a one-way causality from public agriculture expenditure to agriculture output growth in Nigeria. Likewise, the causality test result show that interest rate Granger cause agriculture output growth with no feedback. However, agriculture output growth Granger cause gross fixed capital formation but there is no feedback report. As for

inflation rate and agriculture output growth, there is no causal relationship between the variables at 5% significance level.

Hence, based on the aforementioned empirical results, the study recommends the following. First, government should set up independent monitoring authorities that will ensure budgeted funds reach the target beneficiaries especially and in the agricultural sector and should put in place stringent measures that will deter unsolicited diversion and misappropriation of funds. Second, the monetary authority should encourage investment in the agricultural sector by persuading commercial banks to give loans to agriculture-oriented business at a relatively minimal interest rate. Third, government should put in place measures to stabilize the prices of agricultural produce which is subject to much price volatility and protect the farmers against such fluctuations in order to improve their income and in turn lead to improve agricultural output.

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