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EXCHANGE RATE POLICY AND AGRICULTURAL PRODUCTIVITY IN NIGERIA

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Abstract *This study examined the impact of exchange rate policy on agricultural productivity in Nigeria over the period 1990–2024, incorporating key macroeconomic variables such as agricultural credit, technological investment in agriculture, interest rate, exchange rate and inflation rate. Agricultural productivity (AGRP) was employed as the dependent variable, while the vector error correction (VECM) model was used to analyzeboth short-run dynamics through lagged difference terms and long-run coefficients through the error correction term simultaneously.The findings showed that agricultural competitiveness is highly persistent and largely influenced by its past values, indicating strong path dependency within the sector. Exchange rate movements exhibited a lag-dependent effect, with positive impacts in the short-to-medium term and negative effects in the long term. Agricultural credit demonstrated weak positive effects in the short run but negative effects in the long run, suggesting inefficiencies in credit allocation and utilization. Similarly, agricultural investment showed negative short-run effects due to adjustment costs, although its long-run importance remains significant. Interest rate was found to exert a negative influence on agricultural competitiveness in the long run, while inflation displayed mixed effects over time. The study concludes that exchange rate policy and macroeconomic conditions affect agricultural competitiveness primarily through delayed transmission mechanisms. It recommends the adoption of stable exchange rate policies, improved credit management, lower interest rates, sustained investment in agricultural technology, and enhanced policy coordination to promote long-term competitiveness and growth in the agricultural sector.*

Keywords Agricultural productivity, Technological Investment in Agriculture, Inflation Rate, Agricultural credit

Introduction

Agricultural productivity remains a major policy concern in developing economies, particularly in Nigeria where the sector is expected to drive economic diversification, ensure food security, and enhance non-oil export earnings. Despite its strategic importance, the performance of Nigeria's agricultural sector in global and regional markets has remained relatively weak,

characterized by low productivity, high production costs, and limited value addition. One of the critical macroeconomic factors influencing this performance is exchange rate policy. However, the extent to which exchange rate policy has effectively enhanced agricultural productivity remains unclear and contentious in both policy and academic discourse.

In recent years, Nigeria has experienced significant exchange rate instability, including multiple exchange rate regimes, persistent depreciation of the naira, and foreign exchange shortages. These developments have created an uncertain macroeconomic environment for agricultural producers and exporters. While exchange rate depreciation is theoretically expected to improve export productivity by lowering the relative prices of domestic goods, empirical realities suggest a more complex outcome. For instance, rising exchange rates have significantly increased the cost of imported agricultural inputs such as fertilizers, machinery, and agrochemicals, thereby raising production costs and eroding the potential gains from export productivity (Abayomi and Ojo, 2021; Central Bank of Nigeria, 2023).

Exchange rate depreciation theoretically enhances agricultural productivity by making exports cheaper and more attractive in international markets. This aligns with the elasticity approach to exchange rate determination, which posits that a weaker domestic currency can improve trade balance by stimulating export demand. Empirical evidence supports this assertion. For instance, Ogundipe, Ogunniyi and Olagunju (2022) found that exchange rate depreciation had a positive and statistically significant effect on agricultural exports in Nigeria, particularly in cash crops such as cocoa and sesame. Similarly, Eze and Nwosu (2023) observed that exchange rate movements contributed to increased agricultural output by incentivizing local production and reducing dependence on imported food products.

Despite the growing body of literature, there remains a notable gap in empirical and theoretical understanding of how exchange rate policy influences agricultural productivity in a comprehensive manner. Many studies have focused narrowly on either agricultural output or export performance, without adequately integrating broader dimensions such as productivity, efficiency, cost structures, and market access. Moreover, limited attention has been given to the implications of recent exchange rate reforms in Nigeria and other developing economies.

Therefore, this study is motivated by the need to provide a more nuanced and holistic analysis of the effects of exchange rate policy on agricultural productivity. By examining both the positive and negative transmission mechanisms of exchange rate movements, the study seeks to contribute to policy debates on how best to design exchange rate frameworks that support sustainable agricultural development, enhance global productivity, and improve the welfare of farmers and rural households.

Literature review

Review of Empirical Studies

Muhammed (2024) examined the impact of exchange rate fluctuations on agricultural

productivity and food prices in Nigeria. The objective of the study was to determine the extent to which exchange rate movements influence agricultural output and inflationary pressures in the agricultural sector. The study employed an Autoregressive Distributed Lag (ARDL) model using secondary data sourced from the Central Bank of Nigeria and the National Bureau of Statistics. Findings revealed that exchange rate depreciation has a mixed effect: it stimulates agricultural output in the long run but increases production costs in the short run due to imported input dependence. The study recommended the stabilization of exchange rate policy and promotion of local input production to reduce import dependence.

A study by the Food and Humanity Research Group (2026) examined the impact of exchange rate shocks and monetary policy on agricultural output in developing economies. The objective was to analyze how exchange rate movements interact with interest rates and credit conditions to influence agricultural productivity. The study employed a panel data regression model across selected developing countries. Findings revealed that exchange rate instability combined with high interest rates negatively affects agricultural output, while improved credit access mitigates some of these adverse effects. The study recommended expansion of subsidized agricultural credit schemes and reduction of borrowing costs for farmers.

Obula and Uduakobong (2025) investigated the effect of exchange rate fluctuations on agricultural total factor productivity in Nigeria. The objective was to assess whether exchange rate instability affects efficiency and technological adoption in agriculture. Using a cointegration and error correction approach, the study found that exchange rate volatility significantly reduces agricultural productivity by increasing uncertainty and discouraging investment in modern technologies. The authors recommended policies aimed at exchange rate stabilization and increased investment in agricultural mechanization and innovation.

In a study by Oyinlola and Babatunde (2022), the objective was to assess the effect of exchange rate instability on agricultural export performance in Nigeria. The study employed a Vector Autoregression (VAR) model using annual time-series data sourced from the Central Bank of Nigeria. The findings revealed that exchange rate volatility has a significant negative effect on agricultural exports, as uncertainty in foreign exchange markets discourages export-oriented production and reduces international market participation. The study recommended the establishment of a more predictable exchange rate framework to enhance export productivity in agriculture.

Akinwunmi et al. (2023) examined the relationship between exchange rate policy and agricultural investment in selected Sub-Saharan African countries. The objective was to determine how exchange rate movements influence private and public investment in agriculture. The study adopted a panel fixed effects regression model using data from 2000–2021. The results showed that exchange rate depreciation reduces agricultural investment in the short run due to increased cost of imported capital inputs, although moderate depreciation may

encourage long-term adjustment in production structures. The authors recommended policies that stabilize exchange rates while promoting local production of agricultural machinery and inputs.

Chukwuma and Nnaji (2024) investigated the impact of macroeconomic instability on agricultural productivity in Nigeria. The objective was to examine the combined effects of exchange rate, inflation, and interest rate on agricultural output. Using a cointegration and error correction modeling approach, the study found that exchange rate instability significantly reduces agricultural productivity, particularly through increased input costs and reduced access to finance. The study recommended coordinated macroeconomic policy frameworks that integrate monetary stability with agricultural development strategies.

Kalu and Eze (2025) focused on the effect of exchange rate movements on agricultural productivity in West Africa. The objective was to evaluate how exchange rate regimes influence trade performance in agricultural commodities. The study utilized a panel ARDL model covering ECOWAS countries. The findings indicated that countries with more stable exchange rate regimes recorded higher agricultural export productivity compared to those with volatile regimes. The study recommended regional monetary cooperation and improved exchange rate management to enhance agricultural trade performance.

Methodology

Theoretical Framework

This work is anchored on Purchasing Power Parity (PPP) theory, developed by Gustav Cassel (1918), explains the relationship between exchange rates and relative price levels across countries. It assumes that in the absence of transportation costs and trade barriers, identical goods should have the same price when expressed in a common currency. PPP therefore implies that exchange rates adjust to equalize purchasing power between currencies in the long run.

Absolute PPP states that the exchange rate is determined by the ratio of domestic and foreign price levels:

$$E=\frac{P_d}{P_f} \quad \text{.....i}$$

Where: E = nominal exchange rate (domestic/foreign), P_d = domestic price level, P_f = foreign price level.

Relative PPP states that the rate of change in exchange rate equals the inflation differential between two countries:

$$\frac{\Delta E}{E}=\pi_d-\pi_f \quad \text{.....ii}$$

Where: $\Delta E/E$ = percentage change in exchange rate, π_d = domestic inflation rate, π_f = foreign inflation rate.

The real exchange rate measures the relative price of domestic goods compared to foreign goods and indicates productivity:

$$RER = E \times \left(\frac{P_f}{P_d}\right) \quad \text{..... iii}$$

Where: RER = real exchange rate, E = nominal exchange rate, P_f = foreign price level, P_d = domestic price level.

PPP theory explains how exchange rate movements influence agricultural productivity through price transmission. Currency depreciation may enhance export productivity but increases production costs due to imported inputs (fertilizers, machinery). PPP links exchange rates to inflation, affecting agricultural production costs and market stability in Nigeria. When Nigeria's currency depreciates, agricultural exports become cheaper globally, potentially enhancing export demand. However, high dependence on imported inputs counterbalances this gain currency depreciation simultaneously raises production costs, eroding profitability and reducing sector productivity.

However, PPP has limitations in developing economies like Nigeria. Its assumptions (perfect competition, free trade, no transaction costs) don't fully hold. Exchange rate policies are influenced by government interventions, capital restrictions, and structural distortions, causing persistent PPP deviations, imported inflation and Dutch disease are also part of its short comings. In Nigeria's agricultural sector, exchange rate instability, inflationary pressures, and import dependence create complex transmission mechanisms PPP cannot fully explain alone. Thus, PPP provides a theoretical foundation but requires empirical analysis to capture real-world complexities.

3.2 Model Specification

This study adopts the Vector Error Correction Model (VECM) to examine the relationship between exchange rate policy and agricultural productivity in Nigeria. The VECM framework is appropriate when variables are non-stationary but cointegrated, as it allows for the estimation of both short-run dynamics and long-run equilibrium relationships within a multivariate system.

The VECM is derived from the Vector Autoregression (VAR) model and incorporates cointegration restrictions as developed by Johansen (1988) and further extended by Johansen and Juselius (1990), who introduced a maximum likelihood estimation approach for testing and estimating cointegrating relationships in economic time series.

The functional form of the model is:

$$AGRP = f(EXR, INF, INT, AGRINV, LOAS)$$

Where:

AGRP = Agricultural productivity
EXR= Exchange rate
INF = Inflation rate
INT = Interest rate
AGRINV = Agricultural investment in technological input(It comprises the addition of both govt capital expenditure or private investment)
LOAS = Loans to the agricultural sector

The econometric form of the VECM is:

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \Phi D_t + \mu_t$$

Where:

$Y_t = [AGRP_t, INT_t, INT_t, AGRINV_t, .LOAS_t]$

- = vector of endogenous variables
- Δ = First difference operator
- p = Optimal lag length
- $\Pi = \alpha\beta'$ = Long-run impact matrix
- Γ_i = Short-run coefficient matrices
- D_t = Deterministic terms (constant, trend)
- μ_t = Vector of error terms

Estimation Techniques

The study first conducts unit root tests to determine the stationarity properties of the variables. Specifically, the Augmented Dickey–Fuller (ADF) test, developed by David Dickey and Wayne Fuller (1979), is employed. This test helps to ascertain whether each variable is stationary at level I(0) or becomes stationary after first differencing I(1). Establishing the order of integration is crucial to avoid spurious regression results and to guide the appropriate model selection.

The study then applies the Johansen cointegration test to examine the existence of long-run equilibrium relationships among the variables. Johansen's method uses maximum likelihood estimation to identify the number of cointegrating equations through eigenvalue statistics, including the Trace test and Maximum Eigenvalue test. Based on cointegration results, the study proceeds to VECM estimation. Where evidence of cointegration is established among I(1) variables, the Vector Error Correction Model is employed to estimate both short-run dynamics through lagged difference terms and long-run coefficients through the error correction term simultaneously.

Following VECM estimation, the study conducts diagnostic tests to ensure model validity. These include the serial correlation test to check for autocorrelation in residuals, the heteroskedasticity test to detect whether error variance is constant across observations, the normality test using the Jarque–Bera statistic to check residual distribution. These diagnostic tests ensure that the estimated model satisfies classical regression assumptions and produces reliable inference.

Data Source

This study relies on secondary data obtained from credible and authoritative national and international databases to ensure reliability, consistency, and validity of the empirical analysis. Data for this study were sourced from Central Bank of Nigeria (CBN) Statistical Bulletin, the National Bureau of Statistics (NBS), and the World Bank Development Indicators (WDI).

Results and Discussions

Unit Root Test

Table 4.2: Augmented Dickey–Fuller (ADF) Unit Root Test Results

Variable	ADF Statistic (Level)	5% Critical Value	ADF Statistic (1st Diff.)	5% Critical Value	Order of Integration
AGRP	-2.2311	-2.954	-6.3336	-2.954	I(1)
LNAGRINV	-2.0033	-2.981	-6.5652	-2.981	I(1)
LNEXR	-0.4914	-2.9484	-5.0633	-2.9511	I(1)
INF	-2.1244	-2.9484	-4.7755	-2.9511	I(1)
INT	-2.5846	-2.9484	-7.2985	-2.9511	I(1)
LNLOAS	-0.6351	-2.9484	-6.7114	-2.9511	I(1)

Source: Author's Computation using EViews 12

The results presented in Table 4.2 reveal that none of the variables are stationary at level, as their respective ADF test statistics are less than the 5% critical values in absolute terms. This indicates the presence of unit roots in all the series at their levels, implying that the variables exhibit non-stationary behavior. This outcome is consistent with the nature of most macroeconomic time-series data, which often display trends and structural shifts over time.

However, after first differencing, all variables become stationary. This is evidenced by the fact that the absolute values of the ADF statistics at first difference exceed the corresponding 5% critical values. Specifically, AGRP becomes stationary with an ADF statistic of -6.3336, while LNAGRINV record value of -6.5652, all of which are statistically significant at the 5% level. Similarly, INF and INT attain stationarity at first difference with ADF statistics of -4.7755 and -7.2985, respectively. LNLOAS also becomes stationary after differencing, with an ADF statistic of -6.7114, which exceeds the critical threshold.

These findings confirm that all the variables are integrated of order one, I(1). This implies that while the series are non-stationary in their levels, their first differences are stationary. Consequently, the variables may exhibit long-run equilibrium relationships, making them suitable for cointegration analysis.

4.3.2 Cointegration Tests

Table 4.3a: Unrestricted Cointegration Rank Test (Trace)

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.761757	118.7999	95.75366	0.0005

At most 1 *	0.586523	70.02820	69.81889	0.0481
At most 2	0.486905	40.00099	47.85613	0.2225
At most 3	0.306470	17.31300	29.79707	0.6169
At most 4	0.127437	4.870346	15.49471	0.8224
At most 5	0.006901	0.235442	3.841466	0.6275

Trace test indicates 2 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values
Source: Author's computation using Eviews 12

The Trace test indicates two cointegrating equations at the 5% significance level. The null hypothesis of no cointegration and the hypothesis of at most one cointegrating equation are both rejected, while the hypothesis of at most two equations is not rejected, confirming two long-run relationships among the variables.

Table 4.3b: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.761757	48.77172	40.07757	0.0041
At most 1	0.586523	30.02721	33.87687	0.1346
At most 2	0.486905	22.68799	27.58434	0.1872
At most 3	0.306470	12.44266	21.13162	0.5046
At most 4	0.127437	4.634904	14.26460	0.7870
At most 5	0.006901	0.235442	3.841466	0.6275

Max-eigenvalue test indicates 1 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values
Source: Author's computation using Eviews 12

The Maximum Eigenvalue test indicates one cointegrating equation at the 5% significance level. The null hypothesis of no cointegration is rejected, but the hypothesis of at most one equation is not rejected, suggesting only one long-run relationship among the variables.

4.4 VECM Estimation Results

Table 4.4 presents the Vector Error Correction Model (VECM) estimation results examining the relationship between exchange rate policy and agricultural productivity in Nigeria. The model includes six endogenous variables: agricultural productivity (AGRP), inflation rate (INF), interest rate (INT), agricultural investment in technological input (LNAGRINV),

exchange rate (LNEXR), and loans to the agricultural sector (LNLOAS).

Table 4.4: Vector Error Correction Estimates

CointegratingEq: CointEq1	Coefficient	(Std. Error)	[t-Statistic]		
AGRP(-1)	1.000000	—	—		
INF(-1)	0.244408	(0.03774)	[6.47672]		
INT(-1)	2.532573	(0.22658)	[11.1775]		
LNAGRINV(-1)	9.505917	(0.78564)	[12.0996]		
LNEXR(-1)	-10.43177	(1.07806)	[-9.67640]		
LNLOAS(-1)	5.189760	(0.70218)	[7.39096]		
C	-78.34595	—	—		
ECT	**D(AGRP)**	**D(INF)**	**D(INT)**	**D(LNAGRINV)**	**D(LNEXR)**
Ecm	-0.167971	-0.584596	-0.320467	-0.073464	-0.001190
	(0.10495)	(0.35004)	(0.07910)	(0.02576)	(0.01504)
	[-1.60056]	[-1.67008]	[-4.05120]	[-2.85240]	[-0.07910]
Statistics	**D(AGRP)**	**D(INF)**	**D(INT)**	**D(LNAGRINV)**	**D(LNEXR)**
R-squared	0.666989	0.650391	0.759721	0.664340	0.200866
Adj. R-squared	0.439139	0.411186	0.595319	0.434677	-0.345910
F-statistic	2.927318	2.718961	4.621127	2.892678	0.367365
Akaike AIC	4.830610	7.239825	4.265262	2.020995	0.944873
Schwarz SC	5.465492	7.874707	4.900144	2.655877	1.579755

Source: Author's Computation using EViews 12

The cointegrating equation (CointEq1) reveals the long-run relationships among the variables. Agricultural investment in technological input (LNAGRINV) has the strongest positive effect on agricultural productivity with a coefficient of 9.505917 (t = 12.0996), indicating that a 1% increase in technological input investment increases agricultural productivity by approximately 9.51% in the long run. Interest rate (INT) also shows a significant positive long-run effect (coefficient = 2.532573, t = 11.1775), while inflation (INF) has a smaller but significant positive effect (coefficient = 0.244408, t = 6.47672). Exchange rate (LNEXR) exhibits a significant negative long-run relationship (coefficient = -10.43177, t = -9.67640), suggesting that currency depreciation reduces agricultural productivity in the long run, likely due to increased costs of imported agricultural inputs. Loans to the agricultural sector (LNLOAS) have a positive long-run effect (coefficient = 5.189760, t = 7.39096), indicating that increased credit access improves agricultural productivity. The error correction term (CointEq1) for D(AGRP) has a coefficient of -0.167971 with a t-statistic of -1.60056. Although the coefficient is negative, as theoretically expected, it is statistically insignificant at the 5% level, indicating weak evidence of adjustment toward long-run equilibrium. The coefficient represents the speed of adjustment from short-run disequilibrium to long-run equilibrium, suggesting that approximately 16.8% of the deviation from equilibrium is corrected within one year.

However, the lack of statistical significance implies that this adjustment process is not strong or reliable in explaining short-run dynamics. This suggests that agricultural productivity in Nigeria responds slowly and inconsistently to shocks, with limited short-run convergence to long-run equilibrium.

For the other variables, the error correction coefficients are: D(INF) = -0.584596 (t = -1.67008), D(INT) = -0.320467 (t = -4.05120, significant), D(LNAGRINV) = -0.073464 (t = -2.85240, significant), and D(LNEXR) = -0.001190 (t = -0.07910, insignificant). The significant negative coefficients for interest rate and agricultural investment indicate faster adjustment in these variables compared to agricultural productivity itself. The R-squared values indicate that the model explains 66.70% of the variation in agricultural productivity (D(AGRP)), 65.04% for inflation (D(INF)), 75.97% for interest rate (D(INT)), and 66.43% for agricultural investment (D(LNAGRINV)). However, the model explains only 20.09% of the variation in exchange rate (D(LNEXR)), with a negative adjusted R-squared of -0.345910, suggesting that exchange rate is less influenced by the other variables in the system. The F-statistics are significant for all equations except D(LNEXR) (F = 0.367365), indicating that the model fits well for agricultural productivity, inflation, interest rate, and agricultural investment.

Discussion of Findings

The VECM results Thecointegrating equation (CointEq1) reveals the long-run relationships among the variables. Agricultural investment in technological input (LNAGRINV) has the strongest positive effect on agricultural productivity with a coefficient of 9.505917 (t = 12.0996), indicating that a 1% increase in technological input investment increases agricultural productivity by approximately 9.51% in the long run. Interest rate (INT) also shows a significant positive long-run effect (coefficient = 2.532573, t = 11.1775), while inflation (INF) has a smaller but significant positive effect (coefficient = 0.244408, t = 6.47672). Exchange rate (LNEXR) exhibits a significant negative long-run relationship (coefficient = -10.43177, t = -9.67640), suggesting that currency depreciation reduces agricultural productivity in the long run, likely due to increased costs of imported agricultural inputs. Loans to the agricultural sector (LNLOAS) have a positive long-run effect (coefficient = 5.189760, t = 7.39096), indicating that increased credit access improves agricultural productivity. The error correction term (CointEq1) for D(AGRP) has a coefficient of -0.167971 with a t-statistic of -1.60056. Although the coefficient is negative, as theoretically expected, it is statistically insignificant at the 5% level, indicating weak evidence of adjustment toward long-run equilibrium. The coefficient represents the speed of adjustment from short-run disequilibrium to long-run equilibrium, suggesting that approximately 16.8% of the deviation from equilibrium is corrected within one year. However, the lack of statistical significance implies that this adjustment process is not strong or reliable in explaining short-run dynamics. This suggests that agricultural productivity in Nigeria responds slowly and inconsistently to shocks, with limited short-run convergence to long-run equilibrium.

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for agricultural productivity (AGRP) over the period 1990–2024 reveal a dynamic relationship between macroeconomic variables and sectoral performance in Nigeria. The findings indicate that agricultural productivity is strongly influenced by long-run equilibrium relationships among exchange rate, inflation, interest rate, agricultural investment in technological input, and loans to the agricultural sector. These results are broadly consistent with recent empirical studies (2022–2025) that emphasize the importance of cointegrated relationships in developing agricultural economies.

In the long run, the VECM cointegrating equation reveals that agricultural investment in technological input (LNAGRINV) has the strongest positive effect on agricultural productivity with a coefficient of 9.505917, which is highly significant. This finding supports recent evidence by Adebayo (2024) and Mensah (2023) who argue that investment in mechanization, irrigation systems, improved seeds, and agrochemicals significantly enhances productivity in developing economies. However, unlike ARDL studies that sometimes find negative short-term effects due to investment gestation lags, the VECM confirms a robust positive long-run relationship, indicating that technological input investment ultimately strengthens agricultural productivity through productivity enhancement channels.

The exchange rate results represent a critical contribution of this study. The VECM shows a strong negative long-run coefficient for LNEXR (-10.43177), which is highly significant. This counterintuitive finding suggests that currency depreciation reduces agricultural productivity in the long run, contrary to conventional trade theory. This result aligns with recent studies by Okonkwo (2023), Aizenman (2025), and Rey (2024), who emphasize that exchange rate depreciation in developing economies like Nigeria produces structural costs due to high import dependence for agricultural inputs. While depreciation may make exports cheaper globally, it simultaneously increases the cost of imported fertilizers, machinery, and agrochemicals, thereby eroding profitability and productivity. This

finding supports the input cost channel hypothesis rather than the traditional export productivity argument.

The inflation dynamics observed in this study show a positive but modest long-run coefficient (0.244408) that is statistically significant. This suggests that inflation exerts a small positive long-run effect on agricultural productivity, possibly through nominal price adjustments that benefit agricultural producers. However, this positive effect is likely offset in practice by increased input costs and reduced purchasing power. The findings align with Adeyemi (2022) and Khan et al. (2024), who find that inflation initially erodes agricultural profitability through rising input costs but may later enhance producer incentives as output prices adjust upward. The VECM confirms that inflation affects productivity through delayed price adjustment mechanisms.

The interest rate results provide important insights into monetary transmission in Nigeria's agricultural sector. The VECM shows a positive and highly significant long-run coefficient for INT (2.532573), which suggests that higher interest rates may reflect stronger monetary policy credibility and lower inflation expectations, stabilizing the macroeconomic environment and supporting agricultural investment. This finding contrasts with conventional expectations but aligns with Eze and Nwosu (2023) and Nguyen (2025), who highlight that monetary policy credibility and macroeconomic stability can support agricultural investment even when borrowing costs are highexpecially when there are other available means of sourcing funds. The insignificant short-run effect confirms that interest rate changes affect agricultural productivity only after a considerable delay through macroeconomic stability channels.

The findings on agricultural credit reveal important structural insights. The VECM shows a positive and significant long-run coefficient for LNLOAS (5.189760), indicating that increased credit access improves agricultural productivity by enabling farmers to purchase inputs, adopt modern technologies, and expand production. The marginally significant positive short-run effect suggests that liquidity injections can temporarily stabilize production. However, unlike ARDL studies that sometimes find negative long-run credit effects due to debt overhang, the VECM confirms a positive long-run relationship, indicating that agricultural credit in Nigeria generally supports productivity when properly allocated. This aligns with Salami (2022) and Ibrahim and Lawal (2024), who emphasize that credit effectiveness depends on proper allocation and monitoring.

In the short run, the error correction term for AGRP shows a coefficient of -0.167971, which is negative but marginally insignificant. This indicates that approximately 16.8% of deviations from long-run equilibrium are corrected within one year, suggesting a relatively slow adjustment process. This finding contrasts with ARDL studies that often report faster adjustment speeds (e.g., Shahzad et al., 2024; Martinez, 2025). The slow adjustment confirms the structural rigidity of Nigeria's agricultural sector, supporting World Bank (2023) and FAO (2024) reports that highlight constraints such as seasonal production cycles, infrastructural deficits,

and limited market access. Agricultural productivity does not respond immediately to policy shocks, requiring time for macroeconomic adjustments to materialize.

Overall, the VECM findings demonstrate that agricultural productivity in Nigeria is strongly influenced by long-run equilibrium relationships among macroeconomic variables. Agricultural investment in technological input and loans to the agricultural sector positively enhance productivity, while exchange rate depreciation negatively affects it through input cost channels. The slow adjustment speed confirms structural constraints in the sector, indicating that policy interventions require time to produce sustained effects

Conclusion and Recommendation

Overall, the study establishes that improving agricultural productivity in Nigeria requires a comprehensive policy approach that emphasizes macroeconomic stability, efficient financial intermediation, reduced import dependence through domestic input production, and sustained investment in agricultural development. Such an approach will enhance the capacity of the sector to respond effectively to policy changes and contribute meaningfully to economic growth and development. Based on the findings of this study, the following recommendations were made

1. The government should stabilize exchange rate for agricultural inputsgiven the negative long-run effect found in this study. policymakers should prioritize developing domestic production capacity for critical agricultural inputs to reduce import dependence.
2. There is a need to improve the efficiency of agricultural credit delivery by strengthening monitoring mechanisms and ensuring that loans are directed toward productive agricultural investments, with repayment timelines aligned to crop gestation cycles.
3. Policymakers should promote sustained investment in agricultural technology, including mechanization, irrigation systems, and modern farming techniques, to enhance long-term productivity and productivity, as this showed the strongest positive long-run effect.
4. Monetary authorities should ensure that borrowing costs remain accessible for agribusinesses by maintaining policy stability and implementing targeted credit support measures, including concessional lending and interest rate subsidies for agricultural financing.
5. Efforts should be made to control inflation and maintain price stability through supply-side interventions, including improving food storage infrastructure and reducing post-harvest losses, as persistent inflation undermines production planning.
6. Government should prioritize huge allocation for fertilizer, tractors, agro-processing equipment to enhance increasing agricultural productivity.

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