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MACROECONOMIC DETERMINANTS OF AGRICULTURAL OUTPUT GROWTH IN NIGERIA: AN EMPIRICAL ANALYSIS

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ABSTRACT

Nigeria's agricultural sector remains chronically underperforming relative to its immense potential, largely due to macroeconomic volatility that systematically undermines productivity. Hence, this study investigated the macroeconomic drivers of agricultural output growth in Nigeria, specifically assessing the impacts of the GDP growth rate, monetary policy rate (MPR), exchange rate, and inflation rate. Utilizing an ex-post facto research design, the study analyzed annual time-series data spanning from 1986 to 2025 sourced from the Central Bank of Nigeria, the National Bureau of Statistics, and the World Bank. Autoregressive Distributed Lag (ARDL) bounds testing approach was employed to examine both short-run and long-run dynamics. Findings indicated the existence of a long-run equilibrium relationship between the selected macroeconomic variables and agricultural output. In the short run, the GDP growth rate significantly stimulates agricultural output, with a 1% increase leading to a 0.302% rise in output. Conversely, the MPR exerts a negative short-run impact (-0.139%) due to high borrowing costs for capital, though it shows a positive relationship in the long run. The exchange rate demonstrated a positive influence on output in both the short and long run, suggesting that currency movements may enhance domestic competitiveness. Inflation was found to consistently erode profit margins and decrease output across both time horizons, with a 1% increase resulting in a -0.008% decrease in output. Thus, this paper recommended that the Central Bank of Nigeria (CBN) establishing single-digit interest rate windows for the agricultural sector to insulate farmers from broad monetary tightening. The Federal Ministry of Agriculture and Food Security (FMAFS) should prioritize the digital distribution of high-quality inputs via the Agro-Pocket platform to eliminate middlemen. Additionally, the government should implement input price

buffers to mitigate inflationary pressures and design policies to integrate local farmers into the African Continental Free Trade Area (AfCFTA), amongst others.

KEYWORDS: Agricultural Output, Macroeconomic Variables, ARDL, Nigeria, Monetary Policy.

JEL Codes: Q10, E52, E31, F31, O11.

I. INTRODUCTION

With over a billion workers, over \$1.3 trillion in annual revenue, and about half of the world's livable land, agriculture continues to be a vital pillar of the global economy (Shyamoli & Arghadeep, 2022). The industry is considerably more important in Africa, where it accounts for 30–40% of GDP, contributes more than 80% of trade value, supplies more than half of industrial raw materials, and employs more than two-thirds of the population (Saghir, 2014; Osabohien *et al.*, 2020). The agricultural performance of African nations has remained inconsistent despite this strategic significance.

Despite agriculture's fundamental importance in Nigeria's economy, the industry consistently underperforms in comparison to its enormous potential. Nigeria ought to be a net exporter of food due to its more than 37 million hectares of fertile land and several agro-ecological benefits (International Food Policy Research Institute [IFPRI], 2021). However, due to inadequate execution, corruption, lax oversight, and the exclusion of smallholder farmers, decades of ambitious initiatives (Seven Point Agenda, Agricultural Transformation Agenda, Anchor Borrowers' Programme, National Agricultural Growth Scheme) have repeatedly failed.

A crucial but little-studied fact at the heart of this conundrum is that agricultural productivity is consistently being undermined by macroeconomic volatility. Changes in exchange rates raise the price of imported inputs, such as pesticides, machinery, and fertilizers. Farmers' profit margins and purchasing power are eroded by persistent inflation (the CPI reached 117.34 index points in March 2025). The majority of smallholders, the farmers who produce the majority of Nigeria's food, are excluded from formal credit due to high interest rates and restrictive lending policies. In the meantime, measures meant to stabilize the economy frequently function independently of agricultural realities, leading to unforeseen distortions. Therefore, this study offered a thorough examination of the ways in which macroeconomic factors, including GDP growth rate, monetary policy rate, currency rate, and inflation rate, affect Nigeria's agricultural production growth.

II. Literature Review

Theoretical Framework

Theoretical framework of this paper builds upon the Agricultural Supply Response Theory which suggests that farmers respond to economic inducements arising from macroeconomic variables and policy variables and this effect on supply is modeled using an adaptation of the Cobb Douglas production function: Where Y is the volume of agricultural production; K is the volume of capital input in agricultural activities; L is volume of labour input in agricultural activities and A is the volume of total factor productivity. The Cobb-Douglas Production Function theory explains how macroeconomic factors like GDP growth rate, monetary policy rate, exchange rate, and inflation rate relate to the growth of agricultural output in Nigeria. The Cobb-Douglas production function is a widely used economic model that describes the relationship between output and two primary inputs: labour and capital as follows:

$$Q = AK^{\alpha} L^{\beta} \quad (1)$$

Where $\alpha + \beta = 1$. The monetary worth of tangible assets required for production, such as buildings, machinery, and equipment, is represented by the capital, K . The workforce's productive effort, expressed in person-hours, is represented by the labour, L . The elasticity or responsiveness of output in relation to capital is measured by the exponent α , a number between 0 and 1. The total-factor productivity (TFP) is represented by the constant A . The overall quality or efficiency of the production process is represented by the value of A , which is a ratio of output to total input. It is simple to expand the Cobb-Douglas formula to incorporate more than two elements of production. Businesses will be able to transform labour and capital into output products more effectively as technology advances and workers become more skilled and educated. As a result, total-factor productivity should increase over time (Utuk *et al*, 2024).

However, to make empirical modeling easier, the dependent variable in this study was the contribution of the agricultural sector to GDP, while the independent variables were macroeconomic factors including GDP growth rate, monetary policy rate, exchange rate, and inflation rate. This makes it possible to show how Nigeria's agricultural output is impacted by macroeconomic factors. Equation (3.1) can now be written in a functional form as:

$$AGDP = f(\text{GDPGR}, \text{MPR}, \text{EXR}, \text{INFR}) \quad (2)$$

Where AGDP stands for agriculture contribution to gross domestic product as a measure of agriculture output and GDPGR, MPR, EXR, and INFR, are selected macroeconomic

variables. A strong framework for comprehending how macroeconomic factors affect agricultural output is provided by applying the Cobb-Douglas production function to Nigeria's agricultural sector. The availability and cost of labor and capital inputs are influenced by macroeconomic factors like GDP growth rate, monetary policy rate, exchange rate, and inflation rate. For instance, high interest rates make borrowing money for farm equipment or materials more expensive, and inflation has an impact on labor earnings and agricultural input costs. The price of imported inputs like machinery and fertilizer is affected by changes in exchange rates.

In addition, the Cobb-Douglas production function is appropriate for this paper because it takes into account total factor productivity, which can capture the effects of policy interventions, technological advancements, and agricultural efficiency gains that are frequently impacted by macroeconomic conditions. Monetary policy rates, for example, can have an impact on investments in infrastructure and agricultural technologies, which in turn affect productivity. By incorporating TFP, the model takes into account qualitative changes in production processes that may result from macroeconomic stability or instability, rather than restricting analysis to input quantities alone. This all-encompassing strategy fits in nicely with the intricate dynamics of Nigeria's agricultural industry, where productivity and input levels are both susceptible to changes in the macroeconomic environment.

Empirical Review

In their analysis of Somalia's agricultural output using the ARDL model, Bashir and Said (2026) discovered that while land use for grain cultivation strangely reduces productivity in the near run, domestic investment and rainfall greatly boost output in both time horizons. Importantly, this study showed that in rural economies, environmental and physical inputs frequently outweigh solely macroeconomic variables. In the Nigerian context, Oguwuike et al. (2026) employed OLS and ECM but found that coefficients for the exchange rate, interest rate, and money supply while positively signed were statistically insignificant. This suggests that under certain policy regimes, traditional macroeconomic levers may fail to trigger meaningful sectoral growth. Aham et al. (2026), who also employed the ARDL approach, challenge this conclusion, showing that while exchange rate depreciation improves long-term competitiveness, bank loans and inflation (surprise) have a negative connection with output. The detrimental effects of lending point to systemic inefficiencies in Nigeria's distribution and use of agricultural loans.

This conclusion is contested by Aham et al. (2026), who also used the ARDL approach, demonstrating that bank loans and inflation (surprise) have a negative relationship with output whereas exchange rate depreciation enhances long-term competitiveness. The negative consequences of lending indicate structural inefficiencies in the allocation and utilization of agricultural loans in Nigeria. In Tanzania, interest rates, exchange rates, and inflation were all found to have a statistically significant negative influence on agriculture, which clearly contradicts the positive exchange rate findings in Nigeria. Daudi and Muba (2025) highlight this regional instability.

Extending the focus to Sub-Saharan Africa, Kolawole (2025) found a unidirectional causal link in which agricultural output is driven by macroeconomic variables such as interest rates and foreign direct investment. On the other hand, Bonny and Ayunku (2024) discovered that inflation and the money supply had very little effect in Nigeria, indicating that agricultural performance may be shielded from or even ignored by larger monetary fluctuations. This is corroborated by Udoji et al. (2024), who discovered that non-monetary bottlenecks were the main obstacles and that monetary variables in Nigeria were essentially inconsequential between 1999 and 2022. Using the ARDL technique, Muhammad and Bello (2020) investigated the economic factors influencing agricultural productivity in Nigeria. Result showed that while the inflation rate has a negative relationship with agricultural productivity, the labour force and real exchange rate have a positive relationship. From a global perspective, however, Setshedi and Mosikari (2019) in South Africa and Balageetha and Suthacini (2024) in India stress that while inflation is a universal deterrent, capital formation and GDP growth continue to be the most dependable long-term stimulants for the agricultural sector. Despite the scope of these studies, there is a dearth of contemporary ARDL-based research that combines the erratic exchange rate changes observed in the Nigerian economy beyond 2023 with GDP growth rates as a key driver.

III. Data and Method

This paper used secondary data from 1986 to 2025 from the National Bureau of Statistics and Development Indicators (World Bank, 2026) and the Central Bank of Nigeria Statistical Bulletin, 2026.

Model Specification

The model for this paper is based on the theoretical framework as expressed in equation (2). Thus, the linear specification model applied in the study is of the form:

$$AGDP = \beta_0 + \beta_1 GDPGR + \beta_2 MPR + \beta_3 EXR + \beta_4 INFR + \varepsilon_t \quad (3)$$

Where, AGDP = Agricultural sector contribution to GDP., GDPGR = GDP growth rate., MPR = Monetary policy rate., EXR = Exchange rate., INFR = Inflation., β_0 = The intercept or autonomous parameter estimate, β_1 to β_4 = Parameter estimate representing the coefficient of GDPGR, MPR, EXR and INFR respectively, and ε_t - other variables not explicitly included in the model. It is expected that β_1, β_2 & $\beta_3 > 0$ and $\beta_4 < 0$.

The Bounds Test method of cointegration was used to examine the macroeconomic factors influencing Nigeria's agricultural output growth from 1996 to 2025. An ARDL model with one dependent variable (Y) and several independent variables (X1, X2,..., Xn) has the following general form:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^p \delta_i \Delta Y_{t-i} + \sum_{j=0}^q \gamma_j \Delta X_{1,t-j} + \sum_{k=0}^r \theta_k \Delta X_{2,t-k} + \dots + \mu_t \quad (4)$$

To guarantee stationarity, Δ represents a variable's first difference (or another order of integration). The dependent variable's lags for (X1, X2) are denoted by P, q, and r. Therefore, one econometric method for analyzing time series data is the Auto Regressive Distributed Lag (ARDL) model. When two or more non-stationary variables have a long-term relationship, it is especially useful in the context of co-integration. Accordingly, this paper employed the Autoregressive Distributed Lag (ARDL) Model to investigate the macroeconomic drivers of agricultural output growth in Nigeria. Transforming Equation (3) into an ARDL Model results as follows:

$$\Delta AGDP_t = \alpha_0 + \sum_{i=1}^m \alpha_{1i} \Delta AGDP_{t-i} + \sum_{j=0}^n \alpha_{2j} \Delta GDPGR_{t-j} + \sum_{k=0}^o \alpha_{3k} \Delta MPR_{t-k} + \sum_{l=0}^p \alpha_{4l} \Delta EXR_{t-l} + \sum_{l=0}^r \alpha_{5l} \Delta INFR_{t-l} + \alpha_6 AGDP_{t-1} + \alpha_7 AGDP_{t-1} + \alpha_8 GDPGR_{t-1} + \alpha_9 MPR_{t-1} + \alpha_{10} EXR_{t-1} + \alpha_{11} INFR_{t-1} + \varepsilon_t \dots \dots (5)$$

The bounds test is conducted by testing the null hypothesis (H_0) against the alternative hypothesis (H_1) using the following equations:

$$H_0 : \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = 0 \text{ and } H_1 : \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq \alpha_5 \neq 0$$

The bounds test results obtained from the calculated F-Statistic are similar to those of Pesaran et al. (2001), who rejected the null hypothesis of no cointegration and concluded that cointegration between the series is present if the F-Statistic is greater than the upper bound I (1) in each case. Additionally, the series Error Correction Model for Equation (3.4) is as follows:

$$\Delta AGDP_t = \alpha_0 + \sum_{i=1}^m \alpha_{1i} \Delta AGDP_{t-i} + \sum_{j=0}^n \alpha_{2i} \Delta GDPGR_{t-j} + \sum_{k=0}^o \alpha_{3i} \Delta MPR_{t-k} + \sum_{l=0}^p \alpha_{4i} \Delta EXR_{t-l} + \sum_{l=0}^q \alpha_{5i} \Delta INFR_{t-l} + ECT_{t-1} + \varepsilon_t \text{-----} (6)$$

ECT_{t-1} = lagged Error correction term. The evolution process that agents use to react to the prior period of prediction errors is captured by the ECT.

IV. RESULTS AND DISCUSSIONS

Descriptive Statistics

Table 1 presents the descriptive statistics for the paper.

Table 1: Descriptive Statistics.

	AGDP	GDPGR	MPR	EXR	INFR
Mean	24.61250	3.984250	14.26300	212.1275	20.00825
Median	24.70000	4.125000	13.50000	128.9500	13.10000
Maximum	36.90000	15.33000	27.50000	1535.000	72.80000
Minimum	18.00000	-6.370000	6.000000	1.800000	5.400000
Std. Dev.	3.852418	3.980774	4.277801	330.2427	16.84159
Skewness	0.916478	0.162310	0.995597	3.091254	1.683004
Kurtosis	4.289273	3.984198	4.965056	12.42703	4.756119
Jarque-Bera	8.369916	1.790038	13.04383	211.8205	24.02327
Probability	0.015223	0.408600	0.001471	0.000000	0.000006
Observations	40	40	40	40	40

Source: Author's Computation, 2026 (Eviews-12)

Table 1 shows that the agricultural sector's contribution to GDP (AGDP) ranges from 18.00000 (minimum) to 36.90000 (highest), with a standard deviation of 3.85 percent and an approximate average of 24.61 percent. The GDP growth rate (GDPGR) has a minimum value of -6.370000 and a maximum value of 15.33000, with a mean value of 3.98 percent and a standard deviation of 3.98 percent. The monetary policy rate (MPR) has a standard deviation of 4.28 percent, a range of 6.000000 to 27.50000, and an approximate average of 14.26 percent. The exchange rate (EXR) has a standard deviation of ₦330.2427, a range of 1.800000 to 1535.000, and an approximate average of ₦212.1275. Additionally, the inflation rate (INFR) has a standard deviation of 16.84 percent and an approximate average of 20.00 percent, with a range of 5.400000 to 72.80000.

Additionally, Table 1 showed the skewness coefficient, a measure of how far a distribution deviates from symmetry, with skewness values greater than one for the exchange rate and inflation rate variables and less than one for the agricultural sector contribution to GDP, GDP growth rate, and monetary policy rate variables. The kurtosis finding, which gauges how

peaked a distribution is in comparison to a normal distribution, confirms that the complete data series are not platykurtic (not having negative values). Furthermore, as the corresponding Jarque-Bera probability values of these variables have a significance level of less than 5%, the bulk of the variables are not normally distributed. The accompanying Jarque-Bera probability value has a significance level higher than 5%, therefore it is possible to conclude that they have a normal distribution even though the GDP growth rate matching Jarque-Bera statistic is nominally distributed.

Correlation Analysis

Correlation analysis offers important insights into the relationship between the dependent variable, agricultural sector contribution to GDP (AGDP), GDP growth rate (GDPGR), Monetary policy rate (MPR), exchange rate (EXR), and inflation rate (INFR). The correlation coefficients in this study aid in determining the strength of these relationships as well as whether these variables move together in a positive or negative manner.

Table 2: Correlation Matrix Result.

	AGDP	GDPGR	MPR	EXR	INFR
AGDP	1				
GDPGR	0.275350	1			
MPR	0.092185	-0.100470	1		
EXR	0.217556	-0.061974	0.371588	1	
INFR	-0.000343	-0.277027	0.395340	0.004385	1

Source: Researcher's Computation Using EViews-12 (2026)

There is no significant multi-collinearity in the model, as shown by the correlation coefficients in Table 2, which are significantly below 0.8. Consequently, there is no multicollinearity issue with any of the variables. Furthermore, Table 2's correlation coefficients showed a negative relationship between Nigeria's inflation rate (INFR) and the agriculture sector's GDP contribution (AGDP). However, there was a positive association between the agricultural sector's contribution to GDP (AGDP), GDP growth rate (GDPGR), monetary policy rate (MPR), and exchange rate (EXR). Additionally, the highest association (27%) was identified between the GDP growth rate (GDPGR) and the agriculture sector's contribution to GDP (AGDP).

Unit Root Results

A popular statistical technique for figuring out whether a time series data set is stationary is a unit root test, like the Augmented Dickey-Fuller (ADF) test. The statistical characteristics of the series, such as mean, variance, and autocorrelation, are said to be stationary when they

remain constant throughout time. Conversely, non-stationary data may include characteristics that vary over time, which may cause regression analysis to produce erroneous findings. Table 3 presents the findings of the Augmented Dickey-Fuller (ADF) unit root test:

Table 3 Traditional Unit Root Test Results.

Variable	Method	Level	First Diff.	Order of Integration
		Stat. (Prob.)	Stat. (Prob.)	
AGDP	ADF	-1.904528 (0.3267)	-6.771314*(0.0000)	I(1)
GDPGR	ADF	-4.153550* (0.0023)	-10.51465*(0.0000)	I(0)
MPR	ADF	-3.516095**(0.0127)	-8.221672*(0.0000)	I(0)
EXR	ADF	-2.835013 (0.6251)	-5.971995*(0.0001)	I(1)
INFR	ADF	-3.300604 (0.0811)	-4.324247*(0.0084)	I(1)

Note: *, ** Indicates stationary at the 1% and 5% level.

Source: Researcher's Computations using E-Views 12

According to the traditional test of the Augmented Dickey-Fuller (ADF), Table 3's GDP growth rate (GDPGR) and monetary policy rate (MPR) variables tend to be stationary at level. On the other hand, the variables of inflation (INFR), exchange rate (EXR), and agricultural sector contribution to GDP (AGDP) are probably going to be stationary in first difference. The chosen variables are suitable for use in additional regression analysis without differencing since they implicitly lack a unit root and are hence stable over time. This result suggests that the chosen variables were somewhat stable during the reviewed time.

Co-integration Results

Since all of the variables were found to be integrated at different orders, they all met the requirements of the ARDL-bound testing approach, which requires all of the variables in the equation to be static at level or at first difference or modification. Because the (ARDL) limits test approach is applicable whether variables are integrated at level I(0), first difference I(1), or when they are mixed, it is essential to test for the stationarity test or attributes of the variables in bounds approach to co-integration. This implies that when an I(2) variable is present, the limits testing assumption will collapse. Given that every variable in this study is a combination of I(1) and I(0), the Augmented Dickey-Fuller (ADF) unit root results shown in Table 3 suggest that the limits testing approach is appropriate.

The co-integration test aids in determining whether long-term equilibrium relationships exist between relevant variables. The ARDL error correction model is appropriate if co-integration between variables is discovered. Table 4 displays the cointegration test result:

Table 4: Result of ARDL Bounds Test for Cointegration.

Null Hypothesis: No Long-run Relationships Exist		
Test Statistic	Value	K
F-Statistic	3.548399	4
Critical Value Bounds		
Significance	Lower Bound	Upper Bound
5%	2.56	3.49

Source: Researcher's Computations based on E-Views 12

According to Table 4, the F-statistics boundaries test value of 3.548399 is greater than the upper and lower bound limit values of 2.56 and 3.49 at the 5% critical level of significance. This indicates that the dependent variable and the model's explanatory variables have a long-term equilibrium connection. Estimating the Error Correction Model comes next after it has been determined that the variables have a long-term relationship.

Autoregressive Distributed Lag (ARDL) Regression Results

In light of the cointegration of the dependent variable with the regressors, this study proceeded to estimates the error correction and the long-term models. Table 5 presented the outcomes of the estimates as follows:

Table 5: ARDL Regression Results.

Dependent Variable: D(AGDP)

Co-integrating Estimates (ECM Estimates)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPGR)	0.302	0.100	3.003	0.00
D(GDPGR(-1))	0.671	0.147	4.546	0.00
D(GDPGR(-2))	0.492	0.158	3.105	0.00
D(MPR)	-0.139	0.165	-0.845	0.41
D(MPR(-1))	-0.363	0.158	-2.289	0.04
D(MPR(-2))	-0.344	0.158	-2.175	0.05
D(EXR)	-0.006	0.003	-1.864	0.08
D(EXR(-1))	0.006	0.006	0.089	0.93
D(EXR(-2))	-0.029	0.025	-1.179	0.26
D(INFR)	-0.008	0.042	-0.202	0.84
D(INFR(-1))	0.163	0.048	3.366	0.00
D(INFR(-2))	-0.027	0.034	-0.788	0.44
CointEq(-1)*	-0.638	0.120	-5.307	0.00
R-squared	0.781			
Adjusted R-squared	0.746			
Durbin-Watson stat	2.414			
Long Run				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPGR	-0.471	0.392	-1.202	0.25

MPR	0.616	0.402	1.533	0.15
EXR	0.003	0.015	0.235	0.82
INFR	-0.092	0.127	-0.724	0.48
C	20.210	6.488	3.115	0.00

Source: Researcher's Computation Using EViews-12 (2026)

Table 5 revealed that the variables used in this study, GDP growth rate, monetary policy rate, exchange rate, and inflation rate have a statistically significant effect on the contribution of the agricultural sector to GDP, which is a proxy for agricultural sector output, either at level or one period lagged in the short run. However, none of the explanatory factors have a long-term, statistically significant effect on the output of the agricultural sector. Furthermore, GDP growth rate, one period lagged exchange rate and inflation rate variables are in agreement with this study a priori expectation in the short-run. While, monetary policy rate, exchange rate and inflation rate variables comply to this study a priori expectations in the long term. Long-term agricultural output in Nigeria appears to be influenced by factors such as inflation, exchange rates, and monetary policy rates.

At the one percent level, the Error Correction Model is highly statistically significant, negatively signed, and as expected. This offers more evidence of the long-term link between the regressors and the dependent variable. The coefficient's absolute value, which ranges from 0 to 1, indicates that annual adjustments are made to the short-run divergence from the equilibrium (long-run) position, which is approximately 64%, in order to maintain the equilibrium. Since the explanatory variables explain for more than 78% of the variation in agricultural output, the model looks to be well-fitting, as demonstrated by the R-squared value of 0.781. On the other hand, the DW figure of 2.414 suggested that there is no problem with serial correlation. As such, the conclusions of this study can be trusted for formulating policy recommendations.

Post Estimation Tests

This paper conducted a few diagnostic tests to assess the model's stability and applicability as well as the validity of the results. Results is as presented in Table 6 as follows:

Table 6: Diagnostic Test Results.

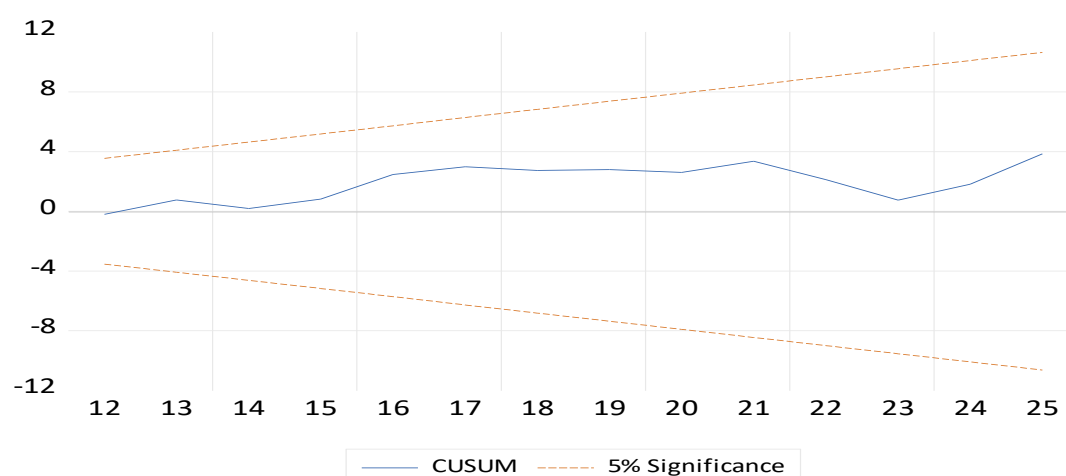
Test	Null Hypothesis	T-Statistic	Prob
Jarque-Bera	There is a normal distribution	1.95	0.38
Heteroskedasticity: LM	No conditional heteroscedasticity	5.94	0.18
Heteroskedasticity: Breusch-Pagan-Godfrey	No conditional heteroscedasticity	1.10	0.44

Source: Researcher's Computations based on E-Views 12

From Table 6, the model did not demonstrate serial correlation or heteroskedasticity over the research period. The heteroscedasticity tests indicated that the residuals are homoscedastic. The findings of the diagnostic tests for serial correlation and heteroscedasticity revealed that the data is reasonably well behaved. Furthermore, the p-value for the normality test for the research period is greater than 0.05, showing that the residues are distributed regularly. This leads in a uniform distribution of the residuals. As a result, the normal distribution null hypothesis was not rejected.

Stability Test Result

Because the plots of the charts are within the necessary boundaries at the 5% significant level, the stability test in Figure 1 also showed that the agriculture sector output model is stable during this study period. According to Bahmani-Oskooee and Rehman (2005), when the plot of these data is inside the critical bounds at the 5% significant level, the null hypothesis which asserts that the regression equation is accurately specified cannot be rejected.

**Figure 1: Stability Tests Result.**

Source: Researcher's Plot using E-Views 12

DISCUSSION OF FINDINGS

Descriptive statistics of the study variables were the first step in the investigation. All of the variables had positive mean values, according to the results of the descriptive statistics that summarized the central tendency, dispersion, and distribution shape of a dataset. Additionally, variables with skewness values greater than one include the exchange rate and inflation rate, while variables with skewness values less than one include the agricultural sector's contribution to GDP, GDP growth rate, and monetary policy rate. The kurtosis finding, which gauges how peaked a distribution is in comparison to a normal distribution, confirms that the complete data series are not platykurtic (not having negative values). Furthermore, since the corresponding Jarque-Bera probability values for these variables have a significance level of less than 5%, the bulk of the variables are not normally distributed. The accompanying Jarque-Bera probability value has a significance level higher than 5%, therefore it is possible to conclude that they have a normal distribution even though the GDP growth rate matching Jarque-sBera statistic is nominally distributed.

A correlation matrix was used to evaluate the strength and direction of the association between each pair of variables being studied. According to Li et al. (2022), correlation tests are essential in research for evaluating a variety of variables and determining their direction and strength. They help with the feature process and find redundant or closely related variables by offering information on potential, trends, and patterns. Additionally, they prioritize multicollinearity regression models, which identify circumstances in which independent variables exhibit strong correlations, hence enhancing the precision and reliability of research outcomes.

The relationship between the reported variables is displayed in Table 2. The purpose of this test is to ascertain the relationship between two or more variables. There is no significant multi-collinearity in the model, as shown by the correlation coefficients in Table 2, which are significantly below 0.8. It is sufficient to state that there is no multicollinearity issue with any of the variables. All of the variables are quite appropriate for additional statistical testing in light of this.

Since the data used in this study are aggregate in nature, it next examined the time series features of the variables. Therefore, the Augmented Dickey-Fuller (ADF) unit roots test was used to examine the variables' stochastic characteristics. According to the standard test of the Augmented Dickey-Fuller (ADF), the unit root test findings showed that the GDP growth rate (GDPGR) and monetary policy rate (MPR) variables tend to be stationary at level. However, Agricultural sector contribution to GDP (AGDP), Exchange rate (EXR), and Inflation (INFR)

variables are likely to be stationary in first difference. Thereafter, to determine whether the relevant variables have a long-term relationship, the ARDL bounds test approach to co-integration was adopted and the result showed that the bounds test value of the F-statistics which is 3.548399 is higher than the values of the upper and lower bound limit which are 2.56 and 3.49 at 5% critical level of significance. This indicates that the dependent variable and the model's explanatory variables have a long-term equilibrium connection. This study estimated the Error Correction Model after establishing a long-term link between the variables. At the one percent level, the Error Correction Model is highly statistically significant, negatively signed, and as predicted.

The GDP growth rate, monetary policy rate, exchange rate, and inflation rate variables used in this study have a statistically significant impact on the agricultural sector's contribution to GDP, a proxy for agricultural sector output, either at level or one period lagged in the short run, according to the estimated ARDL regression results in Table 5. However, none of the explanatory factors have a long-term, statistically significant effect on the output of the agricultural sector. Long-term agricultural output in Nigeria appears to be influenced by factors such as inflation, exchange rates, and monetary policy rates.

The study's variable-by-variable analysis revealed a positive and substantial short-term relationship between GDP growth rate and agricultural output based on the estimated ARDL regression in Table 5. As a result, Nigeria's agricultural output will rise by 0.302 percent in the short term for every percentage increase in GDP growth rate. The High-Payoff Input Model is supported by the positive short-run correlation (0.302%) between agricultural output and GDP growth rate. A more favorable climate for the public and private investments needed to supply farmers with cutting-edge technical knowledge and inputs is suggested by stronger economic growth. Additionally, this result is consistent with the findings of Setshedi and Mosikari (2019), who discovered that GDP significantly boosts agricultural output in South Africa. Long-term agricultural output is, however, adversely and negligibly correlated with GDP growth rate. It follows that Nigeria's agricultural output will eventually decline by -0.471 percent for every percentage increase in GDP growth rate.

Also, the positive short-run relationship (0.302%) implies that agricultural production reacts fast to changes in the economy when conditions are good. On the other hand, the negative long-run relationship (-0.471%) may be due to structural problems: economic growth in Nigeria is oil dependent; growth can therefore cause crowding out of agriculture (Dutch Disease; it may cause growth for urban sector; it could push farmers out for the farm labor

force; it leads urban-biased and can push out the labors who work agriculture as time pass out; Etc).

Monetary tightening lowers agricultural output in the short term, according to the negative short-run MPR coefficient (-0.139%, $p=0.41$). This illustrates the capital cost channel found in the modified Cobb-Douglas framework: rising interest rates make borrowing agricultural machinery, equipment, and working capital more expensive, which limits farmers' capacity to make investments in inputs that boost productivity. Additionally, the immediate impact of elevated borrowing costs on working capital and agricultural investment is shown in the negative short-run MPR effect (-0.139%). This result is in line with the findings of Oniore *et al.* (2026), who noted that Nigerian output suffered as a result of excessive lending costs brought on by monetary policy rates. Furthermore, the negative short-run MPR effect (-0.139%) illustrates the direct effect of higher borrowing costs on working capital and agricultural investment. This outcome is consistent with the findings of Oniore *et al.* (2026), who observed that excessive loan costs resulting from monetary policy rates negatively impacted Nigerian output. This could be due to the following factors: (a) the stabilizing effect of credible monetary policy on inflation expectations, which encourages long-term agricultural investment; (b) the selection effect, which shows that farmers who can obtain credit at higher rates are more productive; and (c) the complementarity between the growth of the financial sector and monetary stability. In contrast, Daudi and Muba (2025) found a completely negative impact in Tanzania, indicating that the influence of monetary policy on agriculture varies depending on the setting.

Meanwhile, the predicted short-term impact of a one-period lag in exchange rates on agricultural output is favorable. In the short term, agricultural output will rise by 0.006 percent for every percentage shift or increase in the one-period lagged exchange rate. This result is in line with the investigation's a priori expectations. In a similar vein, agricultural output was positively impacted by exchange rates over time. In the long run, agricultural output will grow by 0.003 percent for every percentage change or increase in one period lagged exchange rate. Once more, this result is in line with the a priori assumptions of this study and the empirical evaluation of Aham *et al.* (2026) and Oniore *et al.* (2026), who contended that changes in exchange rates, like depreciation, might boost Nigerian local output and increase competitiveness. It, however, runs counter to Daudi and Muba's (2025) findings that Tanzanian agricultural growth is negatively impacted by exchange rates.

In the short and long terms, the coefficient of inflation is negative. As a result, Nigeria's agricultural output will decline by -0.008 and -0.092 percent, respectively, for every

percentage increase in inflation. This result is in line with the investigation's a priori expectations since growing prices reduce real wages and raise the price of agricultural inputs, which reduces production efficiency. The empirical literature provides substantial support for this study's conclusion that inflation and agricultural output are negatively correlated. According to studies like Aham *et al.* (2026), Oniore *et al.* (2026), and Muhammad and Bello (2020), one of the main causes of rising production costs and declining profit margins for Nigerian farmers is inflation.

IV. CONCLUSION AND RECOMMENDATIONS

This research used a combination of Trend Analysis, Descriptive Statistics, Correlation Matrix, Unit Root Test, and Autoregressive Distributed Lag (ARDL) model regression technique to examine the impact of macroeconomic variables such as GDP growth rate, monetary policy rate, exchange rate, and inflation rate impact on agricultural output growth in Nigeria from 1986 to 2025. This paper is rooted in the Cobb-Douglas Production Function theory and depended on secondary data sourced from Central Bank of Nigeria Statistical Bulletin, 2025, National Bureau of Statistics and Development Indicators (World Bank, 2026) from 1986 to 2025.

Based on the Autoregressive Distributed Lag (ARDL) model regression technique, GDP growth rate, monetary policy rate, exchange rate and inflation rate variables has a statistically significant impact on agricultural sector output., either at level or one period lagged in the short-run. While, none of the explanatory variables has a statistically significant long-run impact on agricultural sector output. Specifically, one percentage increase in GDP growth rate, will lead to an increase in agricultural output in Nigeria by 0.302 percent in the short run. However, one percentage increase in GDP growth rate, will lead to a decrease in agricultural output in Nigeria by -0.471 percent in the long-run. While, controlling for other factors, for instance, a 1 percent increase in monetary policy rate will lead to a decrease in agricultural output by -0.139 percent in the short run. However, one percentage increase in monetary policy rate will lead to an increase in agricultural output by approximately 0.616 percent in the long-run.

Furthermore, one percentage change or increase in one period lagged exchange rate will lead to 0.006 percent increase in agricultural output in the short-run. Similarly, one percentage change or increase in one period lagged exchange rate will lead to 0.003 percent increase in agricultural output in the long-run. The coefficient of inflation rate is negative both in the short-run and long-run. Consequently, one percentage increase in inflation rate, will lead to a

decrease in agricultural output in Nigeria by -0.008 and -0.092 percent respectively. Based on the findings, the following recommendations were made:

- i. Distributing subsidized high-quality seeds and fertilizers should be a top priority for the Federal Ministry of Agriculture and Food Security (FMAFS) in order to take advantage of the favorable relationship between economic growth and agricultural productivity. To avoid middlemen and minimize leaks, this should be accomplished using transparent digital platforms such as the Agro-Pocket (NAGS-AP).
- ii. The Central Bank of Nigeria (CBN) should create single-digit interest rate windows especially for the agricultural sector because the Monetary Policy Rate (MPR) has a short-term negative impact on agricultural output (-0.139%) because of high borrowing costs. Farmers would be shielded from widespread monetary tightening targeted at other industries.
- iii. The Nigerian Export Promotion Council (NEPC) should create strategies to incorporate local farmers into the African Continental Free Trade Area (AfCFTA), as the exchange rate has been found to boost domestic production by perhaps increasing competitiveness. This would enable the industry to take advantage of the export potential brought about by currency fluctuations.
- iv. The Federal Ministry of Agriculture and Food Security (FMAFS) should establish input price buffers. Specifically, the FMAFS should provide input price buffers or direct subsidies to protect smallholder farmers from the rising costs of fuel, seeds, and labour., since inflation was found to consistently erode profit margins and decrease output both the short and long run (0.008% and -0.092%) respectively.

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