International Journal of Management Foresight and Strategy | ISSN 3087-4386
Published by BIRPUB https://birpub.org/ijmfs
Imp. Factor: 7.256

Agricultural Sector Growth and Economic Growth Nexus in Nigeria (1984–2024)

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Abstract

This study investigates the agriculture–economic growth nexus in Nigeria using annual time-series data from 1984 to 2024 and a parsimonious ARDL (2,2,1,2,1,2) model. The ARDL bounds test provides no evidence of a confirmed long-run cointegrating relationship. In the short run, exchange rate dynamics emerge as the most statistically significant factors within the estimated specification, while the agricultural-sector variables are individually statistically insignificant. This pattern suggests weak macroeconomic transmission between agricultural performance and aggregate economic growth amid persistent exchange-rate instability. The findings contribute empirical evidence on how macroeconomic instability may weaken the agriculture–growth transmission channel in an externally vulnerable, import-dependent economy, with implications for the sequencing of agricultural investment policies and macroeconomic stabilisation measures in Nigeria.

Keywords: *Agricultural Sector Growth, Economic Growth, Agricultural Exports, Government Expenditure, Exchange Rate.*

Cite: Ogbuehi I. L. & Isiwu G. D. (2026). Agricultural Sector Growth and Economic Growth Nexus in Nigeria (1984–2024). *International Journal of Management Foresight and Strategy, 4*(6), 434-451. https://doi.org/10.5281/zenodo.21976023

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Introduction

The agricultural sector has historically been the cornerstone of Nigeria's economy. In the pre-oil era, it contributed more than 60 per cent of GDP, accounted for over 70 per cent of total exports, and employed approximately 80 per cent of the labour force [1]. The sector provided food security, raw materials for agro-based industries, and foreign exchange through the export of cocoa, groundnut, palm oil, and rubber. The oil boom of the 1970s, however, triggered a fundamental structural shift: public investment and policy attention were redirected to petroleum, causing agricultural productivity to stagnate, food import dependence to deepen, and rural poverty to spread [2]. This overreliance on oil exposed Nigeria to severe external shocks whenever global crude prices declined, underscoring the urgent need for agricultural-led economic diversification.

Despite successive policy interventions from Operation Feed the Nation and the Green Revolution in the 1970s and 1980s, to the Agricultural Transformation Agenda (ATA) and the Agricultural Promotion Policy (APP) the sector continues to face systemic challenges including low mechanisation, inadequate rural infrastructure, weak extension services, post-harvest losses, insecure land tenure, and climate change [3]. Agriculture today contributes approximately 25–30 per cent of GDP and remains the largest employer of labour, yet Nigeria imports billions of dollars in food staples annually [4].

Against this backdrop, this study investigates the agriculture–economic growth nexus in Nigeria within a comprehensive multivariate ARDL framework that simultaneously captures agricultural productivity, exports, government expenditure, employment, and exchange rate dynamics using annual data from 1984 to 2024. The study contributes to the literature by showing that Nigeria's agriculture–growth linkage is mediated by macroeconomic instability particularly exchange rate volatility which weakens the transmission of agricultural sector performance into aggregate economic growth. This finding challenges the policy assumption that expanding agricultural output automatically translates into broader economic development, and reorients attention toward the macroeconomic preconditions that must be in place for agricultural gains to generate economy-wide benefits.

Unlike much of the existing Nigerian agriculture–growth literature, which primarily documents direct productivity effects or aggregate output relationships [22, 23], this study reframes the nexus through the lens of macroeconomic transmission instability. Specifically, the study demonstrates that the weak statistical contribution of agricultural sector variables to broader economic growth may reflect exchange-rate volatility and structurally fragile transmission mechanisms rather than merely insufficient sector-level investment or capital. By integrating structural transformation reasoning [42] with macroeconomic instability dynamics within a parsimonious ARDL framework, the study contributes a more structurally contextualised interpretation of Nigeria's agricultural growth constraints. The paper thus reframes the Nigeria agriculture–growth debate: not merely "does agriculture matter?" but "under what macroeconomic conditions can agriculture's contribution be transmitted into aggregate growth?"

Research Questions

i. What are the short-run and long-run effects of agricultural productivity on economic growth in Nigeria?
ii. What are the short-run and long-run effects of agricultural exports on economic growth in Nigeria?
iii. What is the short-run and long-run effect of government capital expenditure on agriculture on economic growth in Nigeria?
iv. What is the short-run and long-run effect of employment in agriculture on economic growth in Nigeria?

Objectives

i. To assess the short-run and long-run effects of agricultural productivity on GDP growth in Nigeria.
ii. To examine the short-run and long-run effects of agricultural exports on economic growth in Nigeria.
iii. To evaluate the short-run and long-run effects of government capital expenditure on agriculture on economic growth in Nigeria.
iv. To evaluate the short-run and long-run effects of agricultural employment on economic growth in Nigeria.

Hypotheses

i. H_{01}: Agricultural productivity has no statistically significant effect on GDP growth in Nigeria.
ii. H_{02}: Agricultural exports do not have a statistically significant effect on Nigeria's economic growth.
iii. H_{03}: Government capital expenditure on agriculture has no statistically significant effect on economic growth in Nigeria.
iv. H_{04}: Employment in the agricultural sector does not have a statistically significant effect on economic growth in Nigeria.

Literature Review

Conceptual Literature Review

Agriculture–Economic Growth Nexus. The agriculture-led growth hypothesis holds that productivity improvements in agriculture stimulate overall economic growth by providing food, raw materials, and foreign exchange [7]. Agricultural value added growth has a positive and significant impact on economic growth, though its magnitude is mediated by investment levels, infrastructure quality, and institutional support [8].

Agricultural Trade and Economic Growth. Agricultural exports provide foreign exchange earnings, enhance macroeconomic stability, and support industrial development through backward and forward linkages [9]. However, reliance on primary commodity exports without value addition limits the long-run growth contribution of agricultural trade, as processing and marketing value accrues primarily outside the exporting country [10].

Government Expenditure and Agricultural Growth. Public expenditure on agriculture in Nigeria has a positive but lagged effect on economic performance, reflecting the time required for public investment in infrastructure, R&D, and extension services to translate into productive capacity [11]. The composition of expenditure capital versus recurrent and its governance quality critically determine whether spending generates genuine developmental returns [12].

Employment and Poverty Reduction. Agriculture employs a large proportion of Nigeria's labour force, particularly in rural areas, and agricultural expansion significantly reduces rural unemployment and poverty [13]. However, the productivity of agricultural labour rather than its quantity determines the sector's contribution to growth, particularly in economies undergoing structural transformation.

Theoretical Literature Review

Classical and Neoclassical Theory. The classical tradition, drawing on Smith's emphasis on specialisation and Lewis's dualsector model [15], provides the structural transformation context within which agricultural sector performance and its relationship to economic growth is assessed. The Solow neoclassical growth model [16] underpins the cointegration framework by predicting a long-run steady-state equilibrium relationship between agricultural sector variables and aggregate output.

Endogenous Growth Theory. Romer [17] and Lucas [18] argue that long-run growth is generated endogenously through human capital accumulation, innovation, and knowledge spillovers. Government agricultural expenditure on R&D and extension services generates positive externalities and sustained productivity growth providing the theoretical basis for expecting a positive long-run relationship between PCAE and GDP. Export-led growth mechanisms also operate through this framework: exposure to international markets forces innovation and efficiency improvements that endogenously stimulate productivity.

Agricultural-Led Growth Hypothesis. Rising agricultural productivity generates surpluses, lowers food prices, raises rural incomes, and provides raw materials for industry [19]. This hypothesis is particularly relevant in Nigeria where agriculture constitutes a large share of both GDP and employment, and where the sector's productivity performance directly determines the pace of structural transformation.

Resource Allocation Theory. The efficiency of government expenditure in generating agricultural productivity gains depends critically on expenditure composition and governance quality principles drawn from public finance theory. Evidence from Mogues et al. [29] and Cervantes-Godoy and Dewbre [12] consistently shows that capital investment in agricultural R&D and infrastructure yields higher social returns than recurrent or market-distorting expenditures, a finding directly relevant to the insignificant PCAE coefficient in this study.

Empirical Literature Review

Awokuse [21] demonstrated that agriculture Granger-causes economic growth, supporting the sector's role as a growth engine. In Nigeria, Oji-Okoro [22] and Nwoko et al. [23] documented significant positive effects of agricultural output on economic growth. However, Aigbedion and Iyayi [24] showed that agriculture's GDP contribution has been unstable, reflecting the commodity-dependence trap. On exports, Okoruwa et al. [25] and Ogunjobi [26] confirmed positive agricultural export-growth linkages, while Porter [27] and Akpan et al. [28] cautioned that primary commodity export dependence without value addition limits long-run growth. On government expenditure, Agu et al. [29] found a positive relationship between fiscal allocation and agricultural output, while Ogunjobi and Fatai [30] showed that increased allocation has not consistently improved sector performance, pointing to utilisation inefficiencies. On the employment side, Gollin, Lagakos, and Waugh [31] documented vast cross-country differences in agricultural labour productivity implying labour movement out of agriculture is a key feature of development, while Adeleke [32] found that while agriculture contributes significantly to Nigeria's GDP, the relationship with broader economic growth is mediated by institutional and productivity constraints.

Cervantes-Godoy and Dewbre [12] further emphasise that the composition and quality of spending particularly investment in public goods such as R&D and rural infrastructure versus market-distorting subsidies is more important than expenditure volume in determining agricultural growth outcomes. On employment, Gollin, Lagakos, and Waugh [31] documented vast cross-country differences in agricultural labour productivity, suggesting that labour movement out of agriculture is a defining feature of structural transformation. Adeleke [32] found that while agriculture contributes significantly to Nigeria's GDP, its relationship with broader economic growth is mediated by institutional and productivity constraints.

Gaps in the Literature

Three substantive gaps motivate this study. First, most existing studies analyse agricultural output, exports, employment, or government expenditure in isolation rather than within a single multivariate framework, limiting policy conclusions. Second, few studies explicitly account for the exchange rate, which mediates agriculture's growth impact through its effects on export competitiveness and input costs [33]. Third, there is limited recent empirical work covering the post-2010 reform era using approaches that simultaneously capture short-run dynamics and long-run level relationships while accommodating mixed integration orders. This study addresses all three gaps. Its principal finding that exchange rate dynamics, not agricultural sector variables, govern short-run GDP fluctuations in Nigeria advances understanding of the fragile growth transmission mechanisms that constrain agricultural sector contributions to macroeconomic performance.

Methodology

Research Design and Theoretical Framework

This study adopts an ex post facto research design using annual time-series secondary data for Nigeria spanning 1984 to 2024. The study is anchored on Endogenous Growth Theory [17], [18], which holds that economic growth is driven endogenously by human capital accumulation, innovation, and knowledge spillovers. This framework is directly applicable to the interpretation of government agricultural expenditure (LPCAE) as an endogenous growth catalyst that generates productivity enhancing externalities. It also reframes agricultural employment as a quality variable predicting that the productivity of agricultural workers, rather than their number, determines the sector's growth contribution and supports the export-led growth mechanism through which exposure to international markets drives innovation and efficiency improvements.

Model Specification

The general functional form of the model is:

GDP = f (AEXP, EMPAGRC, LOG_EXR, LAGRICG, PCAE) … (1)

The ARDL specification, with selected variables transformed into natural logarithms where appropriate (LOG_EXR, LAGRICG, LPCAE), is:

$$\Delta GDP(t) = \beta(0) + \Sigma[i=0 \text{ to } p1]\ \beta(1,i)\Delta AEXP(t-i) + \Sigma[i=0 \text{ to } p2]\ \beta(2,i)\Delta EMPAGRC(t-i) + \Sigma[i=0 \text{ to } p3]\ \beta(3,i)\Delta LOG\_EXR(t-i)$$

$$+ \Sigma[i=0 \text{ to } p4]\ \beta(4,i)\Delta LAGRICG(t-i) + \Sigma[i=0 \text{ to } p5]\ \beta(5,i)\Delta LPCAE(t-i) + \phi(1)GDP(t-1) + \phi(2)AEXP(t-1) + \phi(3)EMPAGRC(t-1) + \phi(4)LOG\_EXR(t-1) + \phi(5)LAGRICG(t-1) + \phi(6)LPCAE(t-1) + \varepsilon(t) \quad \ldots(2)$$

Where GDP is the annual real GDP growth rate (approximated as the log difference of real GDP, expressed as a percentage; dependent variable); AEXP is agricultural exports; EMPAGRC is employment in agriculture; LOG_EXR is the log of the exchange rate; LAGRICG is log agricultural GDP; LPCAE is log public capital agricultural expenditure; $\beta(0)$ is the constant; $\beta(1,i)$–$\beta(5,i)$ are short-run coefficients on first-differenced regressors; $\phi(1)$–$\phi(6)$ are level coefficients in the conditional long run level specification (reported as indicative tendencies only, given the absence of confirmed cointegration); and $\varepsilon(t)$ is the error term. Data were sourced from the World Development Indicators (WDI) and the Central Bank of Nigeria (CBN) Statistical Bulletin. Estimations were performed using EViews 12.

Pre-Estimation Tests and Estimation Strategy

The Augmented Dickey-Fuller (ADF) unit root test determines the integration order of each variable. The ARDL bounds testing approach of Pesaran et al. [34] is then applied, selected because it accommodates variables of mixed integration orders and simultaneously estimates short-run dynamics alongside long-run level relationships. Finite sample critical values for n=30 and n=35, which bracket the study's effective sample (n=39), are applied throughout. Post-estimation diagnostics cover serial correlation, heteroskedasticity, normality, and parameter stability.

Results and Discussion

Descriptive Statistics

Table 1 presents descriptive statistics for all study variables over the 41-year sample period (1984–2024). GDP is measured as the log difference of real GDP (approximating the annual growth rate); AEXP is agricultural exports as a share of merchandise exports; EMPAGRC is the share of agricultural employment in total employment (percentage); LOG_EXR is the natural logarithm of the official Naira/USD exchange rate; LAGRICG is the natural logarithm of agricultural value added as a percentage of GDP; and LPCAE is the natural logarithm of Public Capital Agricultural Expenditure in nominal millions of Naira. Natural logarithms are applied to LOG_EXR, LAGRICG, and LPCAE to reduce scale differences; EMPAGRC and AEXP are retained in their original measurement units.

Table 1. Descriptive Statistics of Study Variables

Statistic	GDP (Log Diff. Real GDP)	AEXP (Agric. Exports)	EMPAGRC (Agric. Employ. % of Total)	LOG_EXR (Log Exchange Rate)	LAGRICG (Log Agric. GDP)	LPCAE (Log Public Agric. Expend.)
Mean	4.027	0.882	44.591	4.110	3.146	9.530
Median	3.647	0.285	44.919	4.835	3.151	10.695
Maximum	15.329	7.268	52.397	7.299	3.610	11.842
Minimum	-2.035	0.006	34.310	-0.266	2.892	5.651
Std. Dev.	3.765	1.536	5.877	1.807	0.149	2.025
Skewness	0.538	2.916	-0.091	-0.786	0.854	-0.607
Kurtosis	3.579	11.381	1.507	2.896	4.286	1.833
JarqueBera	2.550	178.122	3.864	4.240	7.815	4.840
Prob.	0.279	0.000	0.145	0.120	0.020	0.089
Obs.	41	41	41	41	41	41

Source: Researcher's computation using EViews 12.

GDP growth recorded a mean of 4.027 per cent over the sample period, with a maximum of 15.329 per cent (2002, reflecting post-liberalisation rebound) and a minimum of −2.035 per cent (1993, reflecting structural adjustment contraction). Agricultural exports (AEXP) display a pronounced positive skew (2.916) and extreme kurtosis (11.381), driven by the commodity export booms of 2011–12. The log exchange rate (LOG_EXR) shows a negative skew reflecting the accelerating depreciation of the Naira in the latter years of the sample. LAGRICG (log of agricultural value added as % of GDP) ranges from 2.892 to 3.610, reflecting the sector's declining share of GDP following the oil boom. The Jarque-Bera test indicates that GDP (p=0.279), EMPAGRC (p=0.145), LOG_EXR (p=0.120), and LPCAE (p=0.089) are normally distributed at the five per cent level, while AEXP and LAGRICG show moderate departures from normality driven by their skewed distributions.

Unit Root Test Results

Table 2. ADF Unit Root Test Results

Variable	ADF t-stat	5% Critical	Order	Remark
GDP	-11.8984	-3.5298	I(1)	Stationary at 1st diff.
AEXP	-6.1942	-3.5331	I(1)	Stationary at 1st diff.
EMPAGRC	-9.1346	-3.5366	I(0)	Stationary at levels
LOG_EXR	-4.9075	-3.5298	I(1)	Stationary at 1st diff.
LAGRICG	-4.8326	-3.5404	I(1)	Stationary at 1st diff.
LPCAE	-7.1394	-3.5331	I(1)	Stationary at 1st diff.

Source: Author's computation using EViews 12.

The ADF unit root test results confirm a mixed integration order across the six variables. EMPAGRC is stationary at levels [I (0)], with an ADF statistic of −9.135 that exceeds the five per cent critical value in absolute terms. The remaining five variables GDP, AEXP, LOG_EXR, LAGRICG, and LPCAE are non-stationary at levels but become stationary upon first differencing [I (1)]. The presence of this mixed I(0)/I(1) integration order satisfies the conditions for the ARDL bounds framework, which accommodates such mixed orders without requiring all variables to be integrated of the same order.

ARDL Short-Run Results

The AIC-selected model from all specifications with a maximum of two lags per variable is ARDL (2,2,1,2,1,2), estimated over the adjusted sample 1986–2024 (n=39 observations after lag adjustments). This specification estimates 16 parameters, yielding 23 degrees of freedom an improvement relative to unconstrained higher-lag specifications that addresses the over parameterisation concern. To minimise over-parameterisation risks associated with small-sample annual time-series estimation, lag selection prioritised parsimonious specifications; results were verified to be robust to alternative lag selection using the Schwarz Information Criterion (SIC), which penalises excessive lag inclusion more heavily than AIC and is therefore wellsuited to finite-sample ARDL applications [34]. HC1 heteroskedasticity-consistent standard errors are applied throughout. The ARDL framework is particularly suited to this study because it accommodates mixed integration orders, performs efficiently in small samples relative to alternatives such as VAR or VECM, and permits simultaneous estimation of short-run dynamics and conditional long-run tendencies within structurally constrained macroeconomic environments typical of developing economies all without requiring all regressors to be integrated of the same order [34].

Table 3. ARDL (2,2,1,2,1,2) Model Results Corrected Parsimonious Specification

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	-36.6097	15.8035	-2.3166	0.0205
GDP(-1)	0.1602	0.1668	0.9600	0.3370
GDP(-2)	0.3486	0.1820	1.9153	0.0554
AEXP	0.0162	0.3631	0.0446	0.9644
AEXP(-1)	0.3108	0.4501	0.6905	0.4899
AEXP(-2)	0.1464	0.4424	0.3308	0.7408
EMPAGRC	-0.0184	0.1568	-0.1176	0.9064
EMPAGRC(-1)	-0.1391	0.1674	-0.8309	0.4060

LOG_EXR	-1.4752	1.6734	-0.8815	0.3780
LOG_EXR(-1)	4.8542	1.8827	2.5782	0.0099
LOG_EXR(-2)	-4.6361	1.7261	-2.6858	0.0072
LAGRICG	12.1238	8.3616	1.4499	0.1471
LAGRICG(-1)	0.7830	8.8646	0.0883	0.9296
R^2=0.5794 Adj.R^2=0.3052	F=4.625 ($p<0.001$)	DW=1.888	n=39 DoF=23	LPCAE and lags: included below.
LPCAE	0.8892	1.2017	0.7400	0.4593
LPCAE(-1)	1.6352	1.9256	0.8492	0.3958
LPCAE(-2)	-1.6081	1.7014	-0.9452	0.3446

*Source: Author's computation using EViews 12. *** p<0.01, ** p<0.05, * p<0.10. HC1 heteroskedasticity-consistent standard errors throughout. All 16 parameters of the ARDL (2,2,1,2,1,2) specification are reported. LPCAE and its lags are statistically insignificant, consistent with documented inefficiencies in Nigeria's agricultural expenditure management discussed in Section V.*

The model's adjusted R^2 of 0.305 is appropriate for a growth rate equation; the Durbin-Watson statistic of 1.888 is consistent with the absence of first-order autocorrelation. The inclusion of lagged dependent variable terms is standard in ARDL specifications and does not indicate overfitting given the 23 degrees of freedom.

The ARDL (2,2,1,2,1,2) model is jointly statistically significant (F=4.625, p=0.0005) with an R^2 of 0.579 and adjusted R^2 of 0.305. Exchange rate dynamics emerge as the most statistically significant variables within the estimated specification: LOG_EXR at lag one carries a positive coefficient (4.854, p=0.010) while LOG_EXR at lag two is negative (−4.636, p=0.007), a pattern consistent with exchange-rate adjustment dynamics resembling J-curve-type behaviour whereby an initial positive growth response to currency depreciation is subsequently partially offset by contractionary import-cost effects though this interpretation is offered as a structural analogy rather than a formally estimated trade-balance adjustment model. Agricultural GDP (LAGRICG) has a positive but insignificant contemporaneous effect (12.124, p=0.147). Agricultural exports, employment, and government expenditure are each statistically insignificant across their respective lags a result consistent with weak sectoral integration between agricultural performance and aggregate macroeconomic outcomes in Nigeria.

GDP fluctuations appear more strongly associated with exchange-rate dynamics than with agricultural sector variables within the estimated specification. As an externally vulnerable, import-dependent economy, Nigeria's aggregate output movements are sensitive to currency movements that affect import costs, domestic price levels, and the real value of oil revenues channels that operate independently of agricultural sector performance. This is consistent with evidence from other oil-dependent macroeconomic structures in Sub-Saharan Africa where macroeconomic instability weakens the sectoral growth transmission mechanisms through which agriculture ordinarily contributes to broader economic development [33].

Robustness Note. The principal finding of exchange rate dominance over agricultural variables is robust across all estimated specifications reported in Appendix A. Three robustness exercises are conducted. First, Zivot-Andrews (1992) structural break augmented unit root tests confirm that the integration orders used in the ARDL estimation remain valid after accounting for structural breaks: AEXP, EMPAGRC, LAGRICG, and LPCAE are stationary with a structural break, while GDP and LOG_EXR remain non-stationary a pattern fully consistent with the mixed I (0)/I (1) order justifying the ARDL bounds framework. Second, augmenting the baseline model with a post-2016 exchange rate liberalisation dummy (D2016) and a COVID-19 shock dummy (D2020) leaves the core pattern unchanged: agricultural sector variables (LAGRICG, AEXP, EMPAGRC) remain statistically insignificant, LOG_EXR (-1) remains positively significant (p=0.037), and the COVID dummy is the only newly significant variable (p=0.005). Third, inclusion of a post-2022 exchange rate liberalisation dummy (D2022) similarly preserves all qualitative findings, with LOG_EXR (-1) becoming more significant (p=0.004) and LAGRICG remaining insignificant (p=0.094). These exercises confirm that the central finding exchange rate dynamics rather than agricultural sector variables govern short-run GDP fluctuations is not an artefact of a specific sample window or the exclusion of structural break controls.

ARDL Bounds Test for Long-Run Cointegration

Table 4. ARDL Bounds Test for Cointegration

Test Statistic	Value	5% Critical I(0)/I(1)	1% Critical I(0)/I(1)
F-statistic (Bounds Test)	1.2683	2.39 / 3.38	3.06 / 4.15
t-statistic (ECT / GDP−L1)	−2.3395	−2.86 / −3.78	−3.43 / −4.37
k (regressors) = 5	n = 38	10% Bounds: 2.08 / 3.00	Asymptotic critical values (Pesaran et al., 2001)
Conclusion	F=1.268 < lower bound at 10%	No long-run cointegration confirmed	t-test inconclusive (between bounds)

Source: Author's computation using EViews 12. Critical values from Pesaran, Shin, and Smith [34].

The ARDL bounds test yields an F-statistic of 1.268, below the lower critical value bound of 2.08 at the ten per cent significance level. The null hypothesis of no long-run levels relationship is therefore not rejected. The t-statistic on the ECT term (−2.340) falls between the ten per cent t-bounds (−2.57/−3.46), leaving the t-bounds test inconclusive. On the basis of the F-bounds result, the conclusion is that no confirmed long-run cointegrating relationship exists among the variables over the 1984–2024 period. The analysis therefore focuses on the short-run dynamics documented in Table 3.

Long-Run Coefficient Estimates

Table 5. Conditional Long-Run Level Coefficients (Indicative Tendencies Only No Confirmed Cointegration)

Variable	LR Coefficient	Level Coef.	Level Std. Err.	t-Statistic	p-value
LAGRICG	17.3701	9.9872	7.6942	1.2980	0.2107
AEXP	0.7003	0.4026	0.7025	0.5731	0.5736
EMPAGRC	-0.0723	-0.0416	0.2333	-0.1782	0.8605
LOG_EXR	-2.2279	-1.2810	1.5686	-0.8166	0.4248
LPCAE	2.5828	1.4850	1.4803	1.0032	0.3291

Source: Author's computation using EViews 12.

Table 5 presents the long-run levels coefficients derived from the conditional long-run level specification for completeness; given the absence of confirmed cointegration these are indicative directional tendencies only. Among the level terms, LAGRICG has the largest positive coefficient (level coef=9.987, t=1.298, p=0.211), suggesting a positive but statistically weak directional association between agricultural productivity and economic performance over longer horizons. All other level coefficients AEXP (p=0.574), EMPAGRC (p=0.861), LOG_EXR (p=0.425), and LPCAE (p=0.329) are statistically insignificant, consistent with the bounds test conclusion.

Post-Estimation Diagnostic Tests

The diagnostic tests generally support the adequacy of the estimated model. The Breusch-Godfrey Serial Correlation LM Ftest yields 1.965 (p=0.152), failing to reject the null of no serial correlation; the F-statistic is the preferred diagnostic given the small denominator degrees of freedom in the auxiliary regression [35]. The Jarque-Bera normality test yields 0.395 (p=0.821), consistent with residual normality. The Breusch-Pagan-Godfrey heteroskedasticity test yields an F-statistic of 1.480 (p=0.193), consistent with homoscedastic residuals.

The CUSUM test confirms parameter stability over the estimation period. The CUSUM of Squares test indicates some parameter variation in 2022–2024, attributable to the extreme exchange rate and inflationary shocks of that period; this subperiod instability does not affect the short-run results, which are estimated over the full sample.

Granger Causality

VAR-based Granger causality tests confirm that no individual agricultural variable Granger-causes GDP at conventional significance levels in the short run. Where cointegration is absent, the Granger Representation Theorem does not require shortrun Granger causality to exist [37], so this result is fully coherent with the overall finding that exchange rate dynamics rather than agricultural sector variables drive short-run GDP fluctuations in Nigeria.

A notable finding is that Public Capital Agricultural Expenditure (PCAE) Granger-causes Agricultural GDP (LAGRICG) (Chisq = 16.179, p < 0.001). This unidirectional result from government agricultural spending to agricultural productivity is consistent with the proposed transmission mechanism in Endogenous Growth Theory [17] through which public investment in agricultural R&D and infrastructure generates productivity improvements within the sector.

Evaluation of Hypotheses

Hypothesis 1 (H_{01}): H_{01} is not rejected. Neither the contemporaneous LAGRICG coefficient (12.124, p=0.147) nor its lag (0.783, p=0.930) is statistically significant in the short-run ARDL. The LAGRICG level coefficient in the conditional long-run level specification (9.987, p=0.211) is also insignificant at conventional levels. The Granger causality test finds no short-run predictive relationship from LAGRICG to GDP. The evidence therefore indicates that agricultural productivity does not independently drive GDP growth within this specification, though a positive directional tendency is observed in the conditional long-run level specification.

Hypothesis 2 (H_{02}): H_{02} is not rejected. Agricultural exports (AEXP) are statistically insignificant across all lags in both the short-run ARDL estimation (all p-values > 0.40) and the long-run levels equation (p=0.405). The export-led growth hypothesis is therefore not supported by the corrected ARDL results for the 1984–2024 period. This finding may reflect Nigeria's primary commodity export structure concentrated in unprocessed agricultural products with limited domestic value addition which limits the macroeconomic transmission from export volumes to overall GDP growth.

Hypothesis 3 (H_{03}): H_{03} is not rejected. Government capital expenditure on agriculture (LPCAE) is statistically insignificant in both the short-run ARDL (all lags p>0.35) and the long-run levels equation (p=0.467). While the long-run coefficient is positive (1.865), its statistical insignificance prevents a definitive conclusion that government agricultural spending drives economic growth. This finding is consistent with the documented inefficiencies in Nigeria's agricultural expenditure including fund leakage, implementation gaps, and recurrent rather than capital-focused allocations that dilute the growth impact of public investment in the sector.

Hypothesis 4 (H_{04}): H_{04} is not rejected. Agricultural employment (EMPAGRC) is statistically insignificant in both the shortrun ARDL and the long-run levels equation (p=0.450). This result is consistent with the low-productivity characteristics of subsistence-oriented agricultural employment in Nigeria, where the quantity of agricultural workers does not independently determine aggregate economic growth.

Conclusion and Recommendations

Summary of Findings

This study examined the nexus between agricultural sector growth and economic growth in Nigeria from 1984 to 2024 using an ARDL (2,2,1,2,1,2) model with 23 degrees of freedom. Diagnostic tests generally support the adequacy of the estimated model. The ARDL bounds test yields an F-statistic of 1.268, below the lower critical bound, indicating no confirmed long-run cointegration. The principal findings are:

i. Agricultural GDP (LAGRICG) is statistically insignificant in both the short-run ARDL (p=0.147) and the long-run level equation (p=0.211). The positive directional tendency of the level coefficient suggests a weak long-run association with economic performance, but this falls short of statistical significance and should not be treated as a confirmed relationship.

ii. Agricultural exports (AEXP) are statistically insignificant in both the short-run ARDL and the long-run levels equation. The export-led growth hypothesis is not supported for Nigeria over the 1984–2024 period, likely reflecting the primary commodity concentration of Nigeria's agricultural export base.

iii. Government capital expenditure on agriculture (LPCAE) is statistically insignificant across all specifications, suggesting that documented inefficiencies in Nigeria's agricultural expenditure management dilute the growth impact of public investment.

iv. Agricultural employment (EMPAGRC) is statistically insignificant in all specifications, confirming that the quantity rather than the productivity of agricultural labour is the binding constraint, and supporting the structural transformation perspective.

Conclusion

The findings indicate a weak and unstable integration between agricultural sector performance and macroeconomic growth in Nigeria. Exchange rate dynamics not agricultural productivity, exports, employment, or government expenditure emerge as the dominant short-run influences on GDP within the estimated specification. As an externally vulnerable, import-dependent economy, Nigeria's aggregate output movements are governed by currency volatility and import dependence, suppressing the transmission mechanisms through which agricultural sector performance ordinarily contributes to economy-wide growth. The absence of a confirmed long-run cointegrating relationship points to the importance of macroeconomic stabilisation as a precondition for agricultural gains to generate sustained economic development. Nigeria's agricultural sector retains considerable productive potential, but realising it requires not only sector-specific investment but also the macroeconomic stability and institutional quality that allow limited sectoral spillovers to widen into economy-wide benefits.

Policy Recommendations

i. Prioritise agricultural productivity as the primary policy lever. Government should shift focus from input distribution to a holistic productivity strategy: investment in climate-resilient seed varieties, modern mechanisation services, irrigation infrastructure, and strengthened extension services to ensure knowledge transfer to farmers.
ii. Build agricultural export value chains. Policy must move beyond raw commodity exports towards processed, value-added agricultural products. This requires addressing storage, transportation, and processing infrastructure deficits; providing incentives for value-added agricultural exports; and meeting international phytosanitary standards to access premium markets.
iii. Overhaul agricultural expenditure governance. The nuanced finding on government spending demands that expenditure be redirected from recurrent and untargeted subsidies towards capital investments with high social returns rural infrastructure, agricultural R&D, and extension services. Rigorous monitoring and evaluation of all agricultural projects and improved transparency in fund management are essential to ensure that public investment translates into sustained productive capacity.
iv. Invest in agricultural skill development. The insignificance of employment as a growth driver signals the need to reframe agricultural labour policy from quantity to quality: upgrading agricultural workforce skills, facilitating the transition of surplus labour to productive agro-processing and services, and supporting the gradual structural transformation of the rural economy.

Limitations and Suggestions for Further Research

This study acknowledges several limitations that should be considered when interpreting the findings, and that suggest productive directions for future research.

First, the effective estimation sample of 39 observations (1986–2024, after lag adjustments) limits the precision of some parameter estimates and reduces the statistical power of cointegration tests. The ARDL bounds F-statistic of 1.268 falls below the lower critical bound, but the small sample size means the test has limited power to detect weak or intermittent cointegrating relationships that may nonetheless exist. Future research should revisit this question with longer time series as more recent data become available, or apply finite-sample bootstrap critical values that may be better calibrated to small samples of this kind.

Second, the study relies on national aggregate data, which may mask significant regional and crop-specific heterogeneities in the agriculture–growth relationship. Nigeria's agricultural sector is geographically diverse spanning the cocoa-dominant southwest, the groundnut belt of the north, and the oil-palm-producing south and subnational or commodity-level analysis could reveal transmission mechanisms that aggregate data conceal. Future studies using disaggregated state-level or cropspecific data would substantially enrich understanding of how different agricultural sub-sectors relate to regional and national economic performance.

Third, formal Bai-Perron (2003) multiple-break procedures were not applied to the main estimation, despite the 1984–2024 period spanning major economic discontinuities including the Structural Adjustment Programme reforms, oil price collapses, the 2008–2009 global financial crisis, the COVID-19 shock of 2020, and the post-2022 exchange rate liberalisation. As a partial remedy, Appendix A reports Zivot-Andrews (1992) structural break-augmented unit root tests and dummy-variable robustness exercises. These show that the core findings are qualitatively unchanged when structural break controls are introduced explicitly. Full break-adjusted ARDL estimation which would allow coefficient parameters to vary across regimes remains a productive direction for future research using this dataset.

Fourth, this study assumes a symmetric linear relationship between agricultural sector variables and GDP growth. However, the relationship may be inherently asymmetric: agricultural sector contractions (e.g., driven by climate shocks or policy reversals) may affect GDP differently from expansions of the same magnitude. The Nonlinear ARDL (NARDL) framework of Shin, Yu, and Greenwood-Nimmo (2014) is specifically designed to test for such asymmetries and would provide a natural robustness extension of the present analysis. Future research should apply NARDL decomposition to examine whether positive and negative agricultural shocks have asymmetric short-run effects on Nigeria's economic growth.

Fifth, potential reverse causality between macroeconomic growth and agricultural variables cannot be completely ruled out despite the dynamic ARDL specification. Higher GDP growth could itself stimulate agricultural investment, employment, and export activity, generating endogeneity concerns that are not fully resolved by the lag structure alone. Future research should consider instrumental variable approaches or fully simultaneous system estimation to address this concern more rigorously.

Sixth, the model does not include institutional quality variables such as governance indices, rule of law measures, or corruption perceptions which the literature consistently identifies as moderating the agriculture–growth nexus in Sub-Saharan Africa. Incorporating institutional variables into the ARDL specification would allow future research to test whether the weak agricultural transmission documented in this study reflects genuine structural weakness or is partly an artefact of institutional constraints that mediate the conversion of agricultural output gains into macroeconomic growth. Panel ARDL approaches covering multiple Sub-Saharan African economies with varying institutional endowments could further generalise the findings beyond the Nigerian context.

Finally, robustness to alternative model specifications was not formally reported in this study. Future work should present sensitivity analyses including: (i) alternative lag selection criteria (SIC in addition to AIC); (ii) time-varying parameter models to capture evolving relationships across different policy regimes; and (iii) the inclusion of additional control variables such as oil revenues, inflation, or financial development that may act as confounders in the agriculture–growth relationship. These extensions would substantially strengthen confidence in the present findings and provide a more comprehensive characterisation of the conditions under which agricultural sector performance translates into broader economic development in Nigeria.

Although the model focuses on agricultural sector transmission dynamics, broader macroeconomic variables including inflation, oil price volatility, financial sector development, and monetary policy conditions may also influence aggregate growth outcomes in Nigeria. Their exclusion reflects the study's parsimonious sector-specific modelling strategy rather than an assumption of irrelevance. Future research may extend the framework by incorporating these broader macroeconomic controls within multivariate or structural modelling approaches, which may further illuminate the conditional channels through which agricultural sector performance can or cannot transmit into economy-wide growth.

Finally, the estimated relationships should be interpreted as dynamic macroeconomic associations rather than strictly causal effects. The ARDL framework substantially reduces reverse-causality concerns through its lag structure and dynamic specification, but does not fully resolve the endogeneity inherent in aggregate time-series analysis. Readers should therefore interpret the coefficients as conditional associations that are consistent with the proposed transmission mechanisms, rather than as structurally identified causal parameters.

Data Availability Statement

The annual time-series data (1984–2024) used for the ARDL analysis in this study are obtained from publicly available sources. Agricultural productivity, CO_2 emissions from agriculture, agricultural employment, and agricultural

machinery data were sourced from the World Bank World Development Indicators (WDI) database, freely accessible at https://databank.worldbank.org/source/world-development-indicators. FDI inflows to the agricultural sector were sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin, available at https://www.cbn.gov.ng/documents/Statbulletin.asp. All data used in the estimation are annual time-series observations for Nigeria spanning 1984 to 2024. No primary data were collected. All estimation was conducted using EViews 12; the authors confirm that the dataset and estimation outputs are available upon reasonable request to the corresponding author.

APPENDIX A. STRUCTURAL BREAK AND ROBUSTNESS ANALYSIS

This appendix reports structural break-augmented unit root tests and dummy-variable robustness checks. All three exercises confirm that the core findings of the main analysis are qualitatively unchanged when structural breaks and major macroeconomic shocks are controlled for explicitly.

Table A1. Zivot-Andrews Structural Break Unit Root Test Results

Model C: Break in both intercept and trend. H0: unit root with structural break. 1 augmentation lag.

Variable	ZA t-statistic	Break Year	5% CV	Conclusion
GDP	−3.9183	2000	−5.08	Unit root (non-stationary)
AEXP	−6.8190**	2010	−5.08	Stationary with break (2010)
EMPAGRC	−5.9636**	1992	−5.08	Stationary with break (1992)
LOG_EXR	−3.5867	1998	−5.08	Unit root (non-stationary)
LAGRICG	−5.6112**	2005	−5.08	Stationary with break (2005)
LPCAE	−5.9496**	2009	−5.08	Stationary with break (2009)

*Note: ** significant at 5% level. Critical values from Zivot and Andrews [41]. The detected break dates are economically interpretable:*

AEXP (2010) coincides with commodity export boom; EMPAGRC (1992) with post-SAP structural adjustment; LAGRICG (2005) with the National Economic Empowerment and Development Strategy (NEEDS); LPCAE (2009) with global financial crisis-era expenditure. The mixed integration order remains valid under break-adjusted testing, confirming the appropriateness of the ARDL bounds framework.

Table A2. ARDL Robustness Dummy-Variable Augmented Specifications

Dependent variable: GDP. Baseline = ARDL (2,2,1,2,1,2). D2016 = 1 from 2016 onward (exchange rate liberalisation); D2020 = 1 in 2020 (COVID-19); D2022 = 1 from 2022 onward (exchange rate unification). HC1 standard errors throughout.

Variable / Statistic	Baseline	+ D2016 + D2020	+ D2022
R-squared	0.5794	0.6223	0.6094
Adj. R-squared	0.3052	0.3165	0.3253
LOG_EXR(−1) coefficient	4.8542***	4.4248**	5.2805***

LAGRICG coefficient	12.1238 (p=0.147)	11.6866 (p=0.242)	13.4256 (p=0.094)
AEXP coefficient	0.0162 (p=0.964)	−0.2528 (p=0.614)	n.s.
EMPAGRC coefficient	−0.0184 (p=0.906)	−0.0683 (p=0.716)	n.s.
D2016 coefficient		−2.3306 (p=0.677)	
D2020 coefficient		−4.4465*** (p=0.005)	
D2022 coefficient			n.s.

*Note: *** p<0.01, ** p<0.05, * p<0.10. n.s. = not significant. All specifications confirm that agricultural sector variables (LAGRICG, AEXP, EMPAGRC) remain statistically insignificant across all robustness exercises. LOG_EXR (−1) remains positively significant in all specifications, confirming the dominance of exchange rate dynamics over agricultural sector variables in determining short-run GDP fluctuations. The COVID-19 shock dummy (D2020) is the only newly significant variable, confirming the severity of the 2020 contraction as a structural shock beyond exchange rate dynamics. Source: Author's computation.*

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