Effect of Budgetary Expenditure on Agriculture by the Government on Farm Output and Productivity in Nigeria

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ABSTRACT

The study investigated how government budgetary spending on agriculture in Nigeria affects agricultural productivity. It applied descriptive statistics, Ordinary Least Squares (OLS), the Augmented Dickey-Fuller (ADF) test, and the Autoregressive Distributed Lag (ARDL) model for data analysis. An examination of trends in government agricultural allocations from 2015 to 2023 showed that Nigeria's funding for agriculture consistently remained well below the 10% target set by the Maputo Declaration. Findings from the OLS analysis indicated that the Agricultural Credit Guarantee Scheme Loan, as well as government recurrent and capital expenditures on agriculture, had a positive and statistically significant effect on agricultural output. In contrast, population growth and inflation negatively affected output, while the lending interest rate showed a positive but statistically insignificant influence. The ADF test revealed a mixed order of integration, I (0) and I (1), justifying the use of the ARDL approach. The ARDL results confirmed the existence of a long-run relationship among the variables. In the short run, both government capital and recurrent agricultural expenditures positively influenced agricultural output. The Error Correction Model (ECM) showed a negative and statistically significant coefficient at the 1% level, with a 47% adjustment speed toward long-run equilibrium following shocks, indicating that short-term deviations in output are corrected over time. However, long-run ARDL estimates showed that the Agricultural Credit Guarantee Scheme Loan had a negative and significant effect on output, while population growth had a positive and significant impact. Based on these results, the study concluded that although government spending on agriculture significantly influences output, allocations remain below the Maputo benchmark. It therefore recommended increased government funding for agriculture to realize both short- and long-term economic benefits.

KEYWORDS
Government budgetary expenditure, Agriculture budget share, agricultural Productivity

I. INTRODUCTION

The important roles agriculture plays can never be over-emphasized in any developing economy. It provides raw materials for agro-allied industries, employment opportunities for the vast population, income for the farmers, provision of food for the citizens, and enhances society's wellbeing. The notion that agriculture is the backbone of Nigeria's economy highlights its critical role as a driver of growth and development. Prior to the emergence of crude oil, agriculture served as the foundation of the Nigerian economy, contributing nearly 90% of the country's revenue (Aminu and Amono, 2019). The Nigerian economy is predominantly agricultural, with abundant arable land, a favourable climate, and sufficient water resources that support agricultural development (Food and Agriculture Organization [FAO], 2020).

Despite being largely neglected; the agricultural sector continues to hold a prominent role due to its contribution to the Gross Domestic Product (GDP). It is widely regarded as a key driver of economic growth, a source of wealth creation, and a vital tool for poverty reduction among a significant proportion of Nigeria's population (Idowu, 2014). The share of the agricultural sector in Nigeria's Gross Domestic Product (GDP) declined from 63.8% in 1960 to 41.2% in 1970, further dropping to 20.6% in 1980. It later rose to 37% in 1990, before decreasing again to 27% in 2000, 23.8% in 2010, and 23% in the second quarter of 2022 (Babajide, 2020; CBN, 2017, 2019; NBS, 2022). The primary trigger of the neglect and subsequent decline in agricultural output was the discovery of oil in 1960 (World Bank, 2008; Central Bank of Nigeria [CBN], 2017). Nigeria has transitioned from being self-sufficient in food production to becoming a net importer of food. Low agricultural productivity has been recognized as a major factor contributing to rural poverty in the country (McKinsey Global Institute, 2014). The sector is marked by low yields, largely due to the prevalence of smallholder farmers who often lack adequate knowledge of modern farming practices and the financial capacity to invest in improved seeds and fertilizers (McKinsey Global Institute, 2014). Additionally, agricultural output and fertilizer usage in Nigeria remain significantly below global standards, mainly because farmers have limited access to financing (McKinsey Global Institute, 2014).

In Nigeria, successive governments have largely prioritized the oil sector at the expense of agriculture. Evidence from a 2018 study by the International Food Policy Research Institute (IFPRI) and the World Bank indicates that public spending on agriculture accounts for less than 2% of the total federal annual budget (World Bank, 2018). This allocation is considerably lower than that of other developing nations, such as Kenya (6%) and Brazil (18%), and also falls short of the 10% target established by African leaders under the Comprehensive Africa Agricultural Development Programme (CAADP) (Odi, 2013).

Over the years, government spending on agriculture in Nigeria has increased; however, the sector's performance continues to remain poor (Babajide, 2020; Central Bank of Nigeria [CBN], 2019). The underperformance of Nigeria's agricultural sector, evident in persistent food shortages and rising food prices, has been largely linked to insufficient capital for financing agricultural investments (Ojiegbe & Duruechi, 2015).

To enhance agricultural productivity, successive Nigerian administrations have implemented a wide range of initiatives, such as the National Accelerated Food Production Programme (NAFPP, 1972), National Agricultural and Co-operative Bank (NACB, 1972), Operation Feed the Nation (OFN, 1976), Agricultural Credit Guarantee Scheme Fund (ACGSF, 1978), Commodity Boards (1977), River Basin Development Authorities (RBDAs, 1976), Commodity Marketing and Development Companies (CMDC, 2003), Green Revolution Programme (GRP, 1980), National Agricultural Land Development Authority (NALDA, 1993), National Agricultural Development Fund (NADF, 2002), National Special Programme on Food Security (NSPFS, 2002), National Fadama Development Project (NFDP I, II, III: 1992, 1999, 2008), Nigeria Agricultural Cooperative and Rural Development Bank (NACRDB, 2000), National Food Crisis Response Program (NFCRP), Food Security Thematic Group (FSTG, 2009), and the Growth Enhancement Support (GES) initiative under the Agricultural Transformation Agenda (ATA, 2011) (Ojo, 2015; FAO, 2018).

Amire (2016) observed that government assistance to the agricultural sector has primarily involved the creation of institutional frameworks, including agricultural research, extension services, commodity marketing, input provision, and land-use policies, all aimed at accelerating agricultural development.

Although agriculture plays a vital role in Nigeria's economy and employment, the sector still struggles with limited access to financing from formal financial institutions. The Nigeria Bureau of Statistics [NBS] (2019) reported that in the second quarter of 2019, only 4.2% of commercial bank loans were directed to agriculture, whereas manufacturing received 15.3%, oil and gas 22%, and the broader services sector 36.5%, highlighting that agriculture largely misses out on formal financial support. According to experts, Nigeria's limited budgetary allocation to agriculture is inadequate to tackle essential needs like mechanization, rehabilitation of irrigation systems and dams, storage facilities, and research and development, all of which continue to hinder farmers' productivity (Oxfam, 2023).

The state of agriculture in Nigeria remains poor and largely underdeveloped, with low productivity and output largely attributed to the prolonged neglect of the sector (Adebayo & Afolabi, 2020). This is orchestrated by poor funding of the sector on the part of government and lack of access to funds by the farmers. Given this scenario, Aderibigbe et al. (2014) emphasized that government spending on agriculture is crucial for transforming the sector in Nigeria, particularly considering the low level of investment despite its significant potential for wealth creation, employment generation, and poverty reduction. Against this background, the study was conducted with the primary aim of examining how government budgetary spending affects agricultural productivity in Nigeria.

II. MATERIALS AND METHODS

A. The Study Area

Nigeria is located in West Africa, along the Gulf of Guinea, between longitudes 2°2′ and 14°30′ east and latitudes 4° and 14° north. The country covers a land area of approximately 924,000 km² and is bordered by Niger to the north, Benin to the west, Chad to the northeast, Cameroon to the east, and the Atlantic Ocean to the south (National Bureau of Statistics [NBS], 2020).

Nigeria's population is growing rapidly at an estimated rate of 2.8% per year, with a life expectancy of 47 years. The current population is approximately 210 million and is projected to surpass that of the United States by 2045, reaching around 390 million by 2050 (Muhammad *et. al.,*2017).

Nigeria occupies a total area of 92.4 million hectares (924,000 km²), with land and water covering 79.4 million and 13.0 million hectares, respectively. About 78% of the land, or 71.9 million hectares, is devoted to agriculture, positioning Nigeria among the countries with the highest biofuel potential globally (Food and Agriculture Organization [FAO], 2020).

Nigeria has a diverse and rich vegetation capable of supporting large livestock populations, with an estimated surface water volume of about 267.7 billion cubic meters and underground water of approximately 57.9 billion cubic meters. The country's ecological zones include the semi-arid Sudan (Sahel) zone, Guinea Savannah and Derived Savannah zones, as well as Forest and Mangrove zones characterized by high rainfall, moist sub-humid conditions, and very high humidity. Minor variations exist within each zone, and the ecology and precipitation patterns of a region influence the type of farming systems practiced, dietary preferences, and the utilization of natural resources (Adebayo & Afolabi, 2020).

Nigeria's principal cash crops include cocoa, oil palm, and rubber, while major staple foods consist of rice, cassava, yams, maize, taro, sorghum, and millet. In addition, timber production, livestock rearing (such as goats, sheep, cattle, and poultry), and artisanal fisheries are common occupations in the agricultural sector (National Bureau of Statistics [NBS], *National Agricultural Sample Census*, 2022).

B. Sources and Method of Data Collection

The study relied on secondary data, drawing on time series information from multiple editions of the CBN Statistical Bulletin (2019, 2020, & 2022), spanning the years 1981 to 2022.

C. Method of Data Analysis

The collected data were examined using several econometric methods, including descriptive statistics, Ordinary Least Squares (OLS) regression, Augmented Dickey-Fuller (ADF) tests, and the Autoregressive Distributed Lag (ARDL) approach, encompassing ARDL cointegration analysis as well as both long-run and short-run estimations.

D. Model Specification

To assess the effect of budgetary expenditure on the agricultural sector and its impact on agricultural output, an OLS regression analysis was employed. The independent variables included Agricultural Credit Guarantee Scheme Loan (ACGSL), Government Recurrent Expenditure on Agriculture (GREA), Government Capital Expenditure on Agriculture (GCEA), Lending Interest Rate (LIR), Rate of Inflation (RI), and Population Growth (POPG), while Agricultural Output (AO) served as the dependent variable. The model for the study is specified as follows:

AO = f (ACGSL, GREA, GCEA, LIR, RI, POPG) …………………….. (1)

The econometric model in explicit form is:

$AO = \beta_0 + \beta ACGSL + \beta_2 GREA + \beta_3 GCEA + \beta_4 LIR + \beta_5 RI + \beta_6 POPG + e$ …. (2)

Where:

β0 = Constant

$\beta_1, \beta_2, \ldots \beta_6$ = parameters to be estimated

e =error term

AO = Agricultural output (₦' Billions)

ACGSL= Agricultural Credit Guarantee Scheme Loan (₦' Billions)

GREA = Government Recurrent Expenditure on Agriculture (₦' Billions)

GCEA = Government Capital Expenditure on Agriculture (₦' Billions N)

LIR = Lending Interest Rate (%)

RI = Rate of Inflation (%)

POPG = Population growth (%unit of measurement)

E. Unit Root Test

Empirical studies using time series data typically assume that the data are stationary, meaning the series has a constant mean, variance, and autocorrelation structure over time (Granger & Newbold, 1981). However, many macroeconomic and financial time series display trends, which render them non-stationary (Nelson & Plosser, 1982). Including non-stationary variables in a regression model can lead to spurious regression, unless the variables are co-integrated. In such cases, any forecasts or policy conclusions derived from the regression would be unreliable and potentially misleading (Nelson & Plosser, 1981). To determine whether the variables in the model are stationary, this study applied a unit root testing procedure, specifically using the Augmented Dickey-Fuller (ADF) method. The general form of the unit root test is presented below:

ADF equation:

$\Delta y_t = \beta_1 + \beta_2 + \delta y_{t-1} + \sum^{m}_{i=1} \alpha_i \Delta y_{t-1} + e_t$ .... (3)

Were,

Δy = Change in the variable series to be tested;

y_{t-1} = the variable in Lagged depended form,

t = trend;

β, δ= estimable parameters.

F. Autoregressive Distributed Lag (ARDL) model specification:

The ARDL approach offers unbiased long-run estimates with valid t-statistics even when some repressors are endogenous. It also allows for the assessment of both short-run and long-run effects of one variable on another and enables their separation, provided that the appropriate order of the ARDL model is selected (Pesaran *et. al.,* 2001).

The ARDL models specified for this study is as:

$\Delta AO_{t,j} = C0 + C_1 AO_{t-1,j} + C_2 ACGSL_{t-1,j} + C_3 GREA_{t-1,j} + C_4 GCEA_{t-1,j} + C_5 LIR_{t-1,j} + C_6 RI_{t-1,j} + C_7 POPG_{t-1,j} + \sum_{i=1}^{n1} \alpha_{1i,j} \Delta AO_{t-1,j} + \sum_{i=0}^{n2} \alpha_{2i,j} \Delta ACGSL_{t-1,j} + \sum_{i=0}^{n3} \alpha_{3i,j} \Delta GREA_{t-1,j} + \sum_{i=0}^{n4} \alpha_{4i,j} GCEA_{t-1,j} + \sum_{i=0}^{n5} \alpha_{5i,j} \Delta LIR_{t-1,j} + \sum_{i=0}^{n6} \alpha_{6i,j} RI_{t-1,j} + \sum_{i=0}^{n7} \alpha_{7i,j} \Delta POPG_{t-1,j} + \mu t$ ------------ (4)

III. RESULTS AND DISCUSSIONS

A. Patterns of Agricultural Sector Budgetary Allocation Relative to the National Budget from 2015 to 2023

Despite increasing concerns over food insecurity in Nigeria, the administration in 2023 allocated the lowest proportion of the national budget to agriculture in seven years. Data from the Budget Office indicate that only ₦228.4 billion, representing 1.1% of the total ₦21.83 trillion budget, was designated for the agricultural sector, even though the government claimed to be pursuing food security. Experts note that this inadequate allocation is insufficient to address critical issues such as mechanization, the rehabilitation of irrigation facilities and dams, storage infrastructure, and research and development, all of which continue to negatively affect farmers' productivity (Oxfam, 2023). According to an Oxfam (2023) report, budgetary allocations for agricultural initiatives at the sub-national level are extremely insufficient. An Oxfam (2023) report highlights that budgetary allocations for agricultural programs at the sub-national level are severely insufficient. The report also cautions that the continued dependence of states on donor funding for their agricultural sectors represents an unrealistic approach to revenue planning.

Records indicate that Nigeria is among the least mechanized farming countries globally, with a tractor density of 0.27 hp per hectare, significantly below the Food and Agriculture Organization's (FAO) recommended 1.5 hp per hectare (Ozumba *et. al.,* 2019; FAO, 2020). If Nigeria is serious about fighting and reducing food insecurity, then the government at all levels must give priority attention to the sector by increasing annual budgetary allocation.

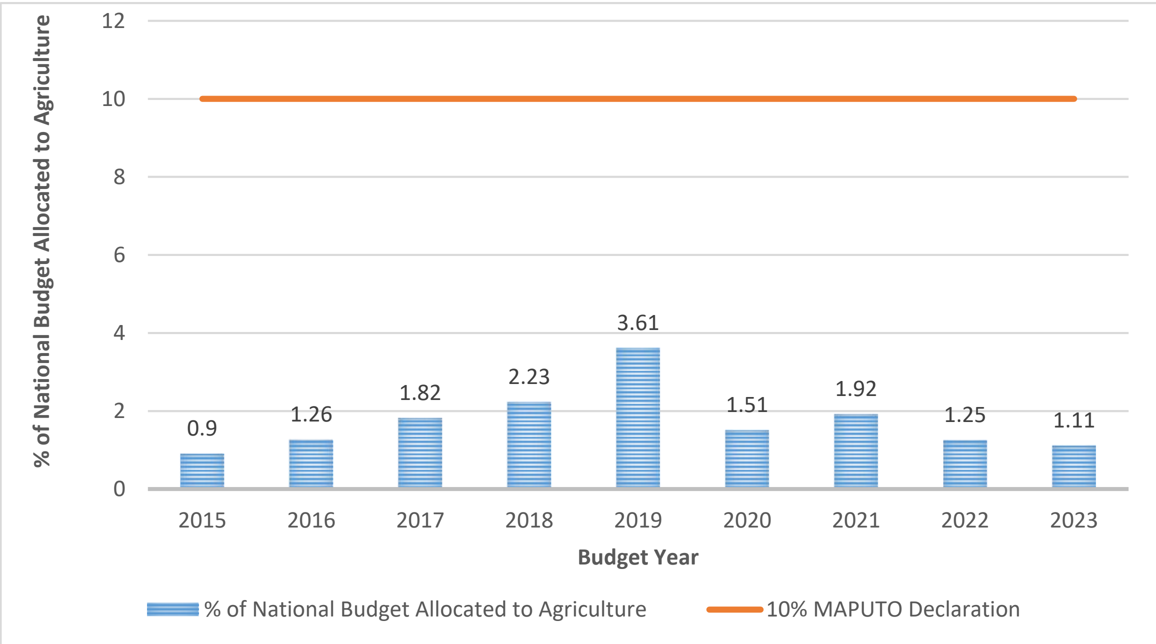

Figure 1: Nigeria's Agricultural Budgetary Allocation in proportion to National Budget (2015-2023)

B. Effect of Government Spending on Agriculture on Agricultural Productivity in Nigeria

Based on the OLS results presented in Table 1, the constant term (β_0) is positive at 6318.709, indicating that if all independent variables remain constant, agricultural output would increase by 6318.709 units annually.

The coefficient for the Agricultural Credit Guarantee Scheme Loan (ACGSL) is positive (0.000587) and statistically significant at the 1% level, suggesting that ACGSL has a positive and significant effect on agricultural output. This means that a 1% increase in ACGSL is associated with a 0.000587% increase in agricultural output. These results are consistent with Onuegbu et al. (2022), who found a positive and significant impact of ACGSL on agricultural output in Nigeria.

Both Government Capital Expenditure on Agriculture (GCEA) and Government Recurrent Expenditure on Agriculture (GREA) have positive coefficients (4.632296 and 81.73391, respectively) and are statistically significant at the 10% and 5% levels. The positive signs align with a priori expectations, indicating that a 1% increase in GCEA and GREA would lead to increases in agricultural output of 4.632296% and 81.73391%, respectively. This finding also aligns with the studies of Sebastian et al. (2018) and Megbowon et al. (2019), who reported a positive effect of government agricultural expenditure on agricultural output in Nigeria.

Population Growth (POPG) and the Rate of Inflation (RI) both have negative coefficients, which aligns with a priori expectations, although neither is statistically significant. This suggests that a 1% increase in either POPG or RI would result in a decrease in agricultural output (AO). It highlights the need for the government to implement measures to manage population growth and control inflation in the country.

The Lending Interest Rate (LIR) shows a positive coefficient but is statistically insignificant, which contradicts a priori expectations. This finding contrasts with Edeh et al. (2020), who reported a negative and statistically significant effect of LIR on agricultural output, indicating that higher lending rates negatively impact agricultural productivity.

The R-squared value of 0.889 indicates that approximately 89% of the variation in agricultural output is explained by the independent variables in the model. Additionally, the F-statistic shows that the overall regression is significant at the 1% level, confirming a good model fit as assumed in OLS estimation.

Table 1: Results of Regression Analysis

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
ACGSL	0.000587	0.000116	5.084063	0.0000*
GCEA	4.632296	2.604101	1.778847	0.0840***
GREA	81.73391	31.80417	2.569911	0.0146**
LIR	82.52003	74.67506	1.105055	0.2767
POPG	-1455.150	3142.378	-0.463073	0.6462
RI	-15.49539	23.37199	-0.662990	0.5117

C	6318.709	8822.664	0.716191	0.4786
R-squared	0.889786	Mean dependent var		8725.956
Adjusted R-squared	0.870892	S.D. dependent var		5866.176
S.E. of regression	2107.813	Akaike info criterion		18.29570
Sum squared resid	1.56E+08	Schwarz criterion		18.58531
Log likelihood	-377.2097	Hannan-Quinn criter.		18.40186
F-statistic	47.09382	Durbin-Watson stat		1.235017
Prob(F-statistic)	0.000000			

*Source: Output from E-views 10 level of Significance: *=1%, ** = 5%, ***=10%)*

C. Stationarity Test

To prevent spurious regression problems that can result from using time series data, the study tested for stationarity using the Augmented Dickey-Fuller (ADF) test. Based on the results, the appropriate lag length for the ARDL model was determined using various selection criteria (Pesaran *et. al.,* Smith, 2001).

The stationarity test results in Table 2 indicate that, at the 5% significance level, the variables are stationary. Agricultural Output (AO), Agricultural Credit Guarantee Scheme Loan (ACGSL), Government Capital Expenditure on Agriculture (GCEA), Lending Interest Rate (LIR), and Population Growth (POPG) became stationary at first difference, I(1), while Government Recurrent Expenditure on Agriculture (GREA) and Rate of Inflation (RI) were stationary at level, I (0).

Since the variables are integrated of mixed orders, I (1) and I (0), they meet the conditions for applying the ARDL model, as noted by Pesaran and Shin (1999) and Pesaran *et. al.* (2001). Prior to conducting the ARDL analysis, the appropriate lag length for the model was determined using the VAR lag selection criteria.

Table 2: Augmented Dickey-Fuller Unit Root Test Result for Stationarity (1981-2022)

Variable	**Order of stationarity**	**ADF Calculated**	**ADF Critical Value**	**Prob**	**Order of integration**	**Decision**
AO	Level	-2.024010	-3.523623	0.5712	I(0)	Not Stationary
	1st Dif.	-5.597221	-3.526609	0.0002	I(1)	Stationary
ACGSL	Level	-2.499946	-3.5236223	0.3266	I(0)	Not Stationary
	1st Dif.	-5.416720	-3.526609	0.0004	I(1)	Stationary
GCEA	Level	-0.984579	-3.523623	0.9351	I(0)	Not Stationary
	1st Dif.	-7.346485	-3.526629	0.0000	I(1)	Stationary
GREA	Level	-4.371928	-3.523623	0.0064	I(0)	Stationary
LIR	Level	-2.243543	-3.523623	0.4539	I(0)	Not Stationary
	1st Dif.	-5.876396	-3.529758	0.00001	I(1)	Stationary
POPG	Level	-2.448960	-3.552973	0.03495	I(0)	Not Stationary
	1st Dif.	-5.584010	-3.833083	0.00003	I(1)	Stationary

RI	Level	-3.681521	-2.936942	0.0082	I(0)	Stationary

Source: Output from E-views 10

D. Lag Selection Criteria

Table 3 shows the VAR lag order selection criteria which comprised of different criteria. This includes Akaike information, Schwarz information, and Hannan-Quinn information criteria. The maximum lag is one (1) and majority of the criteria have one asterisk (*) which corresponds to 1 lag. Hence, the study used one (1) lag in the ARDL model.

Table 3: VAR Lag Order Selection Criteria

Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	-1644.744	NA	1.44e+28	84.70484	85.00342	84.81197
1	-1463.990	287.3527*	1.75e+25*	77.94821	80.33692*	78.80526*
2	-1429.610	42.31363	4.76e+25	78.69797	83.17679	80.30493
3	-1361.459	59.41388	3.79e+25	77.71585*	84.28479	80.07273

Source: Output from E-views 10

E. ARDL Bounds Test for Co-integration

The co-integration test results, using the ARDL bounds testing approach, are shown in Table 4. The findings indicate the existence of a long-run relationship among the variables (AO, ACGSL, GCEA, GREA, LIR, RI, and POPG), as the computed F-statistic exceeds both the lower and upper critical bounds at the 5% significance level. Consequently, the null hypothesis of no co-integration is rejected for the agricultural output model at the 5% level. With the long-run co-integration relationship established, the study proceeded to estimate both the long-run and short-run dynamic parameters of the variables.

Table 4: ARDL Bounds Test for Co-integration (Model Estimation Results)

Model		**F-Statistic** = 3.844268
F (AO, ACGSL, GCEA, GREA, LIR, RI and POPG)		K= 6
Critical Values	Lower Bound	Upper Bound
5%	2.63	3.62

Source: Output from E-views 10

F. Short-Run Estimates of the Error Correction Form of the ARDL Model

The short-run results of the error correction version of the ARDL model are presented in Table 5. The estimated model indicates that Government Capital Expenditure on Agriculture (GCEA) has a positive coefficient, significantly influencing Agricultural Output (AO) at the 5% level, consistent with a priori expectations. This suggests that a 1%

increase in GCEA would raise AO by 118.2% in the short run, holding other factors constant. However, this finding contrasts with Akpan and Akpanabah (2022), who reported a negative and insignificant short-run relationship between GCEA and AO in Nigeria.

Similarly, Government Recurrent Expenditure on Agriculture (GREA) exhibits a positive coefficient, indicating a positive short-run impact on AO, in line with a priori expectations. Specifically, a 1% increase in GREA is associated with a 230.6% increase in AO, although this effect is not statistically significant. The coefficient for Lending Interest Rate (LIR) is positive but also statistically insignificant, which does not align with a priori expectations.

The coefficient of Population Growth (POPG) is negative and significantly affects agricultural output ($p < 0.0009$), consistent with a priori expectations. The result indicates that a 1% increase in POPG would lead to a decrease in agricultural output by 671,413.7% in the short run, holding other factors constant. The Rate of Inflation (RI) also has a negative coefficient, although it is statistically insignificant, which aligns with a priori expectations and suggests a negative impact on agricultural output in Nigeria.

The R-squared value of 0.87 indicates that 87% of the variation in agricultural output is explained by the variables included in the model. The Durbin-Watson statistic suggests the absence of autocorrelation in the residuals, while the F-statistic shows that the overall model is significant at the 1% level.

The short-run estimates of the error correction version of the ARDL model show that the Error Correction Term (ECM) is negative and statistically significant at the 1% level, confirming the presence of cointegration and a stable long-run relationship among the variables. The ECM coefficient of -0.471614 indicates a 47.16% speed of adjustment, meaning that nearly half of any short-term deviation in agricultural output is corrected each period, restoring the system to its long-run equilibrium.

Table 5: Estimated short-run of the error correction version of the ARDL model

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(GCEA)	1.181892	0.413232	2.860117	0.0170
D(GREA)	2.305895	4.094866	0.563119	0.5858
D(LIR)	6.760246	17.81825	0.379400	0.7123
D(POPG)	-6910.018	1476.470	-4.680093	0.0009
D(RI)	-0.051464	3.440196	-0.014960	0.9884
CointEq(-1) *	-0.471614	0.065224	-7.230633	0.0000
R-squared	0.870697	Mean dependent var		441.7779
Adjusted R-squared	0.718577	S.D. dependent var		459.6302
S.E. of regression	243.8308	Akaike info criterion		14.13172
Sum squared resid	1010709.	Schwarz criterion		15.03670
Log likelihood	-247.5026	Hannan-Quinn criter.		14.45370
F-statistic	5.723725	Durbin-Watson stat		2.315270
Prob(F-statistic)	0.000324			

Source: Output of E-views 10

G. Estimated Long-Run Results of the ARDL Model

Table 6 presents the long-run ARDL estimates, showing that the Agricultural Credit Guarantee Scheme Loan (ACGSL) has a negative and significant effect on agricultural output (AO), while Population Growth (POPG) exerts a positive and significant effect in the long run. Specifically, the long-run coefficient of ACGSL is negative and significant ($p < 0.01$), indicating that a unit increase in ACGSL would reduce AO by 0.051% over the long run. This result aligns with the findings of Afolabi et al. (2021), who also reported a negative long-run impact of ACGSL on agricultural output in Nigeria.

Conversely, the positive and significant coefficient of POPG ($p < 0.05$) suggests that a 1% increase in population growth would lead to a 19,245.5% increase in agricultural output in the long run.

Government Capital Expenditure on Agriculture (GCEA) and Government Recurrent Expenditure on Agriculture (GREA) exhibit positive coefficients as expected, but their effects are not statistically significant. Similarly, Lending Interest Rate (LIR) and Rate of Inflation (RI) carry the expected negative signs, indicating a potential negative impact on agricultural output in the long run, though they are not significant. Lower LIR would theoretically allow more farmers to access funds for agricultural activities, thereby boosting output and promoting economic growth. The observed relationship between LIR and AO is consistent with a priori expectations and aligns with empirical findings from studies by Maiga (2017), Harswari and Hamza (2017), and Matarr and Monday (2021).

Table 6: Estimated Long-run of the ARDL model

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
ACGSL	-0.000510	0.000148	-3.448636	0.0062
GCEA	3.325962	4.277990	0.777459	0.4549
GREA	106.3489	61.14563	1.739273	0.1126
LIR	-48.24489	50.50401	-0.955268	0.3620
POPG	19245.54	5076.672	3.790975	0.0035
RI	-29.72037	24.07234	-1.234627	0.2452
@TREND	352.7584	63.45520	5.559172	0.0002

Source: Output from E-views 10

H. Diagnostics and Stability Tests

The study conducted post-estimation diagnostic and stability tests to assess the reliability and robustness of the results obtained from the ARDL and Bounds cointegration models. The diagnostic tests included checks for normality, heteroscedasticity, serial correlation (using the Breusch-Godfrey LM test), and multicollinearity, ensuring the validity of the estimated results. The findings from these tests are summarized in Tables 7 and 8.

Both the Breusch-Godfrey LM test for autocorrelation and the test for conditional heteroscedasticity was applied to the residuals. Additionally, the Ramsey RESET test was employed to check for model mis-specification and the stability of the coefficients.

The results in Table 7 show that the p-values for the heteroscedasticity and serial correlation tests were all greater than 0.05, indicating that the model is free from autocorrelation and heteroscedasticity. The normality test confirmed that the residuals are normally distributed. Similarly, the Ramsey RESET test yielded a p-value greater than 0.05, suggesting that the functional form of the model is correctly specified and that the coefficients are stable over time. These results confirm that the ARDL model estimates are reliable and valid.

Multicollinearity was assessed using the Variance Inflation Factor (VIF), where values below 10 indicate no multicollinearity. The cantered VIF results in Table 8 show all VIF values below 10, confirming that multicollinearity is not present in the model.

Table 7: Diagnostic Tests

	F- Stat	**Probability**
Serial Correlation LM Test (Breusch-Godfrey)	0.528533	0.6087
Obs *R- squared (Chi-Square)	4.434048	0.1089
Heteroskedasticity Test (Breusch-Pagan-Godfrey)	1.422764	0.2864
Normality Test	0.672297	0.714517
Ramsey Test	4.758209	0.0635

Source: Output from(E-views 10)

Table 8: Variance Inflation Factors (Result of Multicollinearity)

	Coefficient	**Uncentered**	**Centered**
Variable	**Variance**	**VIF**	**VIF**
ACGSL	1.33E-08	3.592601	2.110978
GCEA	6.781341	11.59747	6.548606
GREA	1011.506	10.93641	6.244633
LIR	5576.365	17.01544	1.193901
POPG	9874537.	655.6288	1.510131
RI	546.2500	3.218615	1.364913
C	77839396	735.8418	NA

Source: Output from (E-views 10)

I. *Stability Tests*

Stability Tests:

The study further assessed the stability of the ARDL model using the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ). The results are illustrated in Figures 2 and 3.

Figure 4 shows the CUSUM test results, indicating that the ARDL model is stable at the 5% significance level. The residual line remains close to the horizontal axis (0.0) and does not cross the 95% confidence interval, suggesting that the estimated coefficients are stable throughout the sample period. This stability confirms that the regression results are reliable and suitable for policy formulation.

figures demonstrate that the CUSUM and CUSUMSQ lines remain within the 5% critical bounds, indicating that the model is stable. This confirms that the coefficients are consistent and dependable over the study period.

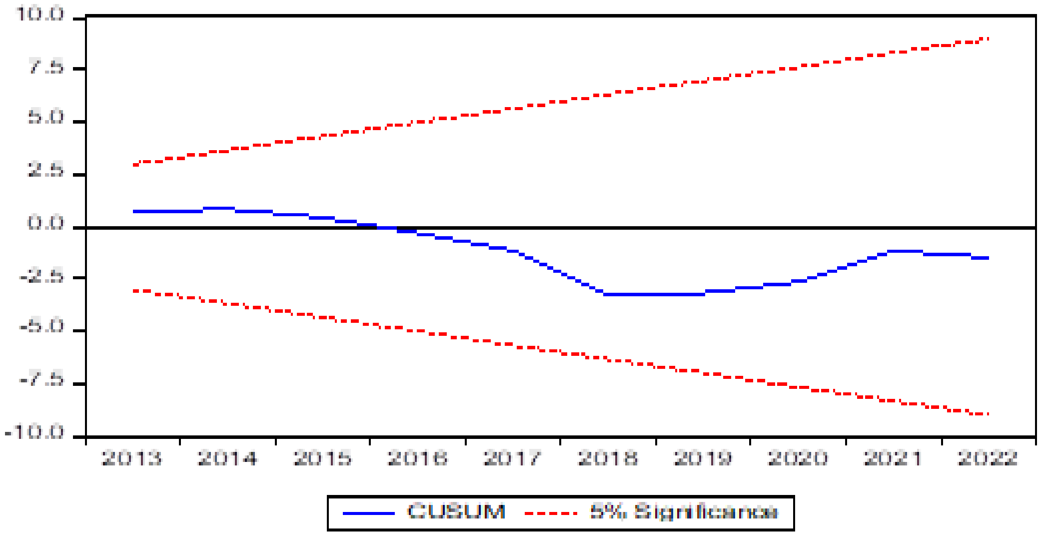

Figure 2: CUSUM Test

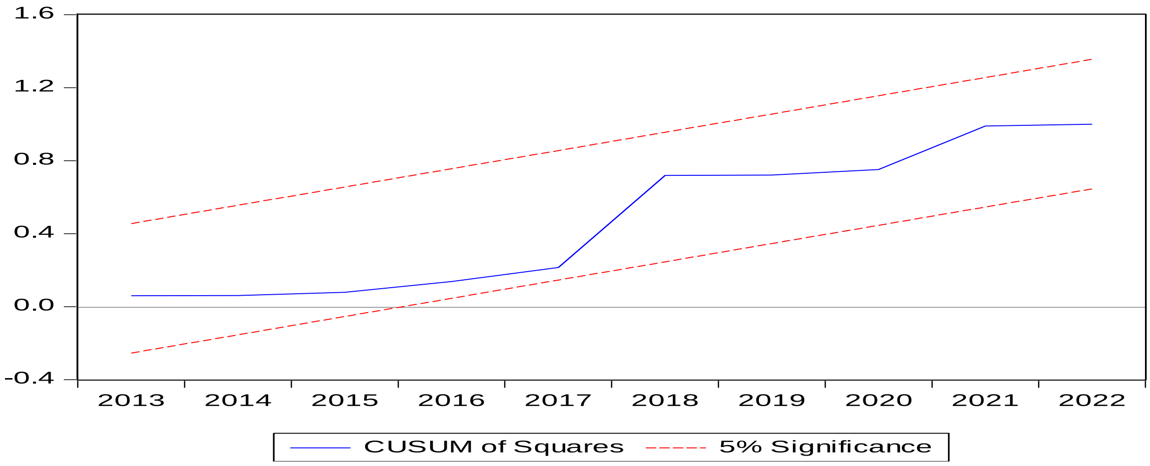

Figure 3: CUSMSQ Test

IV. CONCLUSION

The study assessed the impact of government agricultural budgetary expenditure on agricultural productivity in Nigeria over the period 1981–2022, highlighting the critical role of public spending in enhancing the performance of the agricultural sector. Findings indicate that Nigeria's budgetary allocation to agriculture, relative to the national budget, remains low, emphasizing the need for increased government investment in the sector.

The results show that the Agricultural Credit Guarantee Scheme Loan (ACGSL), Government Capital Expenditure on Agriculture (GCEA), and Government Recurrent Expenditure on Agriculture (GREA) have positive and significant effects on agricultural output (AO). Conversely, Population Growth (POPG) and Rate of Inflation (RI) exhibit negative but statistically insignificant impacts on AO, while Lending Interest Rate (LIR) has a positive yet insignificant effect.

The ARDL model results demonstrate a long-run relationship among the variables. Specifically, GREA and GCEA positively influence AO in the long run, whereas ACGSL exerts a negative long-run effect. POPG negatively affects AO in the short run but has a significant positive impact in the long run. LIR and RI continue to show negative but insignificant relationships with AO.

Overall, the study concludes that government budgetary expenditure plays a significant and positive role in enhancing agricultural productivity and output in Nigeria.

RECOMMENDATION

Based on the findings of the study, the following recommendations were proffered:

I. Government should increase her budgetary allocation to agriculture sector relative to national budget as suggested by the MAPUTU declaration.

II. Government should continue to provide guarantees in respect of loans granted for agricultural purposes by any bank in accordance with the provisions of Agricultural Credit Guarantee Scheme (ACGSF) Fund Act to minimize risks banks are exposed to, as a result of their lending activities to the agricultural sector and to increase the level of banks' credit to the agricultural sector. To achieve this, the government should strengthen the Agricultural Credit Guarantee Scheme by meaningful budgetary allocation in order to enhance its capital base significantly. In addition, the Agricultural Credit Guarantee Scheme (ACGS) should improve on its conditions for credit guarantee in order to make agricultural financing attractive to commercial banks.

III. Government should establish effective monitoring agencies to ensure that the amount allocated to the agricultural sector is judiciously spent on building assets of a lasting nature, like construction of canals, dams, water storage, roads and railway lines, public building of various kinds, ports, etc. in order to boost agricultural output.

IV. Credit should be provided to serious minded farmers to help them alleviate the capital need for inputs and also create incentive for adopting improved technologies at a very low or single digit interest rate.

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