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**DO CORRUPTION AND INSTITUTIONAL GOVERNANCE MATTER
FOR CROP PRODUCTIVITY IN NIGERIA? EVIDENCE FROM TIME-
SERIES ANALYSIS**

¹Mariam Isiaka, ¹Maryam Ubale Dankawu & ²Kachalom Bot Linda

¹Department of Economics, Federal University of Education, Zaria

²Department of Political Science, Federal University of Education, Zaria

Correspondence: misiaka25@gmail.com

ABSTRACT

This study investigates the effect of corruption and institutional governance on crop productivity in Nigeria from 1990 to 2023, focusing on asymmetric policy effects. Annual time-series data were used, with crop productivity as the dependent variable and corruption perception, control of corruption, rule of law, voice and accountability, and government agricultural expenditure as explanatory variables. The Nonlinear Autoregressive Distributed Lag (NARDL) approach was employed to examine asymmetric short- and long-run effects. The bounds test confirms a long-run relationship, with an F-statistic of 10.01806 exceeding the 5% upper-bound critical value of 3.24. Findings reveal significant asymmetric effects of corruption and institutional governance on crop productivity. In the short run, deterioration in corruption perceptions reduces crop productivity, while improvements in rule of law and control of corruption enhance productivity. Long-run estimates show that corruption perceptions negatively affect crop productivity, whereas improved rule of law increases productivity. The error-correction coefficient of -0.6991 indicates that 69.91% of short-run disequilibrium is corrected annually. The study concludes that institutional quality is critical to agricultural productivity and recommends stronger accountability, effective corruption control, consistent agricultural policies, and transparent public expenditure.

Keywords: Crop productivity; corruption; institutional governance; rule of law; control of corruption; voice and accountability; Nonlinear ARDL; Nigeria.

JEL Classification: D73; O13; Q10; Q18; C32.

1. INTRODUCTION

Crop productivity, which refers to the output obtained per unit of land, labour, or capital, is a key indicator of agricultural performance, economic development, and food security. It is determined by a combination of technological, environmental, institutional, and economic factors. In developing economies such as Nigeria, improvements in crop productivity are essential for increasing food availability, reducing dependence on food imports, generating rural employment, improving household incomes, and supporting structural transformation. Nigeria possesses considerable agricultural potential, and agriculture remains central to the country's efforts to improve food production, create employment, strengthen food security, and diversify the economy (FAO, 2026). However, the availability of agricultural resources alone does not guarantee higher productivity because the effectiveness of agricultural policies and investments depends substantially on the quality of institutions responsible for their implementation.

Corruption and institutional governance further condition the effectiveness of other agricultural policy variables. In Nigeria, weak institutional frameworks, poor accountability, and rent-seeking behaviour have long undermined the effective implementation of agricultural policies and programmes (Transparency International, 2023). Corruption may manifest through the misallocation of funds, diversion of agricultural inputs, manipulation of beneficiary lists, and irregularities in government credit and subsidy programmes. Poor governance may also affect the delivery of extension services, agricultural research, infrastructure, and other public interventions, thereby reducing the productivity-enhancing impact of government expenditure. Empirical evidence suggests that better governance can contribute to agricultural productivity by improving resource allocation and encouraging agricultural investment (Anwana, Akpan, & Okon, 2019). Similarly, evidence from Nigeria indicates that institutional frameworks are important for improving agricultural-sector performance and achieving food security (Osabohien, Osabuohien, & Ohalete, 2020). Consequently, the quality of institutions within which agricultural policies are formulated and implemented is an important consideration in understanding crop productivity outcomes.

Nigeria has about 70.8 million hectares of agricultural land, with maize, cassava, millet, yam, rice, and guinea corn among the major crops cultivated in the country. Despite its substantial agricultural resource base, Nigeria continues to experience challenges in achieving adequate domestic food production. For example, rice output increased from approximately 3.7 million metric tonnes in 2017 to 4.0 million metric tonnes in 2018 (Tsoka, 2022). Nevertheless, domestic production remained insufficient to meet national consumption requirements, resulting in continued dependence on imports and informal channels of supply. In an attempt to stimulate domestic production, the Nigerian government introduced restrictions on rice imports in 2019 (Tsoka, 2022). Nigeria is also one of the world's major producers of cassava, producing about 59 million metric tonnes in 2017. Given the country's comparative advantage in major crops, the potential contribution of agriculture to domestic value addition, employment, income generation, and government revenue is substantial. However, translating this potential into sustained productivity requires effective institutions, efficient resource allocation, and credible agricultural policies.

The importance of governance in agricultural productivity arises from the fact that agricultural development depends not only on land, labour, capital, and technology but also on the institutional environment within which these resources are allocated and utilized. Effective institutions can

strengthen accountability, improve public service delivery, reduce transaction costs, protect property rights, and create incentives for farmers and private investors. Conversely, institutional weaknesses can reduce the effectiveness of agricultural expenditure and undermine government interventions. Recent evidence from Nigeria shows that corruption can weaken the productivity-enhancing effect of agricultural financing, suggesting that resources allocated to agriculture may not generate their expected outcomes when governance mechanisms are ineffective (Joshua, Saidu, & Idi, 2025). This reinforces the argument that agricultural financing and public expenditure should be examined alongside the institutional conditions governing their implementation.

The relationship between governance and agricultural productivity may also extend beyond corruption alone. Rule of law, control of corruption, and voice and accountability can influence the predictability, transparency, and effectiveness of agricultural policies. A strong rule of law can improve the security of economic activities and agricultural investments, while effective control of corruption can limit the diversion of public resources. Similarly, greater voice and accountability can strengthen citizens' ability to demand transparency in the design and implementation of agricultural programmes. Cross-national evidence indicates that better governance can indirectly improve agricultural productivity through its contribution to agricultural capital accumulation and more effective institutional infrastructure. In Nigeria, studies have similarly identified institutional frameworks as important determinants of agricultural-sector performance and food security (Osabohien et al., 2020).

However, the effect of corruption and institutional governance on crop productivity may not be uniform when institutional conditions improve or deteriorate. A reduction in corruption may generate productivity gains through more efficient allocation of agricultural resources, while an increase in corruption may impose substantial costs through resource diversion, rent-seeking, and ineffective implementation of agricultural programmes. Likewise, improvements in governance may have effects that differ in magnitude from the effects associated with institutional deterioration. Recent Nigerian evidence shows that corruption can significantly weaken the effect of agricultural financing on productivity, highlighting the importance of examining the interaction between agricultural interventions and institutional quality (Joshua et al., 2025). These possibilities suggest that conventional linear approaches, which assume that positive and negative changes in institutional variables have symmetrical effects, may fail to capture important features of the governance productivity relationship.

Furthermore, recent research on Nigeria's agricultural policy environment shows that the relationship between agricultural policies and productivity is complex, with the effectiveness of policy instruments varying across different economic conditions and regimes (Adekunle & Aregbeshola, 2025). This provides further justification for examining whether changes in corruption and institutional governance produce different effects on crop productivity depending on the direction of the change. Despite the growing literature on agricultural productivity, governance, and institutional quality, relatively limited attention has been given to the asymmetric effects of changes in corruption and specific dimensions of institutional governance on crop productivity in Nigeria. This constitutes an important empirical gap, particularly when considering the long period of institutional and agricultural policy changes experienced by the country.

Research Objective

Against this background, the broad objective of this study is to examine whether corruption and institutional governance matter for crop productivity in Nigeria over the period 1990–2023, with particular emphasis on their asymmetric effects. Specifically, the study investigates whether positive and negative changes in corruption perception, control of corruption, rule of law, voice and accountability, and government expenditure on agriculture exert different effects on crop productivity in the short and long run.

Research Question

Based on the stated objective, the study seeks to answer the following research question:

Do corruption and institutional governance matter for crop productivity in Nigeria, and do positive and negative changes in corruption and institutional governance exert asymmetric effects on crop productivity in the short and long run?

2. LITERATURE REVIEW

2.1 Conceptual Literature Review

Economists typically define corruption as the misuse of public office for private gain, spanning petty (bribes, informal “fees”) and grand (procurement kickbacks, policy capture) forms, plus political and bureaucratic variants. Classic and modern syntheses show corruption depresses investments, distorts incentives, and reallocates resources away from high-productivity uses, key pathways from corruption to lower output and productivity (academic.oup.com).

A foundational cross-country result is that higher corruption lowers investment and growth (Mauro 1995), with later reviews detailing efficiency losses via misallocation, weakened competition, and attenuated policy effectiveness. These are first-order channels for agriculture, where technology adoption, input delivery, and value-chain coordination are crucial (economics.mit.edu corruption review, 2024).

Corruption has many effects on crop productivity, one of which is diversion of subsidised inputs such as fertilizers and farm inputs. This raises farmer prices and lowers application rates; bribes/toll payments along the chain add “informal taxes.” Nigeria’s move to e-vouchers (GES/e-wallet) is often cited as a corruption-reducing reform that improved transparency in fertilizer delivery, with studies reporting reduced leakages and higher usage/yields. (World Bank publication, 2025)

Public spending and procurement inefficiency, such as Kickbacks in irrigation, feeder roads, storage, or extension contracts, inflate costs and lower service quality, depressing total factor productivity (TFP). Global/firm-level evidence finds corruption cuts productivity especially where regulation is heavy, a common feature of agricultural input markets.

Credit and subsidy programmes are crippled as targeted credit is blunted by elite capture, politically connected selection, and weak recovery. Nigeria’s Anchor Borrowers’ Programme (ABP) has disbursed massively since 2015 but has faced recovery and governance concerns, undermining its capacity to raise sustained productivity. (<https://niojoni.com>)

Institutional governance refers to how those rules are created, enforced, and changed (including accountability, rule of law, bureaucratic quality, and control of corruption). Institutions, broadly defined as the formal and informal “rules of the game,” influence incentives, allocate resources, and determine the efficiency with which economic actors interact (North, 1990). Within agriculture, institutional governance is a critical determinant of productivity, particularly in developing economies such as Nigeria where farming remains the main source of livelihood. Institutional governance encompasses the quality of land tenure arrangements, bureaucratic effectiveness, accountability, public service delivery, and the enforcement of property rights (Lin, Khan, & Vo, 2024). These institutional structures can either enhance crop productivity by reducing uncertainty and transaction costs or constrain it by creating inefficiencies and disincentives for investment.

Institutional governance refers to the mechanisms through which rules, policies, and laws governing resource allocation are designed and enforced (Acemoglu & Robinson, 2012). Strong governance

ensures the protection of property rights, reduces corruption, facilitates dispute resolution, and fosters policy stability. Conversely, weak institutions are associated with corruption, rent-seeking, poor enforcement of contracts, and misallocation of public resources, all of which undermine agricultural development.

Pathways Linking Corruption and Institutional Governance to Crop Productivity

a) Property Rights and Land Tenure Security

Secure property rights enhance farmers' incentives to invest in long-term productivity-improving practices, such as irrigation infrastructure, soil fertility management, and mechanisation. In Nigeria, however, customary and overlapping land tenure arrangements create tenure insecurity, discouraging investment in high-value crops and sustainable land management (Feder&Feeny, 1991; Oyetunde-Usman, 2021). Studies in Gombe and other states reveal that tenure insecurity reduces farmers' willingness to adopt modern inputs and technologies, thereby constraining productivity (Ali, Deininger, & Harris, 2019).

b) Agricultural Bureaucracy and Extension Services

The effectiveness of public agricultural institutions, particularly extension services, is another crucial determinant of crop productivity. Strong extension systems disseminate information, promote technology adoption, and ensure timely input delivery. Poor bureaucratic quality, political interference, and inadequate funding, however, limit the reach and effectiveness of extension services in Nigeria (Lin et al., 2024). As a result, many smallholder farmers remain excluded from knowledge and input networks essential for raising productivity.

c) Access to Credit and Market Institutions

Financial institutions and well-functioning markets play an enabling role in improving productivity. Access to credit allows farmers to purchase inputs such as fertiliser, certified seeds, and machinery at the right time (Ume et al., 2021). Evidence from Nigeria shows that agricultural credit schemes and microfinance institutions positively influence agricultural output when properly implemented (Ojo, 2022). Nonetheless, mismanagement, corruption, and poor institutional design in subsidy and credit programmes often lead to elite capture and inefficiencies, undermining their intended productivity impacts.

d) Governance Quality, Corruption, and Policy Stability

Governance quality, reflected in reduced corruption, transparency, and stable policies, has a direct bearing on agricultural performance. Corruption diverts resources from productive investments into rent-seeking, while frequent policy reversals create uncertainty that discourages private investment in agriculture (Ibrahim & Umar, 2020). Nigeria's fertiliser subsidy programmes, for instance, have historically been plagued by corruption and inefficiencies, leading to high input costs and limited productivity gains for smallholder farmers (Olomola, 2018).

e) Provision of Rural Infrastructure and Public Goods

Institutions also determine the extent to which essential rural infrastructure such as roads, irrigation systems, and storage facilities is provided. Efficient public investment lowers transaction costs, reduces post-harvest losses, and facilitates access to markets (Dercon&Gollin, 2014). Weak governance, by contrast, results in underinvestment and poor maintenance of infrastructure, perpetuating low productivity in Nigeria's agricultural sector.

f) Legal Frameworks and Dispute Resolution

The capacity of judicial and customary institutions to resolve disputes also affects productivity. Efficient dispute resolution reduces transaction costs in land markets, tenancy contracts, and credit arrangements (Platteau, 1994). In Nigeria, however, weak formal institutions and politicised customary systems often undermine the security of land and contractual relationships, leading to underinvestment and reduced productivity (Oyetunde-Usman, 2021).

2.2 THEORETICAL LITERATURE

Institutional Theory

The Institutional Theory, as applied to economics, was popularized by Douglass North (1990), who argued that institutions, defined as the formal and informal rules governing economic interactions, are the “rules of the game” that determine the performance of an economy. The theory emerged as a response to neoclassical models that assumed perfect markets and ignored the influence of governance, corruption, and political institutions. North’s institutional economics expanded the analytical framework to include transaction costs, property rights, and enforcement mechanisms as determinants of economic performance.

Institutional Theory emphasizes that economic outcomes depend not only on market forces but also on the quality of institutions that regulate them, such as the rule of law and governance, which ensure transparency, accountability, and contract enforcement. Property rights that help to secure land and asset rights encourage investment and productivity. Reduced transaction costs and political stability. In agricultural contexts, institutional strength determines the effectiveness of government expenditure, credit programmes, and anti-corruption measures in achieving productivity goals (North, 1990; Akinola&Olayemi, 2022).

The theory assumes that Economic agents respond to the incentive structures established by political and legal institutions; institutional reforms evolve gradually and are influenced by historical legacies; economic growth depends on both institutional evolution and policy choices; and that effective enforcement mechanisms are important for maintaining efficient economic interactions.

Critics argue that the Institutional Theory may overemphasize the role of institutions while underestimating the influence of external shocks and market forces. Others contend that the theory’s focus on historical path dependency makes it difficult to design short-term policy solutions (Rodrik, 2007). Furthermore, measuring institutional quality empirically is challenging, as corruption, governance, and rule of law indicators are often subjective and data-limited (Transparency International, 2023).

While the theory successfully integrates governance into economic analysis, it does not provide explicit mechanisms for quantifying institutional effects in production functions. Its broad conceptual nature limits direct application in econometric models without proxy variables (such as corruption indices or governance indicators). Additionally, the theory assumes that institutional change leads to improved outcomes, which may not hold in contexts of entrenched political interests.

Institutional Theory is highly relevant because corruption, insecurity, and governance quality are integral to the study’s analytical framework. Weak institutions in Nigeria lead to misallocation of agricultural funds, diversion of inputs, and poor implementation of credit schemes, thereby reducing crop productivity (Transparency International, 2023). Conversely, strong governance enhances the effectiveness of economic policies, ensuring that government expenditure, credit, and subsidies reach intended beneficiaries. The theory thus provides the conceptual justification for including corruption,

insecurity, and governance as moderating variables that condition the impact of macroeconomic policies on crop productivity.

Keynesian Theory

During the 1930s, British economist John Maynard Keynes created this hypothesis in an effort to comprehend the Great Depression. This theory calls for more government spending and reduced taxation in order to boost demand and lift the global economy out of its slump. According to Keynes, "in the long run, we are all dead." Keynes argued that government action was necessary as a short-term remedy for depression. Spending would be more beneficial than conserving. The government would raise public expenditure, giving citizens more buying power, and producers would create more, resulting in more jobs. This is the multiplier effect, which demonstrates the link between public spending and national revenue. According to critics (Oteng-Abayie&Frimpong, 2009; Folster&Henrekson, 2001), greater government spending may hinder overall economic performance. That is, supporting government spending increases via taxation or borrowing may have long-run negative consequences, since higher taxes hinder innovation, resulting in reduced income and aggregate demand. Similarly, if the government pays its expenditures via domestic borrowing, it may push out private investment, dampening growth. This is still held by classicists and neoclassicalists.

This theory is significant because it explains how governments, particularly in developing countries such as Nigeria, employ government spending to encourage economic growth, which is a necessary component of long-term development. Economic expansion raises people's living standards through improving infrastructure, health, housing, and education services, as well as increasing agricultural productivity and food security (Loto 2012).

2.3 Empirical Literature

Empirical studies on corruption, institutional governance, and agricultural productivity emphasize the importance of institutional quality, policy implementation, land tenure, agricultural finance, and corruption control in shaping agricultural outcomes. In developing economies, where agriculture remains an important source of livelihood, effective institutions are essential for efficient resource allocation and sustained productivity.

Azam, Chani, and Siddiqi (2014) examined the relationship between agricultural productivity, institutional quality, and economic growth in Pakistan using time-series data from 1974–2010. Using the Phillips-Perron unit root and Johansen cointegration tests, the study found that agricultural productivity and institutional quality are important for accelerating economic growth. Similarly, Headey, Alauddin, and Rao (2010), using cross-country econometric analysis, found that governance quality and institutional effectiveness significantly explain agricultural productivity growth alongside technology adoption. Lin, Khan, and Vo (2024) also reported that countries with stricter rule of law, accountability, and corruption control tend to record higher agricultural productivity.

Evidence from Nigeria further demonstrates the importance of governance in agricultural performance. Transparency International (2019) found that corruption in fertilizer distribution, land allocation, and subsidy administration diverts resources intended for farmers and reduces agricultural efficiency. Ibrahim and Umar (2020) reported that corruption significantly reduces crop output in Nigeria by distorting the allocation of subsidies and agricultural credit. Similarly, Okoh and Ebi (2019) found that corruption in policy implementation and mismanagement of agricultural funds negatively affect

agricultural productivity. Omolola (2018) also showed that corruption, input diversion, and political patronage weaken the effectiveness of fertilizer subsidy programmes. Adesina (2012) similarly demonstrated that reforms aimed at reducing corruption in fertilizer procurement and distribution improved access to agricultural inputs and increased yields. Lawal (2019) added that corruption in agricultural extension services, including bribery and nepotism, limits farmers' access to information and technology, thereby reducing productivity.

Institutional arrangements relating to land and agricultural finance also influence productivity. Ali, Deininger, and Harris (2019) found that more secure land tenure in Nigeria encourages investment in fertilizer, mechanization, and soil conservation, resulting in higher productivity. Oyetunde Usman (2021) similarly reported that tenure insecurity discourages the adoption of improved seeds and irrigation, particularly in conflict-prone areas. Ume, Ezeano, and Okonkwo (2021) found that institutional credit enhances farm productivity, although governance weaknesses limit its effectiveness. Ojo (2022) likewise reported that institutional financing positively influences agricultural productivity, but poor governance in credit disbursement reduces its impact. These findings indicate that agricultural resources and financing are more likely to generate productivity gains where institutional arrangements are effective.

The role of institutional governance also extends to food security and agricultural policy. Romanus, Evans, and Precious (2019), using an ARDL model for Nigeria, found that agricultural production and credit improve food security, while institutional factors such as political stability and rule of law also contribute to improved food-security outcomes. However, the effects of control of corruption and voice and accountability were not uniformly positive, suggesting that different dimensions of governance may influence agricultural outcomes differently. Jussi Lankoski and Thiem (2020), using qualitative comparative analysis, further showed that the design of agricultural support policies affects both productivity and environmental sustainability. Oyetunde Usman and Olagunju (2020) also found that corruption negatively affects food security and agricultural productivity across Sub-Saharan Africa by weakening governance and increasing transaction costs. Mauro (1995) provides the broader foundational evidence that corruption reduces investment and productivity growth.

Overall, the empirical literature establishes a strong connection between institutional quality, corruption, agricultural policy effectiveness, and productivity. However, most existing studies examine the effects of corruption and governance within linear frameworks or focus on individual institutional dimensions. Limited attention has been given to whether positive and negative changes in corruption and institutional governance produce asymmetric effects on crop productivity in Nigeria. This is particularly important because improvements in institutional quality may not generate effects of the same magnitude as institutional deterioration. The present study addresses this gap by applying the Nonlinear Autoregressive Distributed Lag (NARDL) approach to examine the short- and long-run asymmetric effects of corruption and institutional governance on crop productivity in Nigeria.

3. METHODOLOGY

The research objective of this study aimed at evaluating the impact posed by corruption and Institutional Governance on crop productivity in Nigeria. The independent variables employed to capture corruption are the corruption perception index (*lgcpi*) and control of corruption (*lgcoc*) (gotten from World Bank data). The institutional rule of law (*lgrol*) (data from the World Bank Indicator Database (WDI)) and voice of accountability (*lgvoa*) (also from WDI). The control variable is government expenditure on agriculture (*lgexag*).

$$\begin{aligned}\Delta cpr_t = & \alpha_o + \sum_{t=1}^p \alpha_1 \Delta cpr_{t-1} + \sum_{t=0}^{q_1^+} \beta_1 lgcpi^+_{t-1} + \sum_{t=0}^{q_1^-} \beta_1 lgcpi^-_{t-1} + \sum_{t=0}^{q_2^+} \beta_2 lgcoc_{t-1}^+ \\ & + \sum_{t=0}^{q_2^-} \beta_2 lgcoc_{t-1}^- + \sum_{t=0}^{q_3^+} \beta_3 lgrol_{t-1}^+ + \sum_{t=0}^{q_3^-} \beta_3 lgrol_{t-1}^- + \sum_{t=0}^{q_4^+} \beta_4 lgvoa_{t-1}^+ \\ & + \sum_{t=0}^{q_4^-} \beta_4 lgvoa_{t-1}^- + \sum_{t=0}^{q_5^+} \beta_5 lgexag_{t-1}^+ + \sum_{t=0}^{q_5^-} \beta_5 lgexag_{t-1}^- + \lambda ECT_{t-1} + \varepsilon_t\end{aligned}$$

The Δ terms capture short-run effects (immediate impacts and lagged changes).

The ECT is the error-correction term (the long-run equilibrium relationship).

The λ should be negative and significant for stable adjustment back to equilibrium.

Estimation Techniques

Unit Root Test

Since the data used in this study are time-series data, it is necessary to examine their stationarity properties before estimation to avoid the possibility of spurious regression. The stationarity of the variables is assessed using the Augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1979, 1981), the Phillips-Perron (PP) test (Phillips & Perron, 1988), and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test (Kwiatkowski et al., 1992). These tests provide evidence on the order of integration of the variables and help determine the appropriate model specification. The tests are conducted under specifications that include a constant and a time trend, where appropriate, to determine whether the variables contain unit roots. The general forms of the tests are presented as follows:

$$\Delta Y_t = b_o + BY_{t-1} + \mu_1 \Delta Y_{t-1} + \mu_2 \Delta Y_{t-1} + \dots + \mu_p \Delta Y_{t-p} + \varepsilon_t \dots \dots 1$$

Where Y_t represents the time series to be tested, β_0 is the intercept term, β is the coefficient of interest in the unit root test, μ is the parameter of the augmented lagged first difference of Y_t to represent the p^{th} -order autoregressive process, and e_t is the white noise error term.

Cointegration Test

To examine the existence of a long-run relationship among the variables, the study employs the Autoregressive Distributed Lag (ARDL) bounds-testing approach to cointegration developed by Pesaran, Shin, and Smith (2001). The approach is appropriate for determining whether a stable long-run relationship exists among variables that are integrated of order zero, $I(0)$, and order one, $I(1)$, provided that none of the variables is integrated of order two, $I(2)$. The ARDL framework also permits the estimation of both short-run dynamics and long-run coefficients within a single model.

The choice of the ARDL approach is motivated by several advantages. First, unlike conventional cointegration techniques that require all variables to be integrated at the same order, the ARDL bounds-testing procedure can be applied when the regressors are a mixture of $I(0)$ and $I(1)$ variables (Pesaran et al., 2001). Second, the approach is suitable for relatively small samples and allows the short-run and long-run effects of the explanatory variables to be estimated simultaneously. Third, the ARDL framework incorporates an error-correction representation, which makes it possible to determine the speed at which short-run deviations adjust towards long-run equilibrium (Chindo et al., 2015).

Since the present study focuses on whether positive and negative changes in corruption and institutional governance have different effects on crop productivity, the nonlinear extension of the ARDL framework, namely the Nonlinear Autoregressive Distributed Lag (NARDL) model, is employed. The NARDL approach decomposes the explanatory variables into their positive and negative partial sums, thereby allowing the effects of increases and decreases in the variables to differ in both the short and long run. This makes the approach particularly suitable for examining the asymmetric relationship between corruption, institutional governance, and crop productivity in Nigeria.

The bounds test is used to establish whether a long-run cointegrating relationship exists among the variables. The null hypothesis of no long-run relationship is tested against the alternative hypothesis of the existence of a long-run relationship. Where cointegration is established, the corresponding error-correction representation is estimated to determine the short-run dynamics and the speed of adjustment towards long-run equilibrium.

Nonlinear Autoregressive Distributed Lag (NARDL) Model

The Nonlinear Autoregressive Distributed Lag (NARDL) model developed by Shin et al. (2014) extends the conventional ARDL framework by decomposing explanatory variables into positive and negative partial sums to capture possible asymmetric relationships in both the short and long run. The approach is particularly suitable for relatively small samples and allows variables to be integrated at levels, $I(0)$, or first differences, $I(1)$, provided that none is integrated of order two, $I(2)$. Given these properties, the study employs the NARDL approach to examine whether positive and negative changes in corruption and institutional governance exert different effects on crop productivity in Nigeria.

Before estimation, the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests are employed to establish the order of integration of the variables and ensure that none is $I(2)$. The ARDL bounds-testing procedure is subsequently used to determine whether a long-run cointegrating relationship exists among the variables. Where cointegration is established, the associated error-correction representation is estimated to capture the short-run dynamics and the speed at which deviations from long-run equilibrium are corrected. Variables are transformed into natural logarithms where appropriate to improve the distributional properties of the data and reduce potential heteroskedasticity.

To examine asymmetry, the relevant explanatory variables are decomposed into positive and negative partial sums. This decomposition makes it possible to distinguish the effects of improvements and deteriorations in corruption and institutional governance on crop productivity. Thus, the NARDL framework provides a basis for determining whether increases and decreases in corruption perception, control of corruption, rule of law, voice and accountability, and government expenditure on agriculture have statistically different effects on crop productivity in the short and long run.

In addition to the NARDL estimation, dynamic ARDL simulations and Kernel-Based Regularized Least Squares (KRLS) are employed to provide further evidence on the relationships among the variables. Dynamic ARDL simulations facilitate the visualization of estimated short- and long-run effects and allow counterfactual changes in the explanatory variables to be examined while other factors are held constant. KRLS complements the analysis by allowing for possible nonlinearities, heterogeneity, and non-additive relationships among the variables. Together, these approaches provide complementary evidence on the asymmetric and nonlinear relationship between corruption, institutional governance, and crop productivity in Nigeria and strengthen the basis for drawing policy conclusions.

4. RESULTS AND DISCUSSION OF FINDINGS

4.1 Presentation of Results

Table 1: Summary of Bound Test analysis

Test Statistic	Value	K
F-statistic	10.01806	10
Significance Level	I0 Bound	I1 Bound
10%	1.83	2.94
5%	2.06	3.24
1%	2.54	3.86

Source: EViews, 2026

Bounds Test for Cointegration

The decision rule for the ARDL bounds test is based on comparing the computed F-statistic with the lower-bound $I(0)$ and upper-bound $I(1)$ critical values. If the F-statistic exceeds the upper-bound $I(1)$ critical value, the null hypothesis of no long-run relationship is rejected, indicating the existence of a long-run relationship among the variables. If the F-statistic falls below the lower-bound $I(0)$ critical value, the null hypothesis cannot be rejected, implying that there is no long-run relationship. However, if the F-statistic lies between the lower and upper bounds, the result is inconclusive.

In this study, the computed F-statistic is 10.01806, which exceeds the 5% upper-bound $I(1)$ critical value of 3.24. Therefore, the null hypothesis of no long-run relationship is rejected, confirming the existence of a long-run cointegrating relationship among the variables. This finding provides justification for proceeding with the Nonlinear Autoregressive Distributed Lag (NARDL) estimation to examine the asymmetric short- and long-run effects of corruption and institutional governance on crop productivity.

Unit Root Test

Table 4.2: The Summary of Unit Root Test Results

Variable	Test	Level Test Statistic	Level p-value	First Difference Test Statistic	First Diff. p-value	Order of Integration
Lgcpr	ADF	-3.015	0.0466	-5.336	0.0002	I(1)
	PP	-2.715	0.0851	-5.337	0	$I(0)/I(1)^*$
Lgcpi	ADF	-1.175	0.6695	-4.402	0.0022	I(1)
	PP	-1.137	0.6853	-7.734	0	I(1)
Lgpinst	ADF	-2.429	0.1439	-5.903	0	I(1)
	PP	-2.622	0.1015	-6.035	0	I(1)
Lgrol	ADF	-2.526	0.1211	-3.649	0.013	I(1)
	PP	-2.333	0.1698	-5.239	0.0002	I(1)

Lgvoa	ADF	-4.536	0.0014	-6.382	0	I(0)
	PP	-4.536	0.0014	-6.384	0	I(0)
Lgnti	ADF	-2.070	0.2574	-4.038	0.0061	I(1)
	PP	-2.166	0.2233	-4.038	0.0061	I(1)

Source: EViews, 2026

The study employs the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests to determine the order of integration of the variables. The purpose of the tests is to establish the stationarity properties of the series and avoid the possibility of spurious regression. The results indicate that most of the variables are non-stationary at levels but become stationary after first differencing, implying that they are integrated of order one, I(1). Specifically, variables such as Lgcpr, Lgexag, and Lgcpi, among others, contain unit roots at levels but become stationary after first differencing. In contrast, lgvoa and lgpinst are stationary at levels, indicating that they are integrated of order zero, I(0).

The combination of I(0) and I(1) variables, with none integrated of order two, I(2), supports the application of the NARDL framework. Therefore, it is not necessary to difference all variables before estimation. Rather, the NARDL model incorporates the variables in their appropriate levels and differences to estimate both the short-run and long-run relationships. The unit root results, together with the bounds-test evidence of cointegration, therefore provide a suitable basis for estimating the asymmetric effects of corruption and institutional governance on crop productivity in Nigeria.

Table 4.3: Short Run Estimate of the NARDL Model

Variable	Coefficient	Std. Error	t-Statistic	P-Value
LGCPR(-1)	0.298346	0.151523	1.968976	0.1436
LGCPR(-2)	0.002540	0.152137	0.016698	0.9877
LGCPPI_POS	0.393107	0.312204	1.259136	0.2970
LGCPPI_POS(-1)	-2.309501	0.509058	-4.536815	0.0200
LGCPPI_NEG	-3.147224	0.742595	-4.238146	0.0240
LGCPPI_NEG(-1)	0.659128	0.532474	1.237858	0.3038
LGROL_POS	1.882295	0.454190	4.144292	0.0255
LGROL_POS(-1)	0.102855	0.378853	0.271491	0.8036
LGROL_NEG	-1.668305	0.307288	-5.429130	0.0123
LGROL_NEG(-1)	-0.325945	0.238106	-1.368906	0.2645
LGVOA_POS	-2.523580	0.709108	-3.558810	0.0379
LGVOA_POS(-1)	-0.641677	0.293821	-2.183903	0.1169
LGVOA_NEG	0.063823	1.123037	0.056830	0.9583
LGVOA_NEG(-1)	0.377285	0.565276	0.667435	0.5522
LGEXAG_POS	-0.069701	0.082722	-0.842585	0.4613
LGEXAG_POS(-1)	-0.159170	0.083153	-1.914185	0.1515
LGEXAG_NEG	-0.017672	0.049030	-0.360432	0.7424
LGEXAG_NEG(-1)	0.252559	0.152665	1.654330	0.1966
LGCOG_POS	0.481062	0.136634	3.520820	0.0389
LGCOG_POS(-1)	0.025095	0.097383	0.257697	0.8133
LGCOG_NEG	-0.582352	0.398490	-1.461396	0.2401
LGCOG_NEG(-1)	0.877278	0.241222	3.636800	0.0358
C	5.991852	1.266721	4.730205	0.0179

Source: EViews, 2026.

Table 4.3 presents the short-run estimates of the NARDL model. The results show that the coefficient of LGCPI_POS is 0.3931, with a t-statistic of 1.2591 and a p-value of 0.2970, indicating that it is not statistically significant at the 5% level. However, LGCPI_POS(-1) has a coefficient of **-2.3095**, a t-statistic of -4.5368, and a p-value of 0.0200, indicating a statistically significant negative effect at the 5% level. LGCPI_NEG has a coefficient of -3.1472, a t-statistic of -4.2381, and a p-value of 0.0240, showing a statistically significant negative effect. Its lagged term, LGCPI_NEG(-1), has a coefficient of 0.6591 and a p-value of 0.3038, and is therefore statistically insignificant.

For LGROL, the positive component, LGROL_POS, has a coefficient of 1.8823, a t-statistic of 4.1443, and a p-value of 0.0255, indicating a statistically significant positive effect. LGROL_POS(-1) has a coefficient of 0.1029 with a p-value of 0.8036, indicating no significant effect. The negative component, LGROL_NEG, has a coefficient of -1.6683, a t-statistic of -5.4291, and a p-value of 0.0123, indicating a statistically significant negative effect. LGROL_NEG(-1) has a coefficient of -0.3259 with a p-value of 0.2645 and is statistically insignificant.

For LGVOA, LGVOA_POS has a coefficient of -2.5236, a t-statistic of -3.5588, and a p-value of 0.0379, indicating a statistically significant negative effect at the 5% level. Its lagged term, LGVOA_POS(-1), has a coefficient of -0.6417 and a p-value of 0.1169, indicating no significant effect. LGVOA_NEG has a coefficient of 0.0638, a t-statistic of 0.0568, and a p-value of 0.9583, while LGVOA_NEG(-1) has a coefficient of 0.3773 and a p-value of 0.5522. Both coefficients are statistically insignificant.

For LGEXAG, the coefficient of LGEXAG_POS is -0.0697, with a t-statistic of -0.8426 and a p-value of 0.4613, indicating no statistically significant effect. LGEXAG_POS(-1) has a coefficient of -0.1592 and a p-value of 0.1515, which is also insignificant. Similarly, LGEXAG_NEG has a coefficient of -0.0177, a t-statistic of -0.3604, and a p-value of 0.7424, while LGEXAG_NEG(-1) has a coefficient of 0.2526 and a p-value of 0.1966. Both negative components are statistically insignificant.

For LGCOC, LGCOC_POS has a coefficient of 0.4811, a t-statistic of 3.5208, and a p-value of 0.0389, indicating a statistically significant positive effect. Its lagged term, LGCOC_POS(-1), has a coefficient of 0.0251 with a p-value of 0.8133, indicating no significant effect. LGCOC_NEG has a coefficient of -0.5824, a t-statistic of -1.4614, and a p-value of 0.2401, indicating no statistically significant effect. However, LGCOC_NEG(-1) has a coefficient of 0.8773, a t-statistic of 3.6368, and a p-value of 0.0358, indicating a statistically significant positive lagged effect.

The lagged dependent variable LGCPR(-1) has a coefficient of 0.2983, a t-statistic of 1.9690, and a p-value of 0.1436, while LGCPR(-2) has a coefficient of 0.0025, a t-statistic of 0.0167, and a p-value of 0.9877. Neither is statistically significant at the 5% level. The constant term (C) is 5.9919, with a t-statistic of 4.7302 and a p-value of 0.0179, indicating statistical significance.

Overall, Table 4.3 shows that the statistically significant short-run coefficients are concentrated in LGCPI, LGROL, LGVOA, and LGCOC, while the coefficients associated with LGEXAG are statistically insignificant. This table-based result provides the basis for the subsequent discussion of the findings and their implications.

Table 4.4: Summary of the Goodness of Fit criteria for the analysis

Indicator	Estimate	Indicator	Estimate
R-squared	0.993641	Mean dependent var	3.038408

Adjusted R-squared	0.947011	S.D. dependent var	0.183925
S.E. of regression	0.042338	Akaike info criterion	-3.876504
Sum squared resid	0.005378	Schwarz criterion	-2.763572
Log likelihood	73.39455	Hannan-Quinn criter.	-3.556020
F-statistic	21.30890	Durbin-Watson stat	3.046519
Prob(F-statistic)	0.013846		

Source: EViews output, 2026

From Table 4.4; R-squared: The R-squared value is 0.9936, which means that the model accounts for 99.36 percent of the variability in crop productivity. This is very high, implying that the model fits the data.

Adjusted R-squared: The value of Adjusted R-squared is 0.9470; that is, it adjusts the predictors in the model. This value supports the fact that the model is not overfitting the data as it is robust.

F-statistic: The F-statistic is 21.3089, and the p-value of the F-statistic is 0.0138, meaning that the model is statistically significant. This implies that one or more of the independent variables can be credited as having a significant influence on the crop productivity variation.

Table 4.5: Summary of Long Run Estimates

Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
CointEq(-1)	-0.6991	0.190684	-3.6663	0.0351
LGCPI_POS	-2.741176	0.847170	-3.235684	0.0480
LGCPI_NEG	-3.558929	1.086434	-3.275790	0.0466
LGROL_POS	2.839523	0.914236	3.105898	0.0531
LGROL_NEG	-2.852539	0.737414	-3.868299	0.0306
LGVOA_POS	-4.527527	1.062504	-4.261185	0.0237
LGVOA_NEG	0.630953	2.069474	0.304885	0.7804
LGEXAG_POS	-0.327373	0.138614	-2.361750	0.0992
LGEXAG_NEG	0.335978	0.198640	1.691395	0.1893
LGCOG_POS	0.723999	0.223395	3.240889	0.0478
LGCOG_NEG	0.421856	0.425078	0.992421	0.3941
C	8.570639	1.400345	6.120375	0.0088

Source: EViews, 2026

Table 4.5 presents the long-run coefficients of the NARDL model. The results show that LGCPI_POS and LGCPI_NEG have negative and statistically significant coefficients, with p-values of 0.0480 and 0.0466, respectively. LGROL_NEG also has a statistically significant negative coefficient of -2.8525 ($p = 0.0306$), while LGROL_POS has a positive coefficient of 2.8395, which is marginally insignificant at the 5% level ($p = 0.0531$). For LGVOA, the positive component is negative and statistically significant (-4.5275, $p = 0.0237$), whereas the negative component is statistically insignificant ($p = 0.7804$).

The coefficients of LGEXAG_POS and LGEXAG_NEG are statistically insignificant, with p-values of 0.0992 and 0.1893, respectively. LGCOC_POS has a positive and statistically significant coefficient of 0.7240 ($p = 0.0478$), while LGCOC_NEG is statistically insignificant ($p = 0.3941$). The error-correction coefficient, $\text{CointEq}(-1)$, is -0.6991 and statistically significant ($p = 0.0351$), indicating that approximately 69.91% of short-run disequilibrium is corrected within one period, with adjustment occurring towards the long-run equilibrium. The constant term is also statistically significant ($p = 0.0088$).

Overall, the table indicates that the long-run effects are statistically significant for both components of corruption perceptions, the negative component of rule of law, the positive component of voice and accountability, and the positive component of control of corruption, while government agricultural expenditure and the negative component of control of corruption are statistically insignificant.

Post Estimation Tests.

Ramsey RESET Test

The Ramsey RESET test helps to check for the problem of model specification errors, especially the check on whether the powers of the fitted values (i.e., squared or cubed terms) are omitted. From the table, the Ramsey RESET test has an F-statistic of 1.4717 and a p-value of 0.5036; this shows that there is no evidence of misspecification in the model.

Breusch-Godfrey Serial Correlation LM Test:

This test checks for the presence of serial correlation in the residuals of the model. The F-statistic of this test is 2.2847 and its p-value is 0.4237. This shows the presence of serial correlation in the residuals is not significant, as the p-value is greater than the standard 0.05 significance level. In addition, the Obs R-squared statistic is 21.3316, and the p-value of 0.0000 from the chi-square test indicates strong evidence of no autocorrelation in the model's residuals.

Heteroskedasticity Test (ARCH)

The ARCH test checks for the presence of heteroskedasticity or difference in variance of residuals over time. The F-statistic here is 0.4961, while the p-value is 0.6158 and the chi-square value of 1.0828 with a p-value of 0.5819 indicate no significant heteroskedasticity in the model, as both p-values exceed the 0.05 threshold. This means that the homoscedasticity assumption is valid.

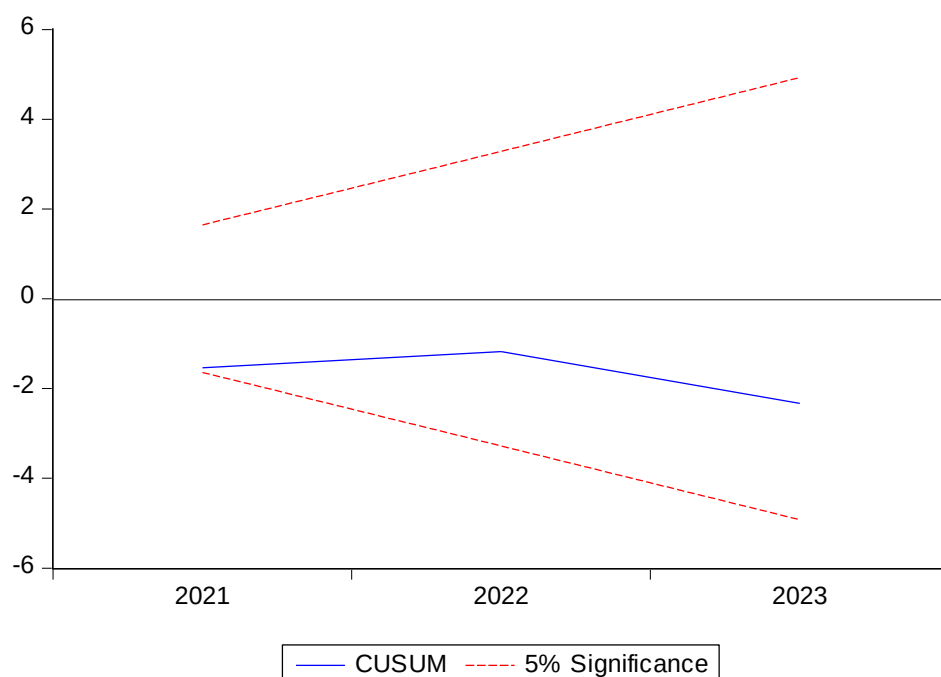
Table 5: Summary Table of Post-Estimation Tests

Test	Statistic	Degrees of Freedom	Probability
Ramsey RESET Test	F-statistic: 1.4717	(2, 1)	0.5036
Breusch-Godfrey Serial Correlation LM Test	F-statistic: 2.2847	(2, 1)	0.4237
	Obs*R-squared: 21.3316	(2)	0.0000
Heteroskedasticity Test (ARCH)	F-statistic: 0.4961	(2, 21)	0.6158

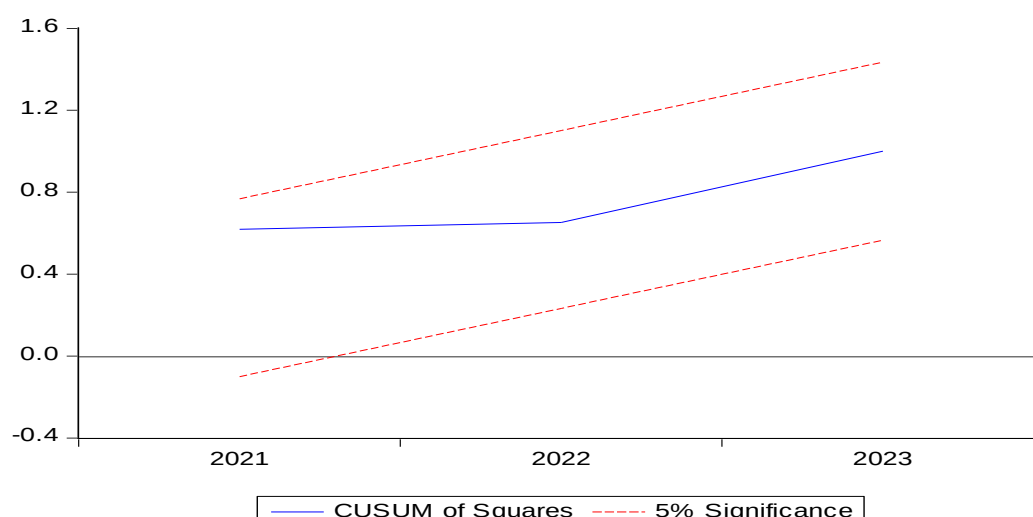
Source: EViews, 2026

Cusum Stability

The graph in the figure below shows the cusum stability of the model; the blue line is shown to be within the red line, showing that the variables of the model are stable. The Cusum square result also shows that the estimates of the model are stable in explaining changes in the independent variables.



Source: Cusum Square Test of Stability, 2026



4.2 Discussion of Findings

The NARDL results provide evidence that corruption and institutional governance matter for crop productivity in Nigeria, with effects differing according to the direction of institutional changes. In the short run, deterioration in corruption perceptions significantly reduces crop productivity, while improvements in the rule of law and control of corruption significantly increase productivity. Conversely, deterioration in the rule of law has a significant negative effect. These findings support the view that corruption weakens resource allocation and the effectiveness of public interventions (Mauro, 1995; Jensen, 2003), while stronger institutions, secure property rights, and effective rule of law promote productive investment and economic performance (North, 1990; Acemoglu et al., 2001). Voice and accountability show a significant negative effect through its positive component, while government expenditure on agriculture has no significant short-run effect in either direction. This suggests that

agricultural spending alone may not translate into higher productivity where institutional and implementation constraints persist.

The long-run estimates reinforce the importance of institutional quality. Both positive and negative components of corruption perceptions have significant negative effects on crop productivity, while deterioration in the rule of law also significantly reduces productivity. The positive component of control of corruption has a significant positive effect, indicating that stronger corruption-control mechanisms are associated with improved agricultural productivity. Government expenditure on agriculture remains insignificant in both directions, suggesting that the effectiveness of expenditure may depend on the institutional conditions under which resources are allocated and implemented. This finding is consistent with the broader literature linking institutional quality and effective governance to improved agricultural and economic outcomes (Anwana et al., 2019; Osabohien et al., 2020).

The error-correction coefficient of -0.6991 is negative and statistically significant, indicating that approximately 69.91% of short-run disequilibrium is corrected within one year, thereby confirming relatively rapid adjustment towards long-run equilibrium. Overall, the findings demonstrate that institutional quality, particularly corruption control and the rule of law, is important for crop productivity in Nigeria. The asymmetric results further show that improvements and deteriorations in institutional conditions do not necessarily produce equal effects, supporting the use of the NARDL framework for understanding the governance–productivity relationship.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The findings indicate that institutional governance plays a significant role in determining crop productivity in Nigeria, although the relationship is nonlinear and asymmetric. Improvements in governance may involve short-run adjustment costs but generate productivity gains over the long run, whereas institutional deterioration can adversely affect agricultural performance. The results therefore suggest that weak institutions, corruption, and policy inconsistency constrain crop productivity, while sustained improvements in governance can support long-term agricultural performance.

The findings further highlight the importance of institutional quality and security conditions for agricultural productivity. Insecurity and terrorism can disrupt agricultural activities and negatively affect productivity in both the short and long run, while reductions in security-related support may further expose rural agricultural systems to adverse shocks. The asymmetric effects of institutional governance indicate that governance reforms may require short-run adjustments before their benefits become evident. These findings underscore the importance of institutional credibility, effective governance, policy consistency, and a secure agricultural environment for achieving sustained improvements in crop productivity in Nigeria.

5.2 Recommendation

Empower Institutional Governance and Policy Credibility

The asymmetric effects of institutional governance suggest that weak institutions can undermine the effectiveness of agricultural policies. Sustained productivity improvements therefore require governance reforms that are credible, transparent, and consistently implemented. Strengthening accountability in agricultural programmes, reducing corruption, and ensuring policy continuity are critical to improving the transmission of policy interventions to the agricultural sector. Even well-

designed policies and increased financial inflows may fail to generate significant productivity gains where institutional capacity is weak. This finding is consistent with the broader literature emphasizing institutional quality as an important determinant of sectoral economic performance (Kaufmann, Kraay, & Mastruzzi, 2019; IMF, 2019).

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