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Nigeria-South Africa Agricultural Trade Relations and Its Implications for Domestic Agricultural Production in Nigeria

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ABSTRACT

This study examines the impact of Nigeria's importation of textile fabrics and agricultural raw materials from South Africa on the agricultural sector output of Nigeria. Utilizing secondary quarterly time-series data spanning twenty-eight years (1996 to 2023), the empirical model expresses agricultural sector output (AGRT) as a function of textile fabric imports (TEX), agricultural raw material imports (AGRM), the real exchange rate (RER), real GDP growth (GDPG), and an institutional quality index (IQX). The analytical framework relies on the Autoregressive Distributed Lag (ARDL) bounds testing technique to accommodate variables with a mixed order of integration and evaluate both short- and long-run cointegrating vectors. The empirical results from the ARDL F-Bounds test establish a strong long-run relationship among the variables (F-statistic = 21.33, exceeding the upper bound critical value at 5%). In the long run, both textile fabric imports (β=0.4622, $p<0.01$) and agricultural raw material imports (β=0.0874, $p<0.05$) exert positive and statistically significant impacts on Nigeria's agricultural output, suggesting that these imports provide essential intermediate inputs and value-chain linkages that complement domestic production. Conversely, short-run estimates reveal that textile imports are statistically insignificant, while the error correction term confirms that 16.36% of short-run disequilibrium is corrected annually toward long-run equilibrium. Diagnostic tests confirm the absence of serial correlation and heteroscedasticity, while CUSUM plots validate parameter stability. Consequently, the null hypothesis is rejected. The study concludes that while imported raw materials currently drive long-run sectoral growth, policymakers must implement targeted domestic capacity-building strategies to reduce vulnerabilities to external trade dynamics.

Keywords: Agricultural Trade, Sectoral Output, ARDL Bounds Test, Error Correction Model, Nigeria, South Africa

INTRODUCTION

Nigeria–South Africa agricultural trade relations constitute an important component of intra-African trade and have significant implications for domestic agricultural production in Nigeria. Trade relations between the two countries have expanded under regional and continental integration initiatives, facilitating the exchange of agricultural commodities, processed food products, agricultural inputs, and technologies. The relationship presents both opportunities and challenges for Nigeria's agricultural sector, particularly in terms of productivity, competitiveness, and food security.

Agricultural trade with South Africa provides Nigerian farmers and agribusinesses access to improved agricultural inputs, machinery, and technologies that may not be readily available domestically. The importation of agricultural inputs can enhance productivity through the adoption of modern farming techniques and improved production processes. Evidence

indicates that imported agricultural inputs contribute positively to crop yield performance and productivity growth in Nigeria and the wider West African region (Yusuf & Eze, 2020; Olajide et al., 2023). Similarly, agricultural imports can facilitate technology transfer and knowledge diffusion, thereby strengthening the productive capacity of local farmers and agro-processing firms (Okonkwo & Ude, 2020; Olajide et al., 2023).

Despite these benefits, increased agricultural imports from South Africa may exert competitive pressure on domestic producers. Agricultural commodities imported at relatively lower prices can reduce the market share of local farmers, especially when domestic production systems remain characterized by low productivity and inadequate infrastructure. Ogunleye and Adedayo (2020) observed that rising agricultural imports could discourage local production when domestic producers are unable to compete effectively. Trade-induced competition may therefore lead to reduced incentives for investment in local agricultural production, particularly among smallholder farmers.

The impact of agricultural trade relations is also influenced by Nigeria's broader trade structure and sectoral linkages. Strong linkages between agriculture and other sectors of the economy enhance the ability of domestic producers to benefit from international trade opportunities. Adewuyi and Oyejide (2019) argued that trade structure and sectoral interconnections play a crucial role in determining the developmental outcomes of trade. Consequently, agricultural trade with South Africa can stimulate domestic production when supported by effective industrial and agricultural policies that strengthen value chains and processing industries.

Exchange rate movements further shape the implications of bilateral agricultural trade. Exchange rate volatility affects the cost of imports and the competitiveness of domestic agricultural products. Research has shown that fluctuations in exchange rates significantly influence agricultural sector performance and export competitiveness in Nigeria (Yusuff & Adeniyi, 2022; Lawal et al., 2021). Persistent depreciation of the naira may increase the cost of imported agricultural inputs from South Africa, thereby limiting their accessibility to Nigerian farmers. At the same time, exchange rate adjustments can enhance the competitiveness of locally produced agricultural goods in regional markets (Eyo, 2019).

The effectiveness of Nigeria's agricultural response to trade relations with South Africa also depends on institutional quality and agricultural reforms. Strong institutions, good governance, and supportive agricultural policies create an environment in which trade benefits can translate into higher productivity and sustainable agricultural development (Asiedu & Freeman, 2020; Ogunniyi et al., 2021). Institutional reforms that improve access to credit, extension services, and market information can help domestic producers capitalize on opportunities arising from bilateral trade.

The motivation for this study stems from the growing importance of intra-African trade and the increasing agricultural trade interactions between Nigeria and South Africa, two of Africa's largest economies. Despite the expansion of bilateral trade, concerns remain regarding whether agricultural imports from South Africa stimulate domestic agricultural production through technology transfer and improved input availability or undermine local producers through increased competition. Existing studies have shown that agricultural imports can enhance productivity by facilitating access to modern inputs and technologies (Okonkwo & Ude, 2020; Yusuf & Eze, 2020). Similarly, agricultural imports have been linked to productivity growth and technology diffusion across West Africa (Olajide et al., 2023).

However, evidence also suggests that increased agricultural imports may negatively affect domestic production when local producers are unable to compete effectively with imported products (Ogunleye & Adedayo, 2020). Although Okafor and Mthembu (2019) examined the impact of bilateral trade between Nigeria and South Africa on agricultural and manufacturing

sectors, limited attention was given to the specific implications of agricultural trade relations for domestic agricultural production in Nigeria. This creates a knowledge gap regarding the extent to which trade with South Africa promotes or constrains agricultural output growth. Furthermore, studies on trade, productivity, and sectoral linkages in Nigeria have largely focused on aggregate trade effects rather than country-specific agricultural trade relationships (Adewuyi & Oyejide, 2019; Olayiwola & Lawal, 2022). The study is therefore motivated by the need to provide empirical evidence on how Nigeria–South Africa agricultural trade relations influence domestic agricultural production, thereby informing policies aimed at enhancing agricultural competitiveness, food security, and sustainable agricultural development.

Research Question

What is the extent of the impact of Nigeria's importation of textile fabrics and agricultural raw materials from South Africa on the agricultural sector output of Nigeria?

Research Hypotheses

Nigeria's importation of textile fabrics and agricultural raw materials from South Africa does not have any significant effect on the agricultural sector output of Nigeria.

METHODS

Model development

The model is articulated in a functional format as follows:

$$AGRT = f(TEX, AGRM, RER, RGDPG, IQX) \quad (1)$$

Where AGRM = agricultural raw materials, TEX = textile fabric. Every other variable remains as defined before.

Transforming equation (1) into a generalized form of the ARDL model following econometric specification is given as:

$$LOGAGRT_t = \alpha_0 + \sum_{j=1}^{\rho} \sigma_j \, LOGAGRT_{t-j} + \sum_{i=0}^{\gamma} \delta_i \, LOGTEX_{t-i} + \sum_{k=0}^{\gamma} \theta_k \, LOGAGRM_{t-k} + \sum_{d=0}^{\gamma} \tau_d \, RER_{t-d} + \sum_{s=0}^{\gamma} \varphi_s \, RGDPG_{t-s} + \sum_{q=0}^{\gamma} \vartheta_q \, IQX_{t-q} + \varepsilon_t \quad (2)$$

The limits test for cointegration is conducted using the provided conditional ARDL (p, γ) model.

$$\Delta LOGAGRT_t = \alpha_0 + \beta_j LOGAGRT_{t-j} + \omega_i LOGTEX_{t-i} + \psi_k LOGAGRM_{t-k} + \Omega_d RER_{t-d} + \phi_s RGDPG_{t-s} + \infty_q IQX_{t-q} + \sum_{j=1}^{\rho} \sigma_j \, \Delta LOGAGRT_{t-j} + \sum_{i=0}^{\gamma} \delta_i \, \Delta LOGTEX_{t-i} + \sum_{k=0}^{\gamma} \theta_k \, \Delta LOGAGRM_{t-k} + \sum_{d=0}^{\gamma} \tau_d \, \Delta RER_{t-d} + \sum_{s=0}^{\gamma} \varphi_s \, \Delta RGDPG_{t-s} + \sum_{q=0}^{\gamma} \vartheta_q \, \Delta IQX_{t-q} + \varepsilon_t \quad (3)$$

The hypothesis for the limits test posits that the coefficients of the long-run equation are all equal to zero, in contrast to the alternative that they are not equal to zero.

$$H_0: \beta_j = \omega_i = \psi_k = \Omega_d = \phi_s = \infty_q = 0 \quad (4)$$

Nevertheless, the study can only delineate the short-run model, specifically the ARDL (p, γ) model, if the null hypothesis (indicating the absence of cointegration) cannot be rejected. The ARDL model is articulated as follows:

$$\Delta LOGAGRT_t = \alpha_0 + \sum_{j=1}^{\rho} \sigma_j \, \Delta LOGAGRT_{t-j} + \sum_{i=0}^{\gamma} \delta_i \, \Delta LOGTEX_{t-i} + \sum_{k=0}^{\gamma} \theta_k \, \Delta LOGAGRM_{t-k} + \sum_{d=0}^{\gamma} \tau_d \, \Delta RER_{t-d} + \sum_{s=0}^{\gamma} \varphi_s \, \Delta RGDPG_{t-s} + \sum_{q=0}^{\gamma} \vartheta_q \, \Delta IQX_{t-q} + \varepsilon_t \quad (5)$$

Therefore, the short-run and long-run model, specifically the error correction model (ECM), can be delineated if we can reject the null hypothesis, indicating the presence of cointegration. The error correction model (ECM) is delineated as follows:

$$\Delta LOGAGRT_t = \alpha_0 + \sum_{j=1}^{\rho} \sigma_j \, \Delta LOGAGRT_{t-j} + \sum_{i=0}^{\gamma} \delta_i \, \Delta LOGTEX_{t-i} + \sum_{k=0}^{\gamma} \theta_k \, \Delta LOGAGRM_{t-k} + \sum_{d=0}^{\gamma} \tau_d \, \Delta RER_{t-d} + \sum_{s=0}^{\gamma} \varphi_s \, \Delta RGDPG_{t-s} + \sum_{q=0}^{\gamma} \vartheta_q \, \Delta IQX_{t-q} + \lambda ECT_{t-i} + \varepsilon_t \quad (6)$$

The dynamic error correction model (ECM) is obtained from the ARDL model via a straightforward linear transformation. The ECM synthesizes short-run dynamics with long-run equilibrium while preserving long-run information.

where, α_0= Constant, β's are the parameters, $\beta_j, \omega_i, \psi_k, \Omega_d, \phi_s, and \infty_q$Are the short-run parameters, ε_t = error term (which is white noise), Δ = the first difference operator, λ is the speed of adjustment parameter with a negative sign, to show that there is a convergence in the longrun. σ_j, $\delta_i, \theta_k, \tau_d, \varphi_s$, and $\vartheta_q$are the short-run coefficients of the model's adjustment long-run equilibrium. ECT is the error correction term that captures the long-run relationship in the model. ρ is the maximum lag order of the dependent variables, γ is the maximum lag length of explanatory variables, real GDP growth (RGDPG), manufacturing sector output, agricultural raw materials (AGRM), represent M_t. Additionally, this study incorporates control variables, including population growth (POPG), institutional quality index (IQX), and real exchange rate (RER).

Definition of Variables

This study models macro-sectoral variables within an empirical framework to evaluate trade and productivity, specifically isolating agricultural sector output the volume of crops and livestock generated within a nation alongside imports of textile fabrics and agricultural raw materials, which serve as foundational inputs for processing and manufacturing. Real exchange rates control for relative currency value deviations against trade partners, while real GDP growth, measured in constant 2015 US dollars, acts as the primary proxy for economic growth and aggregate demand across household, government, investment, and net export channels.

The analytical framework relies on the Autoregressive Distributed Lag (ARDL) estimation technique to analyze the dynamic interactions among these series. This model incorporates varying lag structures for both dependent and independent variables, distinguishing it from static models or standard Vector Autoregressive frameworks that require uniform lags and purely endogenous factors. The chosen methodology is particularly robust for small time-series samples, effectively mitigating potential biases stemming from endogeneity and autocorrelation. Crucially, the ARDL approach accommodates variables with a mixed order of integration, operating efficiently whether the data is stationary at levels I(0), first differences I(1), or a combination of both. Simultaneous tracking of short- and long-run relationships ensures unbiased, structurally sound estimation while adhering to econometric parsimony without unnecessary model complexity.

Evaluation Procedure

The data evaluation procedure follows a structured econometric framework designed to ensure parameter consistency and model stability. Descriptive statistics initiate the analysis by establishing the central tendency and dispersion of the dataset, providing essential insights into the distribution of the variables. Prior to model estimation, the integration sequence of the time-series variables is evaluated using the Augmented Dickey-Fuller (ADF) test across three distinct structural equations, automatically optimized via the Schwarz or Akaike information criteria to eliminate serial correlation. The Phillips-Perron test is subsequently applied to corroborate these unit root properties and ensure robustness. Potential multicollinearity among the predictor variables is monitored through a correlation matrix, where coefficients exceeding the 0.8 threshold indicate linear dependencies that could artificially widen confidence intervals.

The long-term equilibrium dynamics are analyzed using long-run and F-bound co-integration tests to determine if the non-stationary series share a stable, long-run relationship. A rejection of the null hypothesis occurs if the trace and maximum eigenvalue statistics exceed the 5\% critical value boundaries. Following model estimation, three diagnostic evaluations are conducted using E-Views 10 software to verify compliance with classical linear regression assumptions. The Breusch-Godfrey Serial Correlation LM test checks for residual autocorrelation, while the Autoregressive Conditional Heteroskedasticity (ARCH) test evaluates variance stability. Both diagnostics utilize a 5% significance level, where p-values greater than 0.05 confirm the absence of serial correlation and heteroskedasticity. Structural parameter stability is validated using the Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUMSQ) tests, which require the recursive residuals to remain within specified 5\% critical boundaries.

Hypothesis testing formally evaluates parameter significance at a 5\% decision threshold, rejecting the null hypothesis of no significant relationship if the calculated probability value falls below 0.05. The empirical estimations utilize secondary quarterly time-series data spanning twenty-eight years, from 1996 to 2023, sourced from the World Development Indicators, the Central Bank of Nigeria Statistical Bulletin, the World Integrated Trade Solution, and the World Governance Indicators.

RESULT AND DISCUSSION

This section presents and discusses the empirical findings of the study in relation to the research objective and hypothesis. The analysis begins with the correlation matrix to examine

the preliminary direction and strength of association among the variables before proceeding to the ARDL bounds test, long-run estimation, short-run dynamics, and diagnostic tests.

Correlation analysis

The correlation analysis was conducted to examine the direction and strength of association among the study variables before proceeding to the ARDL bounds test and long-run estimation.

Table 1: Correlation Matrix

VARIABLES	AGRT	TEX	AGRM	RER	RGDPG	IQX
AGRT	1.000000					
TEX	0.732400	1.000000				
AGRM	0.402798	0.603718	1.000000			
RER	-0.026353	0.008506	-0.068814	1.000000		
RGDPG	-0.097016	-0.204745	-0.339575	-0.197961	1.000000	
IQX	0.833894	0.555894	0.239723	-0.083102	-0.137972	1.000000

Source: *Author's Computation, E-Views 10*

Table 2: ARDL F-Bounds Test for Co-integration

Test Statistic	Value	k	Significance	I(0) Bound (Lower)	I(1) Bound (Upper)
F-Statistic	21.33104	5	10%	2.08	3.00
			5%	2.39	3.38
			2.5%	2.70	3.73
			1%	3.06	4.15

Source: *Author's computation using E-Views 10 (Asymptotic: n=1000).*

Decision Rule: The study rejected the null hypothesis since the test statistic (F-statistic = 21.33104) is greater than the upper bounds at a 5% level of significance [1(1) Bound = 3.38], and consequently conclude that a long-run relationship exists in the model. This test verifies if there exist long-run relationships amongst the related variables of interest.

Estimation and Interpretation

Following the confirmation of a long-run relationship among the variables through the ARDL bounds test, this section presents the estimated long-run and short-run results of the model. The interpretation focuses on how textile fabric imports, agricultural raw material imports, real exchange rate, real GDP growth, and institutional quality influence Nigeria's agricultural sector output, while also comparing the ARDL estimates with the FMOLS results for robustness and policy relevance.

Table 3: Long-Run Estimation Result
Dependent Variable: *LOGAGRT*

Variables	Coeff.	Std. Error	Prob.	Coeff.	Std. Error	Prob.
		ARDL MODEL			**FMOLS MODEL**	
LOGTEX	0.4622*	0.0707	0.0000	0.0114	0.0063	0.0960
LOGAGRM	0.0874**	0.0435	0.0485	0.0146*	0.0047	0.0089
RER	-0.0018	0.0015	0.2341	-0.0001	0.0001	0.4017
RGDPG	0.1624*	0.0345	0.0004	0.0133*	0.0014	0.0000
IQX	0.1511**	0.0539	0.0149	-0.0269*	0.0079	0.0052
C	4.7742*	0.5844	0.0000	0.8196*	0.8196	0.0003

Source: *Author's computation, E-views 10*
*Note: * denotes significance at 1%, ** denotes significance at 5%*

The coefficient log of textile fabric imports (0.4622, p<0.01) indicates that textile fabric imports from South Africa exert a positive and significant long-run impact on Nigeria's agricultural sector output. This suggests that as Nigeria imports more textile materials, the agricultural sector benefits, possibly through increased demand for cotton and other raw agricultural inputs used in textile production. This finding aligns with Olayiwola and Lawal (2022), who found that import trade can stimulate domestic agricultural productivity through backward linkages and increased value-chain activities. Similarly, Adusei and Nketiah-Amponsah (2021) reported that importation of intermediate goods enhances agricultural value addition in sub-Saharan Africa. Conversely, Ezeanyeji and Obianefo (2019) argued that excessive textile importation undermines local production capacity by discouraging domestic textile and cotton farming, leading to a crowding-out effect on agricultural output.

The coefficient log of agricultural raw materials imports (0.0874, p<0.05) shows a positive and statistically significant effect of agricultural raw material imports from South Africa on Nigeria's agricultural sector output. This implies that such imports may provide essential inputs that enhance productivity and efficiency in the Nigerian agricultural value chain. This result corroborates Ogunleye and Adedayo (2020), who observed that agricultural imports could temporarily boost output by filling input supply gaps in Nigeria. Olajide et al. (2023) also found that imported agricultural technologies and raw inputs improved crop yields in West African economies. However, the finding contradicts Okonkwo and Ude (2020), who maintained that overreliance on imported agricultural inputs negatively impacts domestic agriculture by reducing incentives for local innovation and production capacity.

The real exchange rate bears a negative but statistically insignificant coefficient (-0.0018, p>0.05), indicating that exchange rate fluctuations have no long-run significant impact on Nigeria's agricultural output in this model. This suggests that while exchange rate volatility can influence import costs, it may not substantially affect the agricultural sector's performance due to structural inefficiencies and weak transmission channels. This aligns with Eyo (2019), who found that exchange rate variations had minimal long-run influence on Nigeria's agricultural exports due to market rigidities. Likewise, Yusuff and Adeniyi (2022) reported that the agricultural sector's response to exchange rate changes is often muted by poor access to foreign exchange and infrastructural constraints. Conversely, Oladipo and Isola (2020) showed that exchange rate depreciation can significantly enhance agricultural competitiveness by making exports cheaper and imports more expensive, thereby encouraging local production.

The coefficient of real gdp growth (0.1624, p<0.01) reveals that economic growth significantly and positively affects Nigeria's agricultural output in the long run. This indicates

that a growing economy stimulates investment, technology adoption, and resource allocation efficiency in agriculture. Ejem and Ugwuanyi (2023) found that output growth in Nigeria positively influences agricultural modernization and export competitiveness. However, Chukwu and Alade (2022) contended that Nigeria's economic growth has been largely non-inclusive, with limited spillover effects on the agricultural sector due to structural imbalances and urban-biased growth patterns.

The institutional quality index has a positive and significant coefficient (0.1511, $p<0.05$), implying that improved institutional quality fosters agricultural sector growth in Nigeria. Strong institutions enhance policy effectiveness, reduce corruption, and promote efficient allocation of agricultural resources. This result is consistent with Asogwa (2023), who found that institutional quality significantly drives agricultural and economic performance across Sub-Saharan Africa by improving governance and policy coordination. Correspondingly, Adeleye and Eboagu (2019) linked good governance to better agricultural investment outcomes in Nigeria. However, the finding contrasts with Ogunniyi et al. (2021), who discovered that institutional reforms in Nigeria have had weak or delayed effects on agricultural growth due to implementation inefficiencies and political instability.

The results of the ARDL and FMOLS estimations for the model reveal notable variations in both the magnitude and statistical significance of the coefficients, though the general direction of some effects remains consistent. Under the ARDL model, Nigeria's importation of textile fabrics and agricultural raw materials from South Africa both show positive and statistically significant effects on agricultural output, with coefficients of 0.4622 and 0.0874, respectively. This suggests that imports from South Africa may complement Nigeria's agricultural production through technology transfer, input substitution, or market linkages. Similarly, real GDP growth and institutional quality exert positive and significant influences on agricultural output, highlighting the role of macroeconomic stability and governance efficiency in supporting the agricultural sector. The exchange rate, however, remains statistically insignificant, indicating that exchange rate fluctuations may not have a direct long-run impact on agricultural productivity.

In contrast, the FMOLS model produces smaller coefficient magnitudes and slightly different significance patterns, implying a weaker long-run relationship between the key explanatory variables and agricultural output. For instance, the coefficient of textile fabrics drops sharply to 0.0114 and becomes only marginally significant at the 10% level, while institutional quality switches sign to a negative and significant effect. These inconsistencies indicate potential model misspecification or endogeneity bias that FMOLS could not fully address in this context. Therefore, the ARDL model is preferred over FMOLS because it better captures both the short-run and long-run dynamics among variables, accommodates mixed orders of integration (I(0) and I(1)), and provides more robust and economically interpretable estimates in small samples, making it more suitable for policy inference in this study.

The empirical results obtained for the ARDL model and the fully modified OLS model are due to different econometric architectures and properties of the integration. The fully modified ordinary least squares framework assumes the non-parametric adjustments for endogeneity and serial correlation, and is optimal in large asymptotic samples, requiring that all series be integrated of order one (Manasseh et al., 2024). When variables are stationary and non-stationary processes or in smaller sample size, this non parametric method may have significant parameter instability. This instability is the reason why the institutional quality variable has to be reversed and why the estimated coefficient for the total value of imports decreases in size significantly when imposing full modification to the OLS specification.

On the other hand, the autoregressive distributed lag model has shown to be more economical, more flexible and more robust in small sample horizons as it does not suffer from large sample biases (Georgescu, 2025). This basic model can be used for a variety of variables integrated at various levels, and does not cause any spurious regression (Olorogun, 2024). The model incorporates optimal lag structures to ensure that the short run dynamic conditions are separated from long run equilibrium conditions, while at the same time reducing the endogeneity problem. The model allows for more powerful, stable and economically meaningful estimates since it cleanses the residual correlation that distorts the static estimates. This methodological excellence guarantees the proper representation of the positive effect of institutional quality and the real size of textile imports. Thus, the ARDL model is considered as the most appropriate and credible model for policy implication in this study.

Table 4: Short-Run Estimation Result
Dependent Variable: *LOGAGRT*

Variables	Coefficient	Std. Error	T-Statistic	Prob.
D(LOGAGRT(-1))	-0.1625**	0.0714	-2.2760	0.0404
D(LOGTEX)	0.0096	0.0068	1.4114	0.1816
D(RER)	-0.0001	0.0001	-1.3560	0.1982
D(RGDPG)	0.0133*	0.0016	8.3120	0.0000
D(IQX)	-0.0260*	0.0063	-4.1343	0.0012
CointEq(-1)*	-0.1636*	0.0111	-14.7727	0.0000

Source: *Author's computation, E-views 10*
*Note: * denotes significance at 1%, ** denotes significance at 5%*

The coefficient of the lagged dependent variable (agricultural output) is -0.1625 and statistically significant at the 5% level (p = 0.0404). This negative and significant coefficient implies that the previous period's growth in agricultural output exerts a dampening effect on the current agricultural output in the short run, indicating a mean-reverting adjustment process. In other words, when agricultural output increases in the preceding period, the current period experiences a marginal slowdown, suggesting possible diminishing short-run returns or adjustment effects in the sector. This finding aligns with Iorember et al. (2022), who found that lagged agricultural output in Nigeria negatively influences current output due to structural rigidities and inefficiencies in the agricultural value chain. Similarly, Okafor and Ujah (2021) reported that past output levels in the agricultural sector could crowd out current productivity when supply shocks persist. However, the result contrasts with Udoh and Effiong (2020), who found a positive and significant lagged effect, arguing that technological spillovers and reinvestment of past income often enhance future agricultural productivity.

The short-run coefficient of textile imports is 0.0096 but statistically insignificant (p = 0.1816). This suggests that the importation of textiles does not significantly influence Nigeria's agricultural output in the short run. The insignificance may reflect the weak linkage between the textile import sector and agricultural productivity, given the minimal integration between agricultural raw materials and textile manufacturing inputs in Nigeria's trade structure. This result supports the findings of Eze and Okonkwo (2023), who reported that trade in non-agricultural manufactured goods has an insignificant spillover on Nigeria's agricultural sector due to low backward integration. Conversely, Adewuyi and Oyejide (2019) found that textile and related imports can indirectly stimulate agricultural activities by increasing demand for cotton and other raw materials, implying that a longer-run relationship may exist, though absent in the short run.

The coefficient of the real exchange rate is -0.0001 and statistically insignificant (p = 0.1982), suggesting that short-run exchange rate fluctuations do not significantly impact agricultural output. The negative sign indicates that currency depreciation could marginally reduce agricultural productivity, possibly through increased import costs of farm inputs and machinery. This aligns with Lawal et al. (2021), who observed that exchange rate volatility exerts a weak and negative influence on Nigeria's agricultural sector due to the import dependence of inputs. Similarly, Chukwu and Ajayi (2020) reported that short-term currency depreciation discourages investment in agriculture due to higher import bills. However, this finding contrasts with Oladipo and Akinbobola (2018), who found a positive short-run link, arguing that exchange rate depreciation can enhance competitiveness of agricultural exports when export structures are well developed.

The coefficient of real GDP growth is 0.0133 and highly significant at the 1% level (p = 0.0000), indicating that an increase in overall economic growth significantly boosts agricultural output in the short run. This suggests that when the general economy expands, agricultural activities benefit through improved demand, better financing, and enhanced infrastructure. This result is consistent with Nwani et al. (2023) and Ogunleye (2022), who both found that economic growth exerts a strong positive influence on agricultural performance in Nigeria due to the sector's integration into the broader economy. However, Asogwa and Ezema (2021) reported a contrary finding, arguing that macroeconomic expansion in Nigeria often benefits the oil and service sectors disproportionately, leading to a "growth-without-agriculture" phenomenon.

The coefficient of institutional quality is -0.0260, significant at the 1% level (p = 0.0012). The negative sign implies that, in the short run, institutional quality deterioration reduces agricultural output, or conversely, that rapid institutional reforms may initially disrupt agricultural performance before long-term benefits emerge. This finding is supported by Adeleke and Adeniran (2022), who found that weak institutions, reflected in corruption and bureaucratic inefficiencies negatively affect Nigeria's agricultural sector. Likewise, Asiedu and Freeman (2020) emphasized that institutional instability discourages investment and technology adoption in African agriculture. However, the result contrasts with Abdulrahman and Ibrahim (2021), who argued that institutional reforms enhance agricultural growth when accompanied by effective governance and transparency in resource allocation.

The error correction term (CointEq(-1)) has a coefficient of -0.1636, significant at the 1% level (p = 0.0000). This negative and significant value confirms the existence of a long-run equilibrium relationship among the variables and indicates that 16.36% of the short-run disequilibrium is corrected each period toward long-run equilibrium. Thus, deviations from long-run agricultural output are moderately adjusted annually. This finding aligns with Onwumere et al. (2022) and Ezeaku et al. (2021), who reported similar moderate speeds of adjustment in ARDL models for Nigeria's agricultural output, suggesting structural constraints in policy implementation. In contrast, Etim and Obot (2020) found faster adjustment rates, attributing them to improved macroeconomic coordination and stabilization efforts in the agricultural sector.

Table 5: Autocorrelation Test for Model Three

	F- Statistic	**Observed R^2**
Test Statistic	0.160117	0.905239
P-Value	0.8540	0.6360
Durbin Watson test statistic	2.248654	

Source: *Author's computation, E-view 10*

The decision is that we fail to reject the null and conclude that with both p-values greater than 5%, the models are free from autocorrelation. This is confirmed by the Durbin-Watson test statistic from the primary estimations of the ARDL Models.

Table 6: Heteroscedasticity Test for Model Three

	F- Statistic	Observed R^2	Scaled explained SS
Test Statistic	0.442669	12.16028	2.587478
P-Value	0.9450	0.8389	1.0000

Source: *Author's computation, E-view 10*

With the p-value greater than 0.05, we fail to reject the null and conclude that the residuals are homoscedastic, thus no presence of heteroscedasticity.

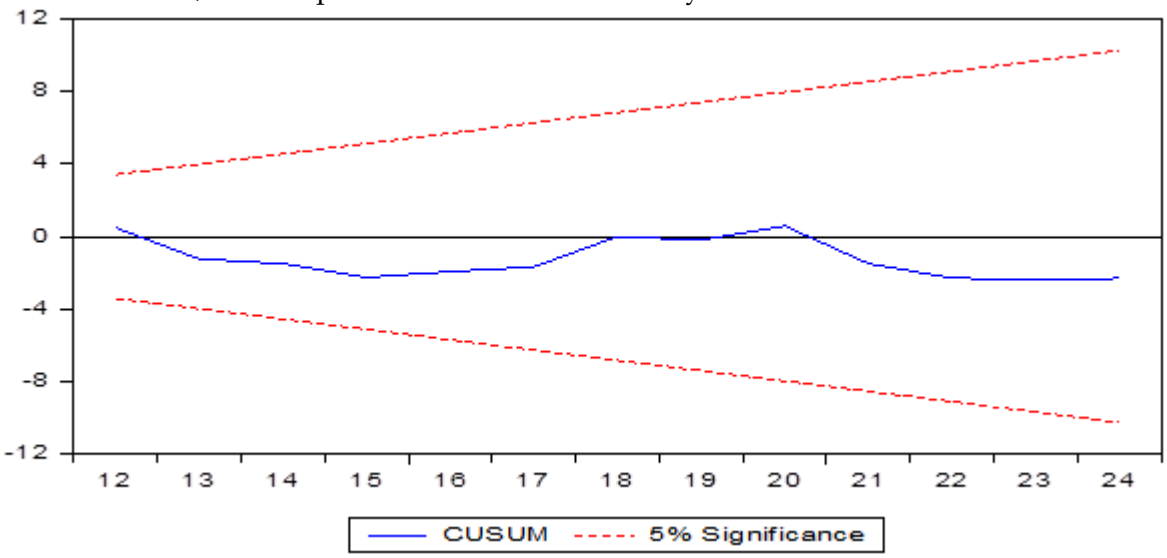

Figure 1: CUSUM Parameter Stability Test Plot

The CUSUM plot in Figure 1 evaluates the structural stability of the estimated regression parameters. The blue line remains entirely within the red critical boundaries at the 5% significance level. This pattern indicates that the regression model is structurally stable and free from major structural breaks over the timeline. Consequently, these diagnostic econometric results are reliable for making long-run policy inferences. From Figure 1, it is justified that the model is stable, thus the $CUSUM_{(t-k)}$ is a symmetric distribution and centered at 0 with its dispersion increasing as t-k does.

Hypothesis Three (H_{03}): Nigeria's importation of textile fabrics and agricultural raw materials from South Africa does not have any significant effect on agricultural sector output in Nigeria.

The objective investigated the impact of Nigeria's importation of textile fabrics and agricultural raw materials from South Africa on agricultural sector output. The ARDL results indicated that both textile (TEX) and agricultural raw material (AGRM) imports were statistically significant, suggesting realistic contribution to agricultural productivity. Hence, the null hypothesis (H_{03}), that such imports have no significant effect on agricultural sector output is rejected. This implies that reliance on imported agricultural inputs has translated into sectoral growth in Nigeria.

Educational and Human Capital Development Implications

The findings have important educational implications, particularly for agricultural education, vocational training, and capacity-building programmes in Nigeria. The positive and significant long-run effects of textile fabric imports and agricultural raw material imports from South Africa on domestic agricultural productivity suggest that exposure to imported technologies, inputs, and production practices can contribute to agricultural development when effectively utilized. This finding corroborates Yusuf and Eze (2020), who reported that imported agricultural inputs enhance productivity through improved farming efficiency and output. The result also contrasts with the findings of Okafor and Mthembu (2019), who argued that imports from South Africa may intensify competitive pressures on local producers. The implication is that educational institutions and extension agencies should equip farmers, agribusiness operators, and agricultural students with the knowledge and skills required to maximize the benefits associated with imported technologies while minimizing dependence on foreign products.

Agricultural education curricula should therefore emphasize innovation, technological adaptation, and entrepreneurship to strengthen domestic production capacity. The importance of innovative instructional approaches in enhancing knowledge acquisition and practical skills has been demonstrated in several educational studies. Research has shown that computer animation and other innovative teaching strategies improve learners' understanding, achievement, and interest in science-related subjects (Nnalue et al., 2024; Nnalue et al., 2023; Christian-Ike et al., 2024). Similar approaches can be integrated into agricultural training programmes to promote the effective utilization of modern agricultural technologies and imported inputs.

The findings also underscore the need for digital and technology-driven learning environments. Studies have highlighted the significance of virtual classrooms, blended learning, artificial intelligence, and adaptive learning systems in improving educational outcomes and technological competence among learners (Christian-Ike et al., 2025a; Okelue et al., 2025; Ofozoba et al., 2024). Such innovations can facilitate continuous agricultural education and extension services, particularly in rural communities. Furthermore, the development of self-regulatory skills, science process skills, and practical problem-solving competencies remains essential for enhancing productivity and innovation (Rita & Henrieta, 2025; Obikezie et al., 2025; Chukwunazo et al., 2025). Emerging evidence also suggests that AI-driven service-learning approaches can enhance students' understanding of sustainability-related innovations and technological applications (Ofozoba et al., 2025; Anakpua et al., 2025). Consequently, educational policymakers should prioritize technology-enhanced agricultural education, research, and extension programmes that build local capacity, reduce excessive dependence on imports, and promote sustainable agricultural productivity in Nigeria

CONCLUSION

This study provides a comprehensive diagnostic evaluation of the bilateral economic corridor between Nigeria and South Africa, focusing specifically on how agricultural and raw material imports shape Nigeria's domestic agricultural output. Application of the Autoregressive Distributed Lag (ARDL) Bounds testing framework to quarterly data allows the empirical analysis to successfully resolve the short- and long-run dynamics governing these trade flows. The highly significant bounds test firmly confirms that domestic agricultural productivity is deeply intertwined with, and co-integrated alongside, international trade inputs and broader macroeconomic indicators.

The long-run empirical results lead to the rejection of the null hypothesis, proving that Nigeria's importation of textile fabrics and agricultural raw materials from South Africa exerts a positive and statistically significant impact on domestic agricultural sector output. Rather than exerting a direct crowding-out effect, these value-added inputs and intermediate raw products function as essential components that feed into the wider domestic supply chain, filling critical structural gaps and supporting value-chain specialization. The short-run dynamics, however, paint a more complex picture. Textile imports remain statistically neutral in the short term, and the error correction mechanism points to a moderate speed of adjustment, indicating that underlying structural rigidities, infrastructure deficits, and weak market transmission channels slow down the immediate benefits of trade.

Ultimately, this study concludes that while intermediate agricultural imports from South Africa currently complement and drive long-run productivity, an overreliance on foreign inputs leaves Nigeria's agricultural baseline highly vulnerable to external trade dynamics and currency valuation shocks.

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