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OIL-PRICE FLUCTUATIONS AND AGRICULTURAL SECTOR GROWTH IN NIGERIA: SHORT-RUN EVIDENCE FROM AN ARDL MODEL

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Abstract

Nigeria depends heavily on crude oil earnings, yet evidence on how oil-price movements affect agricultural growth remains limited and mixed. This study examines the short-run relationship between oil-price fluctuations, measured as the annual percentage change in Brent crude prices, and agricultural value-added growth in Nigeria, controlling for exchange-rate depreciation and inflation. Annual data for 1990–2024 were obtained from the World Bank and the U.S. Energy Information Administration. The 2002–2003 World Bank agricultural growth figures were provisionally replaced with historical Central Bank of Nigeria (CBN) values due to discrepancies between the sources. An autoregressive distributed lag (ARDL) model was estimated using ordinary least squares, with lag lengths selected by information criteria. Oil-price fluctuations showed no statistically significant short-run association with agricultural growth (coefficient = 0.002, p = 0.83). Exchange-rate depreciation and inflation were also insignificant. Agricultural growth exhibited persistence, with the autoregressive coefficients summing to 0.87. The findings remained robust across alternative lag structures, dummy variables, sample periods and data vintages. The results suggest that agricultural policy should prioritise sector-specific growth drivers, preparedness for growth slowdowns and improved agricultural statistics rather than rely on oil-price movements.

Keywords: Oil-price fluctuations; agricultural growth; Nigeria; ARDL; short-run dynamics; agricultural policy.

Introduction

Nigeria's dependence on crude oil exports remains an important feature of its economy. According to the National Bureau of Statistics (2025a), crude oil accounted for 71.39 percent of Nigeria's total merchandise exports in 2024. Agriculture also contributes

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significantly to the economy, accounting for 24.64 percent of real GDP in 2024 (National Bureau of Statistics, 2025b). Since oil proceeds affect the economy through foreign-exchange markets and government budgets, changes in international oil prices may influence agricultural performance. Understanding this relationship is therefore important for economic policy.

In the short run, oil-price fluctuations may affect agriculture through foreign-exchange availability, exchange-rate movements and production costs. Falling oil prices can reduce foreign-exchange inflows, potentially weakening the naira and raising the cost of imported fertilisers, agrochemicals and machinery. Conversely, rising oil prices may improve foreign-exchange supply and public finances but can also appreciate the real exchange rate and redirect resources towards non-tradable activities. These competing effects make the short-run relationship between oil prices and agricultural growth an empirical question. Although public spending and credit may also influence this relationship, they are not modelled in this study because the relevant annual data are not included.

Existing Nigerian studies on oil-price movements largely examine aggregate output, exchange rates and fiscal variables (Akinleye and Ekpo, 2013; Iwayemi and Fowowe, 2011; Umoru, Ohiomu and Akpeke, 2018; Mgbomene et al., 2025), with mixed findings. Agriculture-specific studies examining output growth, productivity, subsector production and food prices also report varying results (Ike, Usman and Köksal, 2025; Ogede, 2020a; Popoola et al., 2022; Hammayo, 2020; Chen et al., 2020; Oseni and Kinbode, 2018; Yusuf, Salau and Adeiza, 2024). Consequently, evidence on how agricultural growth responds to oil-price fluctuations in the short run remains inconclusive. An additional concern is the extreme 2002 observation in the World Bank agricultural growth series, which conflicts with the historical Central Bank of Nigeria (CBN) series and may influence the estimates.

This study examines the short-run relationship between annual agricultural value-added growth and annual percentage changes in Brent crude oil prices, controlling for exchange-rate depreciation and inflation. It employs an autoregressive distributed lag (ARDL) framework using data for 1991–2024. The analysis focuses on statistical associations.

The general objective is to examine the short-run relationship between oil-price fluctuations and agricultural sector growth in Nigeria over the 1990–2024 data period. The specific objectives are to:

(i) estimate the short-run dynamic relationship between oil-price fluctuations and agricultural sector growth;
(ii) examine the short-run relationships between exchange-rate depreciation, inflation and agricultural sector growth;
(iii) assess the persistence of agricultural growth following changes in growth; and
(iv) discuss the implications of the findings for agricultural and macroeconomic policy.

Conceptual review

Oil-price fluctuations refer to the signed annual percentage change in the Brent crude oil price. This measure is distinct from oil-price volatility, which refers to the dispersion or conditional variance of price changes and is commonly estimated using GARCH-type models or realised volatility measures based on higher-frequency data. The measure adopted in this study captures the

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direction and magnitude of annual price changes rather than their conditional variance. Accordingly, the findings relate to oil-price fluctuations as operationally defined in this study, not to oil-price volatility.

Agricultural sector growth is measured as the annual percentage growth in value added from agriculture, forestry and fishing, using the World Bank indicator Agriculture, forestry, and fishing, value added (annual % growth) (NV.AGR.TOTL.KD.ZG) (World Bank, n.d.-a). This measure represents the growth rate of agricultural value added, not agriculture's share of GDP, the level of agricultural output, agricultural productivity or nominal agricultural GDP. Value added is calculated as gross output less intermediate consumption; consequently, changes in input costs may influence the measure.

Exchange-rate depreciation is measured as the annual percentage change in the official naira–US dollar exchange rate, with positive values indicating a depreciation of the naira. Inflation is measured as the annual percentage change in the consumer price index (CPI). A short-run effect refers to the association between agricultural growth and contemporaneous or lagged changes in an explanatory variable, while persistence refers to the extent to which agricultural growth in one period is associated with growth in subsequent periods.

Empirical review

Results for Nigerian macroeconomic aggregates disagree. Akinleye and Ekpo (2013), Umoru, Ohiomu and Akpeke (2018) and Mgbomene et al. (2025) report adverse or asymmetric effects of oil-price shocks or volatility on real GDP and related variables, whereas Iwayemi and Fowowe (2011) find no major impact on most variables and Ozokede and Awogbemi (2025) find a positive but insignificant effect of volatility on GDP growth in both the short and the long run. Differences in sample, variable definition (shocks, asymmetric shocks or conditional volatility) and method are a plausible reason for the conflicting results.

Results for agriculture are also mixed. Ogede (2020a) finds positive but insignificant effects of crude-oil price shifts on agriculture, manufacturing and transport. Ogede (2020b) and Popoola et al. (2022) report negative effects of oil prices on agricultural output growth and productivity, Hammayo (2020) finds that falling oil prices significantly reduce productivity, and Ike, Usman and Köksal (2025) find that a price increase undercuts food-sector production in the long run. Chen et al. (2020) study food prices rather than output, and Adeyemo et al. (2024) do not study oil prices directly. Outcomes, samples, oil-price measures and estimators differ across these studies, so their results are not directly comparable.

Studies of food prices, the exchange rate and fiscal conditions in Nigeria (Oseni and Kinbode, 2018; Yusuf, Salau and Adeiza, 2024; Udeaja and Udoh, 2014; Hatzenbuehler and Mavrotas, 2017) mostly concern prices, output levels or fiscal conditions rather than annual value-added growth. Studies that find little or no effect of oil prices on agriculture or related sectors (Olanipekun and Usman, 2019; Burakov, 2016; Salaudeen, 2023; Anowor et al., 2025) differ from this one in country, outcome and method but are consistent with its finding. Table A4 in the Appendix summarises all the studies reviewed.

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Synthesis

The literature indicates that oil-price movements may influence Nigerian agriculture, although the direction, magnitude and duration of the effects vary according to the outcome variable, oil-price measure and estimation method. Previous studies differ in their use of output levels, productivity measures, oil-price volatility indicators and nonlinear specifications. In contrast, the present study employs an annual short-run autoregressive distributed lag (ARDL) model to examine agricultural value-added growth and explicitly documents the treatment of conflicting observations for 2002–2003. To the best of the authors' knowledge, limited attention has been given to transparent estimates of the short-run relationship between oil-price fluctuations and annual agricultural value-added growth in Nigeria, particularly studies that document data discrepancies and assess the robustness of their findings using alternative specifications. This constitutes the research gap addressed by the present study. Furthermore, findings of little or no statistically significant effect (Ogede, 2020a; Olanipekun and Usman, 2019; Salaudeen, 2023) coexist with evidence of both negative and positive effects. Therefore, an insignificant short-run relationship would not necessarily contradict the existing literature.

Dutch-Disease Framework

The Dutch-disease framework developed by Corden and Neary (1982) explains how a boom in a resource sector can affect other sectors through resource reallocation and real exchange-rate appreciation. In an oil-dependent economy such as Nigeria, an oil-price boom may draw labour and capital towards the petroleum sector and weaken the competitiveness of non-oil tradable sectors, including agriculture. This mechanism suggests a potentially negative relationship between oil-price increases and agricultural growth. However, Dutch disease primarily describes structural adjustments over time; consequently, a short-run growth regression examines only one implication of the broader framework.

Fiscal Transmission

The fiscal transmission channel operates through government revenue and public expenditure. Where agricultural programmes depend on oil-financed public revenue, rising oil prices may expand the fiscal resources available for agricultural support, while falling prices may constrain such expenditure. This mechanism suggests a potentially positive relationship between oil-price increases and agricultural growth. However, the relationship depends on how government allocates oil revenue and whether additional revenue translates into effective agricultural expenditure. Hatzenbuehler and Mavrotas (2017) discuss the relationship between oil revenue, government finances and agricultural programme funding in Nigeria. Because the present study does not include a direct measure of public agricultural expenditure, this transmission channel is not estimated separately.

Cost Channel

The cost channel suggests that oil-price fluctuations may affect agricultural production through inflation and exchange-rate movements. Higher oil prices may contribute to domestic price pressures, while exchange-rate depreciation can increase the domestic cost of imported

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agricultural inputs, including machinery, fertilisers and agrochemicals. These developments may raise production costs and constrain agricultural growth, suggesting potentially negative associations with inflation and exchange-rate depreciation. However, the magnitude and direction of these effects depend on production conditions and the composition of agricultural inputs. A further channel through borrowing costs is plausible but is not explicitly modelled. Udeaja and Udoh (2014) report a significant positive association between the exchange rate and agricultural output in Nigeria, reinforcing the need to determine the direction of the exchange-rate effect empirically.

Implications for the Model

The theoretical channels outlined above imply competing effects of oil-price fluctuations on agricultural growth. While Dutch disease and production-cost pressures suggest potentially negative effects, fiscal transmission may generate positive effects through government support for agriculture. Consequently, theory alone does not determine the net sign of the oil-price coefficient. The empirical model therefore includes oil-price fluctuations, exchange-rate depreciation and inflation as explanatory variables, alongside lagged agricultural growth to account for persistence. The analysis focuses on their short-run relationships with agricultural value-added growth.

Given Nigeria's position as a price taker in the international crude oil market, the Brent crude oil price can reasonably be treated as externally determined relative to domestic agricultural growth. Nevertheless, this assumption does not automatically establish the exogeneity of all regressors or eliminate every potential source of endogeneity in the empirical model.

Data Sources and Collection

The study uses secondary annual time-series data; no survey or other primary data collection instrument was administered. The dataset was compiled from published sources, with raw series and derived variables recorded separately, as presented in Appendix Table A1. The data cover 1990–2024, yielding 35 annual observations for agricultural growth (AGRGR), the Brent crude oil price (OILP), the official exchange rate (EXR) and consumer-price inflation (INF), as summarised in Table 1.

Agricultural growth (AGRGR) is measured using the World Bank indicator Agriculture, forestry, and fishing, value added (annual % growth), code NV.AGR.TOTL.KD.ZG (World Bank, n.d.-a). The exchange rate (EXR) and inflation (INF) were obtained from the World Bank's World Development Indicators (World Bank, n.d.-b). The Brent crude oil price (OILP) is taken from the annual Brent series published by the U.S. Energy Information Administration and republished by the Federal Reserve Bank of St. Louis (U.S. Energy Information Administration, n.d.).

Oil-price fluctuations (OPF) and exchange-rate depreciation are calculated as the annual percentage changes in OILP and EXR, respectively. Consequently, 1990 serves as the base year for calculating these changes, and the estimation sample begins in 1991, yielding 34 annual observations before accounting for any additional losses arising from model specification and lag selection.

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Revisions across data vintages affect agricultural growth observations for 2020–2024 and the exchange rate for 2024. The latest official values are used in the principal analysis, while Section 5.6 examines whether using the earlier data vintage changes the empirical conclusions.

Table 1. Variables, definitions and sources

Variable	Definition	Series / source	Underlying source	Period
AGRGR	Agriculture, forestry and fishing, value added (annual % growth)	World Bank WDI indicator NV.AGR.TOTL.KD.ZG	World Bank / Nigerian official statistics; 2002–2003 provisionally from the CBN historical series (Section 4.1)	1990–2024
OILP	Annual average Brent crude oil price (US dollars per barrel)	EIA annual Brent spot price series, republished by FRED (ACOILBRENTEU)	U.S. Energy Information Administration / Federal Reserve Bank of St. Louis	1990–2024
EXR	Official exchange rate (naira per US dollar, period average)	World Bank WDI indicator PA.NUS.FCRF	IMF International Financial Statistics via World Bank	1990–2024
INF	Inflation, consumer prices (annual %)	World Bank WDI indicator FP.CPI.TOTL.ZG	IMF International Financial Statistics via World Bank	1990–2024

Source: Author's compilation from World Bank (n.d.-a, n.d.-b), U.S. Energy Information Administration (n.d.) and Central Bank of Nigeria (2008).

Agricultural growth in 2002 and 2003. The World Bank reports agricultural growth of 55.58% in 2002 and 7.01% in 2003, while the CBN (2008) reports 4.22% and 6.64%, respectively. The reason for this discrepancy remains unverified. Although Nigeria's 2014 GDP rebasing changed the base year from 1990 to 2010, the NBS (2014) does not establish that this explains the earlier differences. This study provisionally uses CBN figures for 2002–2003 and World Bank figures for other years. Section 5.6 reports sensitivity checks using the unadjusted World Bank figures, with and without impulse dummies. Other unusual values. The series records 321.90% exchange-rate depreciation in 1999 and 72.84% inflation in 1995. Both are retained as published, with a sensitivity check for 1999 reported in Section 5.6. The exchange rate is the period-average official rate, so major exchange-rate reforms appear as changes in the series. No observations are missing for 1990–2024.

Study area

The study area is Nigeria, at national level, with data at annual frequency for 1990–2024. Nigeria is an oil-exporting economy in which agriculture is a major productive sector (see the Introduction). Because oil-price fluctuations and exchange-rate depreciation are annual percentage changes, 1990 is the base year and the estimation sample is 1991–2024 (34 observations, 32 after lags). The results bear on how far agricultural policy and macroeconomic management should treat the oil-price cycle as a driver of agricultural growth. They should not be over-read: the sample is small and the data are national aggregates.

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Variable transformations and stationarity

The raw official exchange-rate level (₦ per US dollar) is not suitable for a time-series regression: augmented Dickey–Fuller (ADF) tests behave as if it were I(2) on 1990–2023 but give no stationary difference once 2024 is included, because the 2024 devaluation makes the series explosive (Appendix Table A3). The annual percentage change (depreciation) is stationary and is the primary exchange-rate variable, and the natural log of the level, which is I(1), is used as a robustness check. Stationarity of the other series is tested with ADF (Dickey and Fuller, 1979), Phillips–Perron (PP; Phillips and Perron, 1988) and KPSS (Kwiatkowski et al., 1992) tests (Section 5.2). With 32 observations these tests have low power, so the model is built to be valid whichever way the ambiguous series are classified.

Model specification

The short-run model is an ARDL(p, q_1, q_2, q_3) dynamic regression for agricultural growth (Pesaran, Shin and Smith, 2001):

$$AGR_t = \alpha + \Sigma_i \varphi_i AGR_{t-i} + \Sigma_k \delta_k OPF_{t-k} + \Sigma_k \lambda_k EXR_{t-k} + \Sigma_k \mu_k INF_{t-k} + \varepsilon_t$$

It is estimated by ordinary least squares. The coefficients are read as short-run dynamic associations, and the sum of the lag coefficients of a variable as that variable's cumulative association over the lags included. The sum of the autoregressive coefficients measures persistence, and the implied impulse response shows how long a shock to growth takes to fade. The bounds F-test for a levels relationship is not used to select the specification: it is designed for an I(1) dependent variable and becomes degenerate when the dependent variable is stationary (Pesaran, Shin and Smith, 2001; McNown, Sam and Goh, 2018), and the unit-root evidence on agricultural growth is unresolved (Section 5.2). The short-run objective does not require a long-run relationship or an error-correction term, so the bounds test is reported only as a supplementary check in Section 5.6. Because the oil-price, depreciation and (on most evidence) inflation series are stationary, inference on their coefficients generally has standard large-sample properties even when growth is highly persistent. As a check, the model is also estimated with growth in first differences. Because the oil-price, depreciation and inflation terms enter contemporaneously in the preferred specification, it is an autoregressive model with exogenous regressors, ARDL(2,0,0,0) being the case in which only growth has lags.

Estimation, lag selection and diagnostics

Lag orders are chosen by a grid search up to two lags for every variable, minimising the Akaike information criterion (AIC) on a common sample (1993–2024, 32 observations); the Schwarz criterion (SBC) is reported alongside. Where the two criteria disagree, the preferred model is chosen by parsimony and influence diagnostics (Cook's distance), not by the significance of coefficients. Heteroskedasticity-robust (HC3) standard errors are reported next to conventional ones. Diagnostics are the Jarque–Bera test, Breusch–Godfrey LM tests (orders 1 and 2), ARCH-LM, Breusch–Pagan, Ramsey RESET and the CUSUM test of recursive residuals. ADF tests use SBC lag selection with at most four lags and MacKinnon (1994) critical values. Robustness checks are the Akaike-selected model, impulse dummies for 1999 and 2024, the log exchange rate, two extra lags of the oil-price term, inflation in first differences, a post-1999 sample, the earlier data vintage,

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growth in first differences, the unadjusted World Bank values for 2002–2003 (with and without impulse dummies) a rebasing step dummy and a supplementary bounds test. Each objective is addressed as follows: objective (i) by the dynamic coefficients of OPF and their cumulative sum; objective (ii) by the coefficients on EXR and INF; objective (iii) by the autoregressive coefficients and the impulse response; and objective (iv) by drawing the results together in Sections 5.7 and 6.

Results and Discussion

The ARDL model is a short-run dynamic regression of agricultural growth on current and lagged oil-price fluctuations, exchange-rate depreciation and inflation. The estimation sample is 1991–2024 (34 observations), with 32 effective observations (1993–2024) after two lags. Agricultural growth for 2002 and 2003 takes the provisional CBN values described in Section 4.1.

Table 2. Descriptive statistics, 1991–2024 (n = 34)

Statistic	AGRGR (%)	OPF (%)	EXR (%)	INF (%)
Mean	4.09	7.42	23.38	19.04
Median	3.79	1.25	4.52	13.13
Maximum	7.41	68.88	321.90	72.84
Minimum	1.24	−47.14	−5.76	5.39
Std. dev.	1.75	28.37	58.94	15.98
Skewness	0.47	0.19	4.36	2.13
Excess kurtosis	−0.85	−0.54	21.05	4.07

Note: EXR is the annual percentage change in the official exchange rate (depreciation). Kurtosis is in excess of 3.
Source: Author's computation from Appendix Table A1.

Mean agricultural growth is 4.09 percent against a median of 3.79, with a standard deviation of 1.75 points and a range of 1.24 to 7.41 percent; the series is close to symmetric. Oil-price fluctuations average 7.42 percent with a standard deviation of 28.37 points, ranging from −47.14 to 68.88 percent. The extreme observations are the 1999 depreciation of 321.90 percent, about five standard deviations above the mean, which coincides with the move from a fixed official rate of about ₦21.89 per dollar to ₦92.34, and inflation of 72.84 percent in 1995.

Table 3. Correlation matrix, 1991–2024

	AGRGR	OPF	EXR	INF
AGRGR	1.00	0.21	−0.11	−0.39
OPF	0.21	1.00	0.07	−0.11
EXR	−0.11	0.07	1.00	0.00
INF	−0.39	−0.11	0.00	1.00

Source: Author's computation from Appendix Table A1.

The simple correlation between growth and oil-price fluctuations is positive but small (0.21), and that with depreciation is −0.11. Growth and inflation are negatively correlated (−0.39), which mainly

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reflects the early 1990s, when inflation was very high and growth was low. As Section 5.4 shows, this association disappears once the persistence of growth is controlled. No other pair exceeds 0.11 in absolute value.

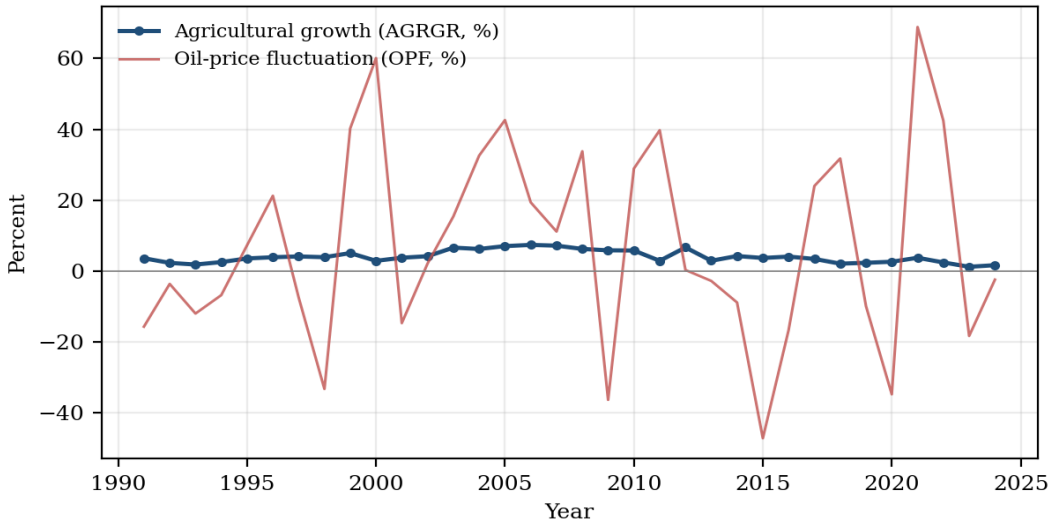


Figure 1. Agricultural growth (AGRGR) and oil-price fluctuation (OPF), 1991–2024
Source: Author's compilation from Appendix Table A1.

Unit-root and stationarity tests

Table 4. Unit-root and stationarity tests, 1991–2024

Variable	ADF, constant (τ, lag)	ADF, constant + trend (τ, lag)	PP, constant	KPSS (level)	Reading
AGRGR	−1.07 (1)	−1.25 (1)	−2.15	0.25	Unit root not rejected by ADF or PP, stationarity not rejected by KPSS; first difference stationary (−9.82)
OPF	−5.78 (1)	−5.67 (1)	−5.21	0.11	Stationary
EXR (% change)	−5.27 (0)	−5.17 (0)	−5.23	0.11	Stationary
INF	**−2.72 (1)**	**−2.16 (0)**	**−2.41**	**0.29**	**I(0) or I(1), not I(2); first difference stationary (−5.43)**

Note: critical values (MacKinnon, 1994, response surface, T = 32 effective observations): constant −2.96 (5%) and −2.62 (10%); constant and trend −3.56 (5%). PP uses a Newey–West (Bartlett) long-run variance with lag 3. KPSS critical values for the level case are 0.35 (10%), 0.46 (5%) and 0.74 (1%). The null of ADF and PP is a unit root; the null of KPSS is stationarity. ADF lags (in parentheses) are chosen by the Schwarz criterion.
Source: Author's computation from Appendix Table A1.

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Oil-price fluctuations and depreciation are stationary by all three tests. Inflation is unresolved: ADF (−2.72) and PP (−2.41) do not reject a unit root at 5 percent while KPSS does not reject stationarity, and its first difference is stationary, so it is I(0) or I(1) but not I(2). Agricultural growth is also unresolved: the ADF statistic does not reject a unit root, PP gives −2.15, and KPSS does not reject stationarity (0.25). No variable is I(2). The ambiguity about growth is consistent with its strong persistence (Section 5.4) and with the low power of unit-root tests in 32 observations. For this reason the study treats the model as a short-run dynamic regression with stationary regressors, reports persistence explicitly and checks the results with growth in first differences (Section 5.6).

Model selection and lag structure

Table 5. Lag selection (maximum two lags, common sample 1993–2024, n = 32)

Model, ARDL(p, q_1, q_2, q_3)	AIC	SBC	Adjusted R^2	Note
ARDL(2, 0, 0, 0)	22.07	30.87	0.46	Preferred (lowest SBC)
ARDL(2, 0, 1, 0)	20.67	30.93	0.50	Lowest AIC
ARDL(2, 1, 0, 0)	22.52	32.78	0.47	
ARDL(2, 1, 1, 0)	21.47	33.20	0.50	
ARDL(1, 0, 0, 0)	26.18	33.51	0.37	
ARDL(0, 0, 0, 0)	37.63	43.49	0.08	Static regression

Note: ARDL(p, q_1, q_2, q_3) refers to the lags of AGRGR, OPF, EXR and INF. AIC and SBC omit the constant used in some packages; rankings are unaffected. Only selected models from the 81-model grid are shown.

Source: Author's computation from Appendix Table A1.

Both criteria select two lags of agricultural growth. The AIC adds a lag of depreciation, ARDL(2,0,1,0), but that model has seven coefficients on 32 observations and carries the 1999 devaluation through the lagged exchange-rate term (Cook's distance 2.64 for 2000). The SBC selects ARDL(2,0,0,0), and its SBC is almost identical to that of the AIC model (30.87 and 30.93 respectively). The SBC model is therefore preferred on parsimony and influence grounds, not because of any coefficient's significance. The AIC model is reported in Appendix Table A2, and the oil-price coefficient is insignificant in both. A static regression with no lagged growth fits far worse, which confirms that persistence is the main feature of the series.

Short-run estimates

Table 6. Short-run ARDL(2,0,0,0) estimates, dependent variable AGRGR (n = 32, 1993–2024)

Variable	Coefficient	Std. error	t-statistic	p-value	p-value (HC3)	95% CI
Constant	0.39	1.03	0.38	0.71	0.70	[−1.72, 2.51]
AGR(-1)	0.43	0.20	2.17	0.04	0.12	[0.02, 0.83]
AGR(-2)	0.44	0.19	2.34	0.03	0.07	[0.05, 0.82]
OPF	0.0018	0.0086	0.21	0.83	0.84	[−0.016, 0.020]
EXR	0.0014	0.0041	0.35	0.73	0.91	[−0.007, 0.010]
INF	0.0035	0.0175	0.20	0.85	0.87	[−0.033, 0.039]

Note: R^2 = 0.55, adjusted R^2 = 0.46; $F(5,26) = 6.34$ ($p < 0.001$). HC3 = heteroskedasticity-robust standard errors. The 95% interval uses the t distribution with 26 degrees of freedom. The joint test

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that the OPF, EXR and INF coefficients are all zero gives $F(3,26) = 0.07$ ($p = 0.97$). A model with only the two lags of growth has $R^2 = 0.55$.

Source: Author's computation from Appendix Table A1.

The model explains 55 percent of the variation in growth, but almost all of that comes from the lags of growth itself: a model with only two autoregressive terms has an R^2 of 0.55. The oil-price coefficient is 0.002 ($p = 0.83$, 95% interval −0.016 to 0.020). In units, a ten-point rise in the Brent price in a given year is associated with a change in agricultural growth of 0.02 percentage points, and the interval is inconsistent with changes larger than about 0.2 points in either direction. An absence of significance is not proof of any effect, but in this sample large short-run effects are inconsistent with the estimates. Depreciation (0.001, $p = 0.73$) and inflation (0.003, $p = 0.85$) are also insignificant, and the three coefficients are jointly insignificant ($p = 0.97$). The negative simple correlation between inflation and growth in Table 3 does not survive once lagged growth is included.

The two autoregressive coefficients (0.43 and 0.44) are significant with conventional standard errors and borderline with HC3 errors, and they sum to 0.87 (standard error 0.19). Growth is therefore highly persistent: Figure 3 shows that a one-point shock to growth is followed by about 0.4 points one year later, 0.6 points two years later and still about 0.3 points after eight years. The estimate is imprecise, and a unit root cannot be excluded, so this persistence should be read as a feature of the sample rather than a precise parameter.

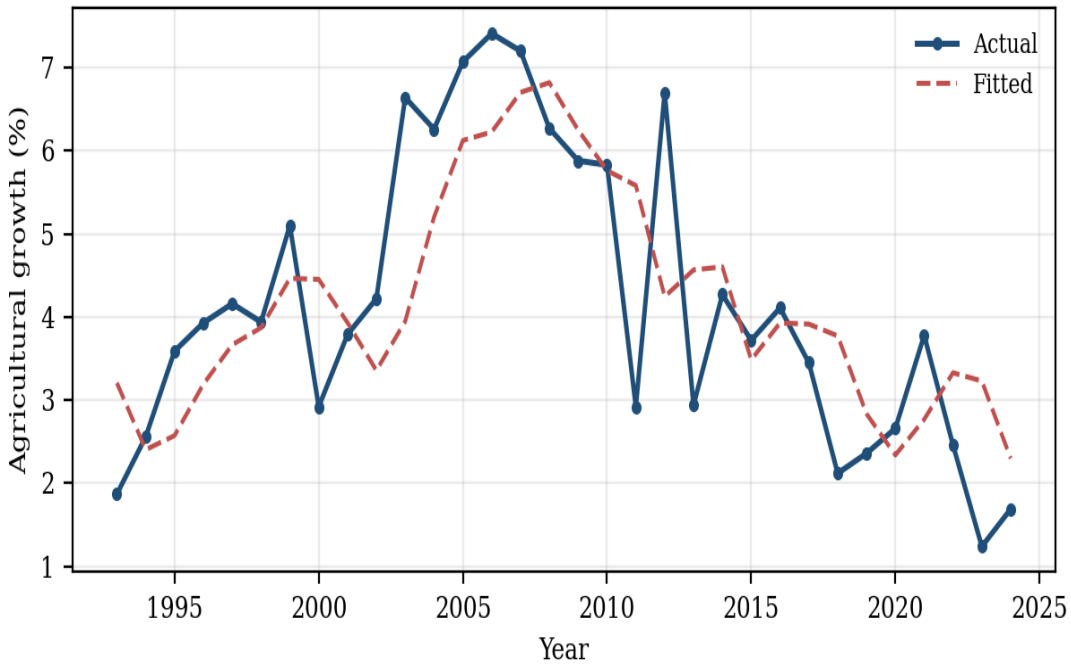


Figure 2. Actual and fitted agricultural growth, ARDL(2,0,0,0)

Source: Author's computation from the estimates in Table 6.

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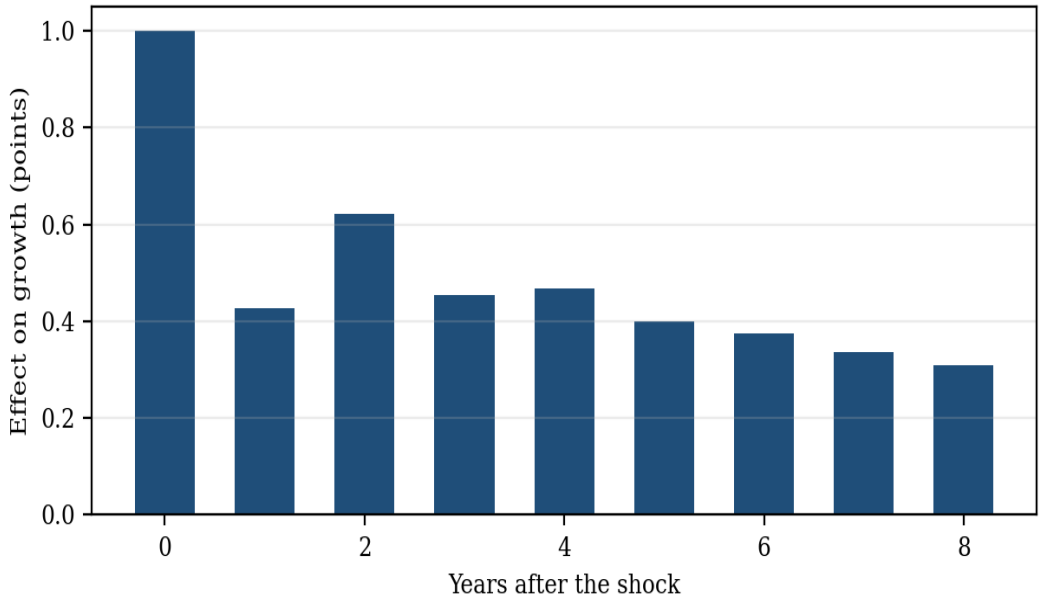


Figure 3. Implied response of agricultural growth to a one-point shock to growth
Source: Author's computation from the estimates in Table 6.

Diagnostic and stability tests

Table 7. Residual diagnostics, ARDL(2,0,0,0) (n = 32)

Test	Statistic	p-value
Jarque–Bera (normality)	0.02	0.99
Breusch–Godfrey LM, order 1	0.22	0.64
Breusch–Godfrey LM, order 2	0.41	0.82
ARCH-LM, order 1	1.19	0.28
Breusch–Pagan	2.48	0.78
Ramsey RESET (F, squared fitted)	0.07	0.80

Note: the CUSUM maximum ratio to the 5% bound is 0.64; values below 1 are inside the bounds (Figure 4). The largest Cook's distance is 1.94 for 1999, against a flag threshold of 4/n = 0.13; no other year exceeds 0.17.
Source: Author's computation from Appendix Table A1.

No diagnostic test rejects at the 5 percent level: the residuals show no sign of non-normality, serial correlation, ARCH effects, heteroskedasticity or functional-form misspecification, and CUSUM stays within its bounds. The one influential observation is 1999, which carries the large devaluation; the 1999 dummy in Section 5.6 shows that it does not change the results. No single test shows that a model is fully valid, and with 32 observations the tests have limited power.

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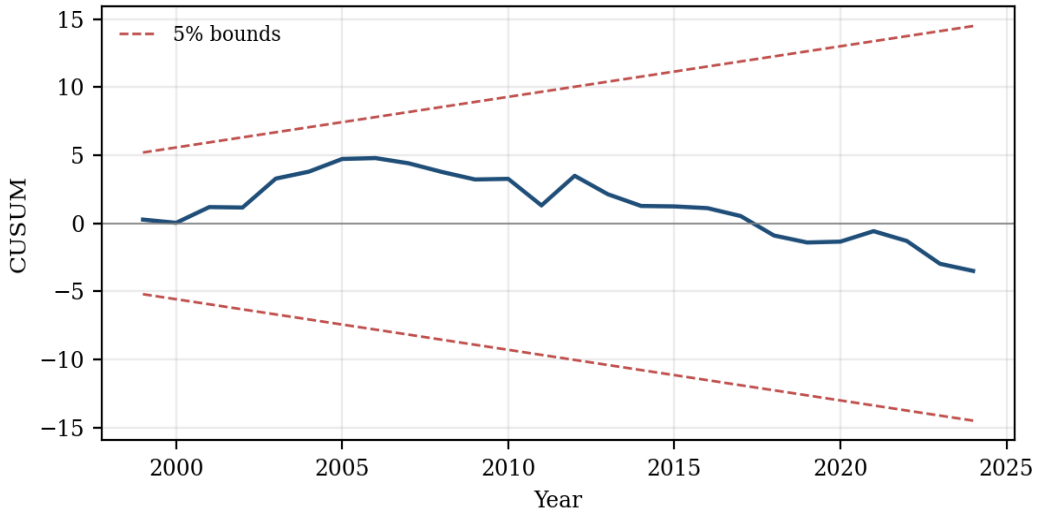


Figure 4. CUSUM test of parameter stability, ARDL(2,0,0,0)
Source: Author's computation from Appendix Table A1.

Robustness

Table 8. Robustness of the oil-price coefficient (OPF)

Variant	OPF coefficient	Std. error	p-value	p-value (HC3)	p (EXR)	p (INF)	n
Baseline: ARDL(2,0,0,0)	0.0018	0.0086	0.83	0.84	0.73	0.85	32
Akaike model: ARDL(2,0,1,0)	0.0069	0.0089	0.45	0.44	0.80	0.89	32
With 1999 impulse dummy	−0.0007	0.0087	0.94	0.94	0.28	0.77	32
With 2024 impulse dummy	0.0017	0.0088	0.85	n/a	0.63	0.82	32
Log exchange rate in place of depreciation	0.0043	0.0084	0.62	0.63	0.20	0.61	32
Oil price with two lags added	0.0062	0.0097	0.53	0.33	0.93	0.87	32
Post-1999 sample (2001–2024)	0.0018	0.0135	0.90	0.91	0.70	0.96	24
Inflation in first differences	0.0016	0.0086	0.85	0.86	0.72	0.52	32
Previously supplied 2020–24 data	−0.0019	0.0080	0.81	0.79	0.56	0.59	32
First-differenced growth (ΔAGR) as dependent variable	0.0004	0.0083	0.96	0.96	0.58	0.50	32
World Bank 2002–2003 values, unadjusted	−0.0033	0.0639	0.96	0.89	0.76	0.50	32
World Bank 2002–2003 values, with impulse dummies for 2002–2004	0.0005	0.0080	0.95	n/a	0.55	0.66	32
Rebasing step dummy, 2010 onward	0.0031	0.0081	0.70	0.76	0.95	0.42	32
Rebasing step dummy, 2014 onward	0.0023	0.0083	0.79	0.83	0.92	0.50	32

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Note: Each row presents a robustness test using the stated model modification. World Bank figures replace CBN values for 2002–2003; additional dummies control for unusual observations. HC3 standard errors are unavailable where leverage is one.
Source: Author's computation from Appendix Table A1.

The oil-price coefficient stays close to zero and insignificant in every variant, ranging from −0.003 to 0.007 with p-values of 0.45 or higher. Adding two further lags of oil-price fluctuations leaves the cumulative association at 0.003 (standard error 0.018, p = 0.86), so there is no delayed effect within two years either. Depreciation and inflation are insignificant in every variant (p of 0.20 or higher for depreciation and 0.42 or higher for inflation). The conclusion does not depend on the 1999 or 2024 observations, the choice of lag model, the form of the exchange-rate variable, the sample period or the data vintage, and it holds when growth is differenced, so it does not rest on settling whether growth is stationary. Using the unadjusted World Bank values for 2002 and 2003 inflates the standard error of the oil-price coefficient sharply (0.0639 against 0.0086) and removes the persistence of growth, because the single 2002 value of 55.58 percent dominates the sample; once impulse dummies absorb 2002–2004, the coefficient is again essentially zero (0.0005, p = 0.95). The conclusion therefore does not depend on the CBN substitution, although the unadjusted series is not informative on its own. As a supplementary check, the bounds F-statistic for a levels relationship is 1.10, below the 5 percent lower critical bound of 3.23 for three regressors (Pesaran, Shin and Smith, 2001; asymptotic bounds, and small-sample bounds are higher), so there is no evidence of a long-run levels relationship, which is consistent with the short-run focus of the study. A step dummy for the rebased series (2010 onward) is negative and significant (−1.13 points, p = 0.04), consistent with the NBS caution that rebasing lowered sectoral growth rates, but it leaves the oil-price coefficient essentially unchanged (0.003, p = 0.70).

Discussion

Objective (i): short-run effect of oil-price fluctuations. Oil-price fluctuations are not associated with agricultural growth in the short run. The current-year coefficient is essentially zero, the cumulative association over three years is also zero, and the interval is inconsistent with effects larger than about 0.2 percentage points of growth for a ten-point change in the oil price.

Objective (ii): exchange rate and inflation. Depreciation and inflation are not significantly related to agricultural growth in any specification, and the three macroeconomic regressors are jointly insignificant. This is an absence of evidence in a small sample of national aggregates, not proof that exchange-rate and price movements never matter for particular crops or inputs.

Objective (iii): persistence. Growth is the only strongly informative variable in the model. The autoregressive terms sum to 0.87, so a shock to growth, whatever its source, fades slowly over several years. This persistence, rather than any macroeconomic variable, accounts for most of the model's explanatory power.

The comparison is limited because outcome measures, periods and estimators differ across studies. Ogede (2020a) and Ozokede and Awogbemi (2025) report positive but statistically insignificant effects of oil-price volatility on sector output and on GDP growth respectively, which is consistent in kind with the insignificant oil-price coefficient found here, although both use

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volatility measures rather than annual price changes. The insignificant oil-price coefficient is also consistent with Olanipekun and Usman (2019) for India, who find no significant effect of the oil price on agricultural production in the short or long run, with Burakov (2016) for Russian agricultural prices, and with Salaudeen (2023), who finds an insignificant short-run effect of oil revenue on Nigerian non-oil output, although these studies differ in outcome, sample and method. Other studies report negative effects, including Ogede (2020b) on agricultural output growth, Hammayo (2020) and Popoola et al. (2022) on agricultural productivity, Ike, Usman and Köksal (2025) on food-sector production and Mgbomene et al. (2025) on aggregate growth. Ogede (2020b) is the closest to this study, since it also relates agricultural growth to oil-price changes for Nigeria, and it finds a significant negative association using quantile regression over 1995–2019. The present result differs, and the difference may reflect the estimator, the sample period, the way the oil-price variable is constructed, the inclusion of lagged growth and controls, or the treatment of the 2002 observation; this study does not test which. What it adds is a short-run result on annual value-added growth that is robust to the choices examined in Section 5.6. The insignificant exchange-rate coefficient differs from Udeaja and Udoh (2014), who report a positive and significant effect of the exchange rate on agricultural output over 1970–2010, although their model also contains fiscal, credit and interest-rate variables that this study does not include.

Conclusions

This study examined the short-run effect of oil-price fluctuations on agricultural sector growth in Nigeria using annual data for 1990–2024. Using provisional CBN values for 2002–2003 in place of the conflicting World Bank figures, it estimated a short-run ARDL model of agricultural growth on oil-price fluctuations, exchange-rate depreciation and inflation. On the three analytical objectives: (i) oil-price fluctuations have no significant short-run association with agricultural growth, and large effects are not supported by the estimates; (ii) exchange-rate depreciation and inflation are also not significantly related to agricultural growth; and (iii) agricultural growth is highly persistent, so slowdowns fade slowly. The results are robust to alternative lag structures, impulse dummies, and the form of the exchange-rate variable, the sample period, and the data vintage and differencing of growth.

The findings are short-run statistical associations in a small sample.

Limitations

This study has some limitations. First, national-level data may conceal differences across regions and farming systems. Second, factors such as rainfall, insecurity, public agricultural spending and access to credit were not included in the model. Third, the small sample of 32 observations limits statistical power; therefore, insignificant results do not prove the absence of an effect. Fourth, the 2002–2003 agricultural growth figures remain subject to an unresolved discrepancy between data sources. Finally, the 2014 national accounts rebasing means that growth rates across the 1990–2024 period are not strictly comparable, although the robustness test with a step dummy leaves the oil-price result unchanged (NBS, 2014; Table 8).

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Recommendations

Based on the study's findings, the following recommendations are proposed:

1. Decouple agricultural programmes from oil-price fluctuations. Since short-run oil price changes show no significant association with agricultural growth, agricultural planning should not depend on oil-price movements.

2. Protect agricultural funding from oil-revenue shocks. Although the fiscal channel was not tested, multi-year funding commitments and stabilisation buffers could help maintain agricultural programmes during revenue downturns.

3. Prepare for persistent growth slowdowns. The estimated persistence of agricultural growth supports considering contingency measures for inputs and storage, although their effectiveness requires further evaluation.

4. Prioritise agriculture-specific growth drivers. Further attention should be given to productivity, irrigation, input access and farm security, which were not directly examined in this study.

5. Target input-cost interventions carefully. Since depreciation and inflation show no significant relationship with national agricultural growth, targeted support should be guided by evidence from input prices and affected subsectors.

6. Reconcile agricultural growth data. The NBS, CBN and World Bank should clarify the 2002–2003 discrepancies and document revisions to improve data consistency and reliability.

7. Expand future research. Further studies should examine agricultural subsectors, oil-price volatility, asymmetric price movements, agricultural spending, credit, weather and state-level data to improve understanding of these relationships.

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Appendix: Data and Supplementary Estimates

Table A1. Annual data, 1990–2024

Year	AGRGR (WDI)	AGRGR (used)	AGRGR (earlier vintage)	OILP ($/bbl)	OPF (%)	EXR (₦/$)	EXR change (%)	INF (%)
1990	4.17	4.17	—	23.76	—	8.04	—	7.36
1991	3.64	3.64	—	20.04	−15.66	9.91	23.28	13.01
1992	2.34	2.34	—	19.32	−3.59	17.30	74.56	44.59
1993	1.87	1.87	—	17.01	−11.96	22.07	27.56	57.17
1994	2.56	2.56	—	15.86	−6.76	22.00	−0.31	57.03
1995	3.59	3.59	—	17.02	7.31	21.90	−0.46	72.84
1996	3.93	3.93	—	20.64	21.27	21.88	−0.05	29.27
1997	4.16	4.16	—	19.11	−7.41	21.89	0.01	8.53
1998	3.94	3.94	—	12.76	−33.23	21.89	0.00	10.00
1999	5.10	5.10	—	17.90	40.28	92.34	321.90	6.62
2000	2.92	2.92	—	28.66	60.11	101.70	10.14	6.93
2001	3.79	3.79	—	24.46	−14.65	111.23	9.37	18.87
2002	55.58	4.22	—	24.99	2.17	120.58	8.40	12.88
2003	7.01	6.64	—	28.85	15.45	129.22	7.17	14.03
2004	6.26	6.26	—	38.26	32.62	132.89	2.84	15.00
2005	7.07	7.07	—	54.57	42.63	131.27	−1.21	17.86
2006	7.41	7.41	—	65.16	19.41	128.65	−2.00	8.23
2007	7.20	7.20	—	72.44	11.17	125.81	−2.21	5.39
2008	6.27	6.27	—	96.94	33.82	118.57	−5.76	11.58
2009	5.88	5.88	—	61.74	−36.31	148.88	25.57	12.54
2010	5.83	5.83	—	79.61	28.94	150.30	0.95	13.74
2011	2.92	2.92	—	111.26	39.76	153.86	2.37	10.83
2012	6.70	6.70	—	111.63	0.33	157.50	2.36	12.22
2013	2.94	2.94	—	108.56	−2.75	157.31	−0.12	8.50
2014	4.27	4.27	—	98.97	−8.83	158.55	0.79	8.05
2015	3.72	3.72	—	52.32	−47.14	192.44	21.37	9.01
2016	4.11	4.11	—	43.64	−16.59	253.49	31.72	15.70
2017	3.45	3.45	—	54.13	24.04	305.79	20.63	16.50
2018	2.12	2.12	—	71.34	31.79	306.08	0.10	12.10
2019	2.36	2.36	—	64.30	−9.87	306.92	0.27	11.40
2020	2.66	2.66	2.17	41.96	−34.74	358.81	16.91	13.25
2021	3.78	3.78	2.13	70.86	68.88	401.15	11.80	16.95
2022	2.46	2.46	1.88	100.93	42.44	425.98	6.19	18.85
2023	1.24	1.24	1.13	82.49	−18.27	645.19	51.46	24.66
2024	1.69	1.69	1.19	80.52	−2.39	1478.97	129.23	33.24

Note: OPF and EXR change are calculated from the levels. The earlier vintage also uses an exchange rate of ₦1,486.57 for 2024. AGRGR (used) differs from AGRGR (WDI) only in 2002 and 2003.
Source: Author's compilation from World Bank (n.d.-a, n.d.-b), U.S. Energy Information Administration (n.d.) and Central Bank of Nigeria (2008).

Table A2. Akaike-selected model: ARDL(2,0,1,0), dependent variable AGRGR (n = 32)

Variable	Coefficient	Std. error	p-value	p-value (HC3)
Constant	0.73	1.02	0.48	0.41
AGR(-1)	0.41	0.19	0.04	0.13
AGR(-2)	0.41	0.18	0.03	0.08
OPF	0.0069	0.0089	0.45	0.44
EXR	0.0010	0.0039	0.80	0.92
EXR(-1)	−0.0070	0.0042	0.11	0.67
INF	0.0024	0.0170	0.89	0.90

Note: $R^2 = 0.60$, adjusted $R^2 = 0.50$. Cook's distance for 2000 is 2.64 because EXR(−1) carries the 1999 devaluation. This model is not preferred.
Source: Author's computation from Appendix Table A1.

Table A3. ADF statistics for the exchange rate in levels and transformations

Series	1990–2023	1990–2024	Reading
Level (₦/US$)	3.43	1.17	Not stationary
First difference	−1.46	6.51	Not stationary in either sample
Second difference	−4.70	2.58	Stationary to 2023 only: I(2) to 2023; explosive with 2024
Natural log of level	—	−0.66	Not stationary (PP −0.66; KPSS 0.921)
First difference of log	—	−4.58	Stationary: the log level is I(1)

Note: constant-only ADF with Schwarz lag selection. The 5% critical value is about −2.95 to −2.96.
Source: Author's computation from Appendix Table A1.

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Table A4. Summary of the studies reviewed

Study	Setting and method	Outcome	Finding on oil prices
Akinleye and Ekpo (2013)	Nigeria; VAR	Real GDP	Positive oil-price shocks have stronger effects than negative ones
Iwayemi and Fowowe (2011)	Nigeria	Macroeconomic variables	No major impact on most variables
Umoru, Ohiomu and Akpeke (2018)	Nigeria; VAR	Exchange rate, reserves, spending, real GDP	Unstable oil prices have adverse effects
Mgbomene et al. (2025)	Nigeria; quarterly, 1990–2023	Economic growth	Significant negative effect of volatility
Ozokede and Awogbemi (2025)	Nigeria; ARDL, 1990–2023	GDP growth	Positive but insignificant effect of volatility, short and long run
Ogede (2020a)	Nigeria; ARDL	Agriculture, manufacturing, transport	Positive but insignificant effect of price shifts
Ogede (2020b)	Nigeria; quantile regression, 1995–2019	Agricultural output growth	Negative effect of crude-oil prices
Ike, Usman and Köksal (2025)	Nigeria; ARDL, 1970–2019	Food and livestock sub-sectors	Price increase undercuts food-sector production in the long run
Popoola et al. (2022)	Nigeria; Hodrick–Prescott filter	Agricultural productivity	Negative relationship
Hammayo (2020)	Nigeria; non-linear ARDL, 1987–2020	Agricultural productivity	Falling oil prices significantly reduce productivity, short and long run
Chen et al. (2020)	Oil exporters; FMOLS and DOLS, quarterly 2000–2019	Food prices	Inverse long-run relationship in high-income exporters
Oseni and Kinbode (2018)	Nigeria; non-linear ARDL, monthly 1997–2016	Maize, wheat and soybean prices	Oil-price increases raise prices
Yusuf, Salau and Adeiza (2024)	Nigeria; non-linear ARDL, monthly 2018–2021	Food prices	Only price increases matter in the short run
Udeaja and Udoh (2014)	Nigeria; ARDL bounds, 1970–2010	Agricultural output	Exchange rate and government expenditure positive and significant (not an oil study)
Hatzenbuehler and Mavrotas (2017)	Nigeria (Cross River state)	Agricultural programme funding	Oil price affects fiscal conditions
Olanipekun and Usman (2019)	India; Bayer–Hanck and ARDL, 1985–2017	Agricultural production	No significant effect, short or long run
Burakov (2016)	Russia	Agricultural prices	Not sensitive in the short term; no long-run causality
Salaudeen (2023)	Nigeria	Non-oil sector output	Positive but insignificant short-run effect of oil revenue
Anowor et al. (2025)	18 African oil producers; GMM	Agricultural exports	Insignificant effects of exchange rates, inflation and commodity prices
This study	Nigeria; ARDL(2,0,0,0), 1993–2024	Agricultural growth	Insignificant; interval inconsistent with effects above about 0.2 points per 10-point price change

Source: Author's compilation from the studies cited.

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