Effects of Agricultural Sector Performance on Economic growth in Nigeria

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Abstract
This study determined the effects of agricultural sector performance on economic growth in Nigeria. The study covered a period of forty-three (1981 to 2023). The study proxied agricultural sector performance by crop production, livestock production, forestry production and fishing production while economic growth was measured by Gross Domestic Product. The study made use of time series data and the data were sourced from World Bank Indicators (WDI) of the World Bank, Central Bank of Nigeria (CBN) statistical bulletin and National Bureau of Statistics (NBS) reports. The technique of data analysis adopted include: descriptive statistical technique, Augmented Dickey-Fuller (ADF) of unit root test, correlation matrix of multicollinearity test, and Autoregressive Distributive Lag (ARDL) approach. The findings of the study showed that crop production, livestock production and fishing production have positive and significant effect on Gross Domestic Product in Nigeria. Also, forestry production has a positive and non-significant effect on Gross Domestic Product. Premised on the findings, the study concluded that agricultural sector performance significantly contributes to economic growth in Nigeria. The study recommends that the government and private sector should prioritize investments in agricultural infrastructure, including irrigation systems, rural roads, storage facilities, and processing plants, which will boost crop yields, while improved roads will reduce transportation costs and waste, making Nigerian agricultural products more competitive domestically and internationally.

Key words*: Gross domestic product, crop production, livestock production, forestry production, fishing production*

1. INTRODUCTION

The place of agriculture in the Nigerian economy has evolved over time. In the pre-colonial era, agriculture was overwhelmingly dominant in Nigeria with farming as a major occupation and means of sustenance. Despite the use of crude implements, enough food was produced to feed the population and cash crops were produced and used for a barter trade system. Given the country's abundant agricultural resources, a wide area of arable land, evenly distributed rainfall, and consistently warm weather, agriculture has gradually become the main source of income for the majority of the population in Nigeria. The period of the Colonial Administration (1861-1960) was characterized by considerable emphasis on research and extension services. In the post-independence era, new policies were developed to achieve more equitable growth in agriculture. Before the discovery of crude oil in Nigeria, the agricultural sector was the dominant sector as it accounted for over 90 per cent of foreign exchange earnings and overall Federal government revenue (Central Bank of Nigeria, 2010).

Basically, the agricultural sector provides employment opportunities for the teeming population, eradicates poverty and contributes to the growth of the economy. In Nigeria also,

because 70% of the population is employed in the agriculture sector, economic growth will be almost impossible to achieve without developing the sector. Furthermore, the importance of agriculture to the Nigerian economy is evident in the nation's natural endowments in production sectors – extensive arable land, water, human resources, and capital. Exploring the nation's productive advantage in this sector is the fastest way to stimulate growth in the economy (Idoko & Jatto, 2018). Furthermore, the important benefits of the agricultural sector to Nigerian economy include: the provision of food, contribution to the Gross Domestic Product (GDP), provision of employment, the provision of raw materials for agro-allied industries, generation of foreign earnings labour and improvement of entrepreneurship through capacity building. The realization of this fact led Nigerian government to embark on several agricultural development programmes in order to develop agricultural sector (Ogbonna & Osondu, 2015). It follows that agriculture financing is one of the most important instruments of economic policy for Nigeria, in her effort to stimulate development in all directions. Finance is required by agricultural sector for the purchase of land, construction of buildings, acquisition of machinery and equipment, hiring of labour and irrigation facilities. In certain cases, such finance may also be needed to purchase new and appropriate technologies. Not only can finance remove financial constraints, but it may also accelerate the adoption of new technologies which will lead to improvement of agricultural output and consequently economic growth (Obansa & Maduekwe, 2013).

However, the Federal Government of Nigeria in the past had initiated various agricultural credit related policies and programmes in attempt to enhance economic growth and improve agricultural production through provision of cheap financial resources to farmers at a concessionary interest rate. Agricultural Credit Guarantee Scheme Fund (ACGSF) is one of such schemes enunciated by the federal government of Nigeria. Other programmes and schemes include; Agricultural Credit Support Scheme (ACSS) people Bank of Nigeria (PBN), Nigeria Agricultural and cooperative Bank [NACB), Economic advancement programme (EAP), Nigerian Industrial Devotement Bank (NIDB), and National Economic Reconstruction Fund (NERFUND). The aim is to identify key macroeconomic impact on agricultural financing in Nigeria from (1980-2010) and this has led to improvement in agricultural production and hence, socio-economic development in Nigeria.
According to Gollin (2019), agricultural sector significantly contributes to economic growth by providing raw materials for industries, reducing dependency on food imports, and generating export revenue. Hence, increase in agricultural productivity will results in increase in overall economic growth. This correlation reflects agriculture's role in sustaining industries such as food processing, textiles, and manufacturing. Therefore, economies that invest in agricultural technology and infrastructure witness a surge in productivity, further fueling Gross Domestic Product (GDP) growth. Technological innovations like improved seeds, fertilizers, and mechanized farming techniques have revolutionized agricultural production, enhancing yields and stimulating economic development (World Bank, 2021).

Additionally, increased agricultural sector enhances food availability and affordability, critical for achieving food security and improving nutritional outcomes. Food security, defined as the availability and accessibility of sufficient, safe, and nutritious food, is crucial for maintaining a healthy and productive population. High agricultural productivity ensures that food supplies meet demand, stabilizing prices and reducing hunger (FAO, 2022). Countries with a strong agricultural base can better cope with global food price fluctuations. For instance, countries that have invested in staple crop production will experience improved food security and reduced malnutrition rates (Pingali & Sunder, 2021). Abebaw (2022) also noted that agricultural production is a powerful driver of socio-economic development, especially in

developing regions where it forms the backbone of the economy. Through its contributions to economic growth agricultural production plays an indispensable role in the socio-economic advancement of nations. However, realizing agriculture's full potential requires addressing persistent challenges, including access to resources, infrastructure, and sustainable practices (Adeola & Ajayi, 2022).

Generally, the contribution of the agricultural sector to the gross domestic product and overall development in Nigeria witnessed a dramatic turnaround due to the discovery of crude in commercial quantities. According to Food and Agriculture Organization (FAO, 2012), agriculture contributes immensely to the economy of countries in many ways through the provision of food, supply of adequate raw materials and provision of the market for the products of a growing industrial sector. Sertoğlu1, Ugural and Bekun (2017) described agricultural sector as an important driver of economic growth, development and poverty eradication in the developing countries including Nigeria. Between January and March 2021, the sector contributed to 22.35 percent of the GDP (World Bank, 2021). This is in support of the assertion of Ehui and Tsigas (2009) that agricultural sector is not only significant in Nigeria because of the ability of the sector to serve as the major employer of labour but also serves as the backbone in providing food to Nigeria's population, and input in the form of raw materials to the industrial sector amongst other benefits.
According to Federico (2005), agriculture plays three key roles in the process of economic growth: the role of the product, the role of the factor, and the function of the market. The agricultural sector's output serves two purposes: it feeds the population and generates foreign exchange through exports of agricultural produce. The factor role concerns the provision of capital and labour to other industries and service sectors. Agriculture is included in the market role as a channel for goods coming from the manufacturing industry. In addition, some literature emphasizes the importance of increases in agricultural productivity as a prerequisite for economic growth. According to this literature – mainly in developing countries, where the agricultural sector accounts for a large share of the workforce and accounts for roughly 25 per cent of the value added in the economy – growth in agricultural productivity causes significant aggregate effects and will therefore also influence the general economic growth within a country (Gollin, 2010; Diao, Hazell & Thurlow, 2010). Nigeria's economy, which employs the majority of the working force and contributes significantly to both the country's GDP and overall exports, is still mostly based on agriculture, despite the country's increasing dependence on oil. Based on available data, over 40% of Nigeria's GDP is derived from agriculture, which also employs approximately 60% of the labour force in formal and informal jobs (Solomon & Mailamba, 2024). With these performances, the expectation would be that the agricultural sector receives prime attention from government and private enterprises particularly in the area of funding to enhance the contribution to the economy-wide aggregates.

In Nigeria, there is growing recognition of the role agriculture plays in boosting economic growth and overall macroeconomic performance. Despite its importance, the agricultural sector receives insufficient funding. The Central Bank of Nigeria (CBN) estimates that agriculture accounts for only about 4% of total bank credit. The government's budget allocation to agriculture has consistently fallen below the Maputo Declaration's recommended 10%, hovering around 1-2% annually. Also, poor infrastructure, such as inadequate rural roads, electricity, and irrigation facilities, limits the sector's efficiency. Post-harvest losses, estimated at 20-40% of total output, are significant due to the lack of storage and processing facilities. Moreover, agriculture in Nigeria is largely subsistence-based, with limited use of modern equipment and technology. Mechanization levels are among the lowest in sub-Saharan Africa, with less than 30 tractors per 100 square kilometers of arable land. Land ownership and tenure

systems are poorly defined, discouraging large-scale investments. Farmers often operate on fragmented plots, reducing productivity. Moreover, frequent conflicts between farmers and herders, as well as banditry and insurgencies in rural areas, disrupt agricultural activities. Over 70% of farmers in northern Nigeria report that insecurity has reduced their productivity while erratic rainfall, desertification, and soil erosion, driven by climate change further reduce agricultural yields.

As a result, the effect of agricultural sector performance on economic growth in Nigerian has not really been felt. Specifically, the agricultural sector contributes approximately 23-25% to Nigeria's Gross Domestic Product (GDP) but falls short of its potential due to low productivity. While the sector grew by 1.88% in Q1 2023, this growth rate is insufficient to drive overall economic expansion.

It is against this backdrop, that the study raised the following questions; what is the effect of crop production on gross domestic product in Nigeria? how does livestock production affect gross domestic product in Nigeria? does forestry product affect gross domestic product in Nigeria? how does fishing production affect gross domestic production in Nigeria? The aim of the study was therefore, to examine the effect of agricultural sector performance on economic growth within the period 1981-2023.

2. LITERATURE REVIEW

Theoretical Framework

Cobb-Douglas Production Function

The Cobb-Douglas production function is based on the empirical study of the American manufacturing industry made by Douglas and Cobb in 1928 (Tan, 2008). In 1928, Charles Cobb and Paul Douglas published in a study in which they modeled the growth of the American economy during the period 1899-1922 (Ioan & Ioan, 2015). It is a linear homogenous production function of degree one which takes into account two inputs, labour and capital for the entire output of the crop production (Moffatt, 2019). The Cobb Douglas production function is expressed by:

$$Q = A. L^{\alpha} . C^{\beta} \quad (2.1)$$

Where;

Q is output, L and C are inputs of labour and capital respectively. A, α and β are positive parameters where $\alpha > 0$ and $\beta>0$. The equation tells that output depends directly on L and C, and that part of the output that cannot be explained by L and C is explained by A which is residual, often called technical change. The coefficient of labour α measures the percentages increase in Q that would result from a percent increase in L, while holding C as constant. Similarly, β is the percentage increase in Q that would result from a percent increase in C while holding L as constant (Tan, 2008). The relevance of the theory is that it is used in the analysis of economies of modern, developed, and stable nations around the world in terms of inputs and output models. This framework applies to agriculture as it highlights the impact of capital and labor productivity on overall agricultural output, offering a useful tool to assess how agricultural production contributes to socio-economic indicators like Gross Domestic Product, poverty reduction, income distribution, and employment. Specifically, the Cobb-Douglas model's utility in agriculture allows for an understanding of how labor and capital investment (such as mechanization and improved seed quality) can enhance productivity and, in turn, contribute to Gross Domestic Product growth. In developing economies like Nigeria, where agriculture plays a significant role in GDP, the elasticity parameters α\alphaα (labor) and β and β (capital) demonstrate the extent to which increasing agricultural inputs can boost Gross Domestic Product.

Unbalanced Growth Theory

Unbalanced Growth theory was propounded by Hirschman in 1957. Hirschman posited that a deliberate unbalancing of the economy according to a pre-designed strategy is the best way to achieve economic growth in an underdeveloped nation. This deliberate unbalancing of the economy means heavy investment into a strategic sector of the economy and not all the sectors taken simultaneously. The underlying assumption of the theory as noted by Jinghan (2011) is that a strategic sector when fully developed catalyzes the growth of other sectors and the aggregate national output. Furthermore, investment in strategically selected industries or sectors of the economy will lead to new investment opportunities and so pave way for further economic development, thus "growth is being communicated from leading sectors of the economy to the followers, from one industry to another, from one firm to another". Unbalanced Growth Theory emphasizes that agriculture can serve as a driver of economic growth by channeling resources into enhancing agricultural productivity. In Nigeria, where agriculture contributes significantly to Gross Domestic Product, strategic investment in agricultural infrastructure, mechanization, and improved crop varieties could increase productivity. This, in turn, raises agricultural output, which has direct implications for Gross Domestic Product growth. Forward linkages to agro-processing and food distribution enhance Gross Domestic Product by creating value-added products from raw agricultural output, boosting national income and output.

Staple Theory

Staple Theory, also known as the Staples Thesis, was developed by Canadian economist Harold A. Innis in the 1930s. The theory provides a framework for analyzing the economic development of regions heavily dependent on primary commodities, referred to as "staples," such as agricultural products, forestry, and minerals. Initially designed to explain Canada's economic development, the theory has been extended to study other resource-rich economies. The central idea of Staple Theory is that the export of staple products acts as a driver of economic growth by fostering backward and forward linkages within the economy. These linkages encourage diversification and industrialization, although dependency on staples can also create vulnerabilities. Staple Theory posits that the economic trajectory of a country is shaped by its resource endowment and the export of primary commodities. The export of these staples leads to the development of other sectors in the economy through three primary linkages: Backward Linkages (Development of industries that supply inputs to the staple production process, such as machinery and labor), Forward Linkages (Processing and transformation of raw staples into finished goods) and Final Demand Linkages (Increased income from staple exports boosts domestic demand for goods and services, stimulating the economy). The theory emphasizes the transformative potential of staple exports while acknowledging the risks of economic over-reliance on these commodities.

Staple Theory provides valuable insights into the role of agriculture in driving Nigeria's economic growth. By emphasizing the importance of backward and forward linkages, the theory underscores the transformative potential of agricultural exports. However, it also highlights vulnerabilities associated with over-reliance on primary commodities. For Nigeria, leveraging agricultural performance to foster diversification, value addition, and rural development can unlock sustainable growth. The agricultural sector stimulates the development of industries that supply inputs like fertilizers, seeds, and machinery. These backward linkages create jobs and foster the growth of related industries, contributing to overall economic growth. For instance, the demand for agro-inputs like fertilizers has led to the establishment of local production facilities, such as the Dangote Fertilizer Plant, which boosts industrial activity. Also, Staple Theory highlights the importance of processing staples

for greater value addition. In Nigeria, processing agricultural commodities such as cassava into starch or palm oil into consumer goods enhances industrial output. Hence, the rise of agro-processing zones aims to transform Nigeria's raw agricultural outputs into exportable finished goods, increasing foreign exchange earnings and Gross Domestic Product. In addition, income from agricultural exports increases domestic demand for goods and services, creating a multiplier effect in the economy. As rural incomes rise, consumption patterns shift, fostering growth in other sectors. Lastly, Staple Theory argues that resource wealth can fund diversification and structural transformation. Nigeria's agriculture, if well managed, could serve as a platform for transitioning from a primary commodity-based economy to a diversified industrial economy.

Empirical Review

Chukwu (2023) examined the impact of agricultural sector on economic growth in Nigeria (1981-2020). The main objective of the study is to examine the impact of agricultural sector on economic growth in Nigeria. The study used multiple regressions. The variables under consideration were real gross domestic product as the dependent variable while crop production, livestock production, forestry production and fish production are the independent variables. The Ordinary Least Square (OLS) technique was used in estimating the relationship between the dependent and independent variables. From the research result Crop production and livestock production have significant impacts on economic growth in Nigeria. Forestry production and fish production have no significant impacts on economic growth in Nigeria. All the independent variables have positive relationship with economic growth in Nigeria respectively, which implies that as crop production, livestock production, forestry production, and fish production increases, real gross domestic product increase. There is no causality relationship between crop production and economic growth in Nigeria. There is no causality relationship between livestock production and economic growth in Nigeria. There is a unidirectional causality relationship flowing from forestry production to real gross domestic product, between forestry production and economic growth in Nigeria. There is no causality relationship between fish production and economic growth in Nigeria. Based on the findings of the work, the study recommends that there is the need for the Nigerian government and its citizenry to concentrate their combined efforts towards increasing the productivity capacity of the crops with the aim of promoting food security and economic growth among others.

Agwu, Mohammed, Best and Udi (2022) examined the interaction between the agricultural sector and economic growth in Nigeria from 1981 to 2019 using data obtained from the World Bank development indicators. The unit root test indicates that the variables were all integrated after the first difference which informed the decision to adopt the Vector Error Correction Model (VECM) technique. The result of the estimation shows that Agricultural output has a significantly positive relationship with GDP in the long run. Granger causality shows a uni-directional causal relationship running from agricultural output to GDP. This study recommended that since the agriculture sector is a machine for economic growth in Nigeria, efforts to add value to the sector should be made through increased investment by both government and private sectors. Secondly, the linkages between the agriculture sector and other sectors be strengthened to increase the effect of agriculture sector growth on growth across the sectors. This can be achieved through increased productivity and the development of the agriculture value chain.

Ogundiwin, Olalekan, Adekunle and Amos (2022) investigated the relationship between agricultural sector and economic growth of Nigeria. The study adopted ex-post facto research design. Economic data were sourced from Central Bank of Nigeria Statistical Bulletin and World Governance Indicator from 1981- 2017. Data were analyzed using descriptive statistics and multiple regression analysis. Agriculture policy had positive but non-significant

moderating effect on the relationship between agricultural exports and the economic growth of Nigeria (ΔR^2 =0.024; β= -0.0001; t(185) =4.3743; p<0.05). The study concluded that agricultural policy impacted the economic growth of Nigeria. The study recommended that an effective and committed policy implementation by the government is needed to improve economic growth. Furthermore, the Nigerian government should provide additional funding for the agricultural sector to raise its productivity and increase its contributions to economic growth.

Wilson, Adikaba, Ngukwarai, Dom and Lopwus (2021) examined the impact of agricultural output on economic growth in Nigeria. GDP being the dependent variable was used as a proxy for economic growth while crop, livestock, forestry, and fishery were the independent variables. Annual times series data of the variables covering the period between 1986-2020 were sourced from CBN and National Bureau for Statistics. The study carried out pre-diagnostic tests including the Unit root test to test the stationarity of the data and the cointegration test to confirm the long-run relationship between variables. Error correction model (ECM) was used in the data analysis. Findings from the study revealed that there exists a long-run relationship between the variables. The results of the error correction model (ECM) revealed that the coefficient of livestock and fishery production were both positive with values of 5.0526 and 67.26 respectively and significant at a 5% level with the p-value 0.0432 and 0.0292. Crop production and forestry had a negative and insignificant impact on Nigeria's economic growth with the coefficient of -4.593964, and -2.625762 and p-value of 0.6432, and 0.6432, respectively. The study, therefore, recommended that the Nigerian government should review its policies on forestry and crop prodsuction so that they can have an impact on Nigeria's economic growth, and encourage more production of livestock and fisheries to have more input., Government should establish and fund more research institutes to improve seedlings to increase the productivity of crops.

John and Ebri (2020) examined the effect of Small and Medium Scale Enterprises (SMEs) on economic growth in Nigeria from 1986 to 2018. Data for the study were sourced from Central Bank of Nigeria Statistical Bulletin. Vector Autoregression (VAR) technique was employed in analysing the data collected. The results of the estimation indicated that SMEs output growth rate has a significant positive effect on gross domestic product (GDP) growth rate (a proxy for economic growth). Furthermore, it was found that SMEs contribute 61% of the growth in GDP. Thus, the study recommended that government of Nigeria should ensure increased positive effect of SMEs on Nigeria's economic growth by ensuring that SMEs have increased access to funding at a reduced cost to boost their growth; ensure that the economy is business/investment friendly for SMEs by adjusting key economic policies such as reduction in tax rate/granting of tax waivers, provision of incentives/grants to SMEs in her domain; tackles issues such as dwindling power supply and insecurity.

Amaefula (2019) underscored the impact of agricultural sector on the economic growth of Nigeria. The yearly data sets on real gross domestic product (RGDP) and agricultural variables such as crop production (CP), livestock (LS), forestry (FO) and fishing (FI) covered the period of 1981to 2017. Applying multiple linear regression model and trend pattern of percentage ratio measure, the results showed that all the agricultural variable except CP have insignificant positive impact on RGDP and CP effect is significant under 1% level. And the trend pattern of percentage ratio measure showed that agricultural sector contributes positively to economic growth in Nigeria. Therefore, government and stake holders in the agricultural sector should put more effort towards improving some sub-sectors such as fishery, forestry and livestock for a robust agricultural sector contribution to economic growth in Nigeria.

Kenny (2019) critically examined the role of agricultural sector performance on economic growth in Nigeria. Key findings indicated that there is a significant long run relationship between agricultural domestic production and its explanatory variables (Agricultural Credit

Guarantee Scheme Fund, Federal Government current expenditure on agriculture, total employment and effect of trade liberalization). The VECM result found 35 percent speed of adjustment of the endogenous growth model which includes Agricultural Credit Guarantee Scheme Fund, Federal Government current expenditure, total employment and effect of liberalization (SAP) on agricultural domestic production implying that Interventions in agriculture will take at least 24 months for one half of its effect to be significant on production in Nigeria. Therefore, Policy consistency and commitment of government is required before such intervention can yield the desired results.

Gap in Literature/Value addition

This chapter has provided in details the theoretical, conceptual and empirical literature on the agricultural sector performance and economic growth in Nigeria. It was observed that a lot of the related studies (Chukwu, 2023; Júlio, Maurício, Terciane & Luc, 2023; Agwu, Mohammed, Best and Udi, 2022; Ogundiwin, Olalekan, Wilson, Adikaba, Ngukwarai, Dom & Lopwus, 2021; John and Ebri, 2020; Amaefula, 2019; Kenny, 2019) on agricultural sector performance and economic growth had conflicting results, creating a gap which this study aims to bridge. This mixed results which was as a result of different sets data employed to examine the effect of agricultural sector performance, was addressed in this study by examining agricultural sector performance proxied by crop production, livestock production, forestry production and fishing production on economic growth in Nigeria. The study also employed additional pre-estimation test such as multicollinearity test to ensure the validity of the results.

METHODOLOGY

Research Design

This study adopted the *ex-post-facto* research design as it is non-experimental in nature, and investigated effects of the independent variables (measures of agricultural sector performance) on the dependent variable (Gross domestic product) by using existing annual time series data spanning a period of forty-three (43) years 1981 to 2023, which were sourced from the Central Bank of Nigeria (CBN) statistical bulletin and the World Bank's development indicators (WDI) and the national Bureau of statistics (NBS) report..

Model Specification

The analytical framework of this study was anchored on Unbalanced Growth theory because of its relevance to this study. Empirically, this study employed a model to measure the link between agricultural sector performance and gross domestic product in Nigeria. the model closely follows the works of Oyetade (2021) with slight modifications.

The functional specification of the model was provided as follows:

$$GDP = f(CRP, LVS, FOR, FIS) \quad (3.1)$$

The mathematical specification of the model was provided as follows:

$$GDP_t = \beta_0 + \beta_1 CRP_t + \beta_2 LVP_t + \beta_3 FOR_t + \beta_4 FIS_t \quad (3.5)$$

(3.8)

The econometrical specification of the model was provided as follows:

$$GDP_t = \beta_0 + \beta_1 CRP_t + \beta_2 LVP_t + \beta_3 FOR_t + \beta_4 FIS_t + U_{it} \quad (3.9)$$

$$\Delta(GDP_t) = \beta_0 + \beta_{1i}\Delta(GDP_{t-1}) + \beta_{2i}\Delta(CRP_{t-1}) + \beta_{3i}\Delta(LVS_{t-1}) + \beta_{4i}\Delta\ln(FOR_{t-1}) + \beta_{5i}\Delta\ln(FIS_{t-1}) + \sum_{t=1}^{p}\alpha_{1i}\Delta(GDP_{t-1}) + \sum_{t=1}^{q}\alpha_{2i}\Delta(CRP_{t-1}) + \sum_{t=1}^{p}\alpha_{3i}\Delta(LVS_{t-1}) + \sum_{t=1}^{q}\alpha_{4i}\Delta(FOR_{t-1}) \sum_{t=1}^{q}\alpha_{5i}\Delta(FIS_{t-1}) + \varepsilon_{1i} \quad (3.13)$$

In furtherance, the short run dynamic parameters are arrived at by the estimation of an error correction model linked with the long-run estimates. The model is stated below:

$$\Delta \ln(GDP_t) = \alpha_0 + \sum_{t=1}^{p} \alpha_{1i} \Delta(GDP_{t-1}) + \sum_{t=1}^{q} \alpha_{2i} \Delta(CRP_{t-1}) + \sum_{t=1}^{p} \alpha_{3i} \Delta(LVS_{t-1}) + \sum_{t=1}^{q} \alpha_{4i} \Delta(FOR_{t-1}) \sum_{t=1}^{q} \alpha_{5i} \Delta(FIS_{t-1}) + \lambda ECMT_{t-1} + \varepsilon_{14i} \quad (3.17)$$

Where:
GDP = Gross Domestic Product
CRP = Crop Production, LVS = Livestock Production, FOR = Forestry Production
FIS = Fishing Production, f = Functional Relationship, β_0 = Regression intercept in GDP, model, β_1 = Parameter or Coefficient of Crop Production, β_2 = Parameter or Coefficient of Livestock Production, β_3 = Parameter or Coefficient of Forestry Production, β_4 = Parameter or Coefficient of Fishing Production, U_i = Error term, Δ = Difference operator and indicates the optimum lag t = Time lag

A Priori Expectation:
This is used to examine the economic usefulness of the equation with regard to meeting the a priori expected sign of the parameters. Generally, agricultural sector performance was expected to contribute positively to the gross domestic product in Nigeria. Specifically, the expected nature of relationship is stated thus: $\beta_1 - \beta_4 > 0$.

3. RESULT ANALYSIS AND DISCUSSION OF FINDINGS

Unit Root Test
As a precondition to time series analysis, the unit root test was conducted using the ADF method to ascertain the stationary process of the series. The results are presented in Table 1.

Table 1: Augmented Dickey-Fuller (ADF) Test Results

ADF Variables	Level	Critical Value @ 5%	1st Difference	Critical Value @ 5%	I(d)	Stationary @
$InGDP_t$	-1.497992	-2.933158	-3.543561**	-2.935001	I(1)	1st Difference
$lnCRP_t$	-0.576461	-2.933158	-6.157169***	-2.935001	I(1)	1st Difference
$lnLVS_t$	-1.133567	-2.935001	-9.509613***	-2.935001	I(1)	1st Difference
$lnFOR_t$	-6.603098***	-2.936942	-	-	I(0)	Level
$lnFIS_t$	-0.797813	-2.941145	-9.464388	-2.941145	I(1)	1st Difference

Note: *, **, and * denote significance at 10%, 5% and 1%, respectively**
Source: Author's Computation, 2024 (E Views 12 Output).

Table 4.3 presents the summary results of the ADF Unit root tests carried out on all the variables in our model. The unit root test results showed that forestry production (FOR) attained stability at level. This is because the test statistic values of forestry production (FOR) is greater than the Mackinnon critical value at 5% level of significance at level. This further indicates that forestry production (FOR) was stationary at order zero [i.e., I(0)]. On the other hand, Gross Domestic Product (GDP), crop production (CRP), livestock production (LVS) and fishing production (FIS) attained stability after first differencing. This is because their test statistic values are greater than the Mackinnon critical value at 5% level of significance at first difference. This further indicates that Gross Domestic Product (GDP), crop production (CRP), livestock production (LVS) and fishing production (FIS) were integrated at order one [i.e., I(1)].

Conclusively, the attainment of mixed stationarity in the variables (that is stationary at order zero and stationary at order one) necessitated the use of ARDL in the estimation of the long run relationship among the variables and the error correction model.

Estimation Model One (Gross Domestic Product Model)

Correlation Analysis

For the purpose of this study, correlation matrix is used to detect multicollinearity. The correlation matrix involves examination of correlation coefficients between pairs of dependent and independent variables. The results of the correlation are presented in Table 4.4:

Table 2: Correlation Matrix

	GDP	CRP	LVS	FOR	FIS
GDP	1				
CRP	0.118448	1			
LVS	0.203861	0.291265	1		
FOR	0.460077	0.174001	0.377163	1	
FIS	0.218212	0.385733	0.485867	0.97219	1

Source: Author's Computation, 2024 (E Views 12 Output).

The result of the correlation matrix in Table 4.4 indicated that crop production, livestock production, forestry production and fishing production) all have weak positive relationships with Gross Domestic Product (GDP). Hence, there is sufficient statistical evidence to conclude that there is absence of multicollinearity problem among the independent variables.

ARDL Bound Cointegration Test

Table 3: ARDL Bounds Cointegration Test

	Critical Value Bound		F-Statistics
F_{GDP}(CRP/CRP, LVS, FOR, FIS) K = 5			6.021146***
Significance	I(0) Bound	I(1) Bound	
10%	2.2	3.09	
5%	2.56	3.49	
2.5%	2.88	3.87	
1%	3.29	4.37	

Note: Null hypothesis: No level relationship; K = number of regressors; *, ** and *** denote significance at 10%, 5% and 1% level, respectively.

Source: Author's Computation, 2024 (E Views 12 Output).

In order to determine if there is cointegration among Gross Domestic Product (GDP), crop production (CRP), livestock production (LVS), forestry production (FOR) and fishing production (FIS), bounds test was conducted. The result of ARDL Bounds correlation test in Table 4.4 showed that bound test indicates presence of long run relationship among Gross Domestic Product (GDP), crop production (CRP), livestock production (LVS), forestry production (FOR) and fishing production (FIS) given that the F-statistics value of 6.021146is higher than the 5% upper bound critical value of 3.49. By this, the null hypothesis is rejected, which leads to the study concluding that there is cointegrating relationship among the variables. The confirmation of long run dynamics among the variables further necessitated the estimation of the extent of the relationship between the dependent and independent variables through estimation of Autoregressive Distributed Lag (ARDL) model.

Model Estimation

The ARDL model was estimated following the evidence of mixed integrated and cointegrated series. The results are presented in Table 4.
The results of the estimation are presented in Table 4.6:

Table 4.: Estimated Long-Run and Short-Run Coefficients of ARDL

Dependent Variable = $lnGDP_t$

Short-Run Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Short-Run Results				
DLOG(GDP(-1))	-0.292075	0.179916	-1.623395	0.1253
DLOG(GDP(-2))	-0.354926	0.131266	-2.703871	0.0163
DLOG(CRP)	0.299224	0.124131	2.410547	0.0292
DLOG(CRP(-1))	0.931179	0.163281	5.702936	0.0000
DLOG(CRP(-2))	-0.477371	0.222037	-2.149961	0.0483
DLOG(LVS)	1.457717	0.567314	2.569507	0.0214
DLOG(LVS(-1))	1.749331	0.564164	3.100751	0.0073
DLOG(LVS(-2))	-1.152086	0.227371	-5.066989	0.0001
DLOG(FOR)	0.320618	0.163297	1.963406	0.0684
DLOG(FOR(-1))	-0.030808	0.095541	-0.322458	0.7516
DLOG(FOR(-2))	-0.340580	0.378554	-0.899686	0.3825
DLOG(FIS)	0.591714	0.244296	2.422116	0.0286
DLOG(FIS(-1))	0.348125	0.099362	3.503600	0.0032
DLOG(FIS(-2))	-0.357226	0.086640	-4.123126	0.0009
CointEq(-1)*	-0.079618	0.011472	-6.940401	0.0000

R^2 = 0.870819
Adjusted R^2 = 0.754556
Durbin-Watson stat = 2.556392

Long-Run Results

$lnCRP_t$	0.765876	0.289630	2.644325	0.0184
$lnLVS_t$	3.010886	0.700837	4.296128	0.0006
$lnFOR_t$	37.81647	19.92492	1.897949	0.0771
$lnFIS_t$	2.466463	0.674027	3.659295	0.0023
C	-25.82751	29.56121	-0.873696	0.3961

EC = LOG(GDP) - (0.7659*LOG(CRP) + 3.0109*LOG(LVS) + 37.8165*LOG(FOR) + 2.4665*LOG(FIS) - 25.8275)

Source: Author's Computation, 2024 (E Views 12 Output).

Interpretation of Short-Run and Long-Run Autoregressive Distributive Lag (ARDL) Estimation Model Results

Crop Production (CRP) and Gross Domestic Product (GDP)

The short-run estimates of the ARDL model are shown in Table 4.6. The results revealed that crop production has a positive and significant effect on Gross Domestic Product in Nigeria. This is evidenced by the positive coefficient value (0.299224) of crop production at initial level and its p-value (0.0292) which is less than 0.05. This implies that an increase in the crop production by a unit will lead to 0.299224significant increase in Gross Domestic Product in the short-run. Also, the long-run estimates of the ARDL model results revealed that crop production has a positive and significant effect on Gross Domestic Product in Nigeria. This is evidenced by the positive coefficient value (0.765876) of crop production and its p-value (0.0184) which is less than 0.05. This implies that an increase in crop production by a unit will lead to 0.765876significant increase in Gross Domestic Product in the long-run.

Livestock Production (LVS) and Gross Domestic Product (GDP)

Furthermore, the short-run estimates of the ARDL model are shown in Table 4.6. The results revealed that livestock production has a positive and significant effect on Gross Domestic Product in Nigeria. This is evidenced by the positive coefficient value (1.457717) of livestock production at initial level and its p-value (0.0214) which is less than 0.05. This implies that an increase in the livestock production by a unit will lead to 1.457717significant increases in Gross Domestic Product in the short-run. Also, the long-run estimates of the ARDL model results revealed that livestock production has a positive and significant effect on Gross Domestic Product in Nigeria. This is evidenced by the positive coefficient value (3.010886) of livestock production and its p-value (0.0006) which is less than 0.05. This implies that an increase in livestock production by a unit will lead to 3.010886 significant increases in Gross Domestic Product in the long-run.

Forestry Production (FOR) and Gross Domestic Product (GDP)

Moreover, the short-run estimates of the ARDL model are shown in Table 4.6. The results revealed that forestry production has a positive and non-significant effect on Gross Domestic Product in Nigeria. This is evidenced by the positive coefficient value (0.320618) of forestry production at initial level and its p-value (0.0684) which is greater than 0.05. This implies that an increase in the forestry production by a unit will lead to 0.320618 insignificant increases in Gross Domestic Product in the short-run. Also, the long-run estimates of the ARDL model results revealed that forestry production has a positive and non-significant effect on Gross Domestic Product in Nigeria. This is evidenced by the positive coefficient value (37.81647) of forestry production and its p-value (0.0771) which is greater than 0.05. This implies that an increase in forestry production by a unit will lead to 37.81647 insignificant increases in Gross Domestic Product in the long-run.

Fishing Production (FIS) and Gross Domestic Product (GDP)

Moreover, the short-run estimates of the ARDL model are shown in Table 4.6. The results revealed that fishing production has a positive and significant effect on Gross Domestic Product in Nigeria. This is evidenced by the positive coefficient value (0.591714) of fishing production at initial level and its p-value (0.0286) which is less than 0.05. This implies that an increase in the fishing production by a unit will lead to 0.591714significant increase in Gross Domestic Product in the short-run. Also, the long-run estimates of the ARDL model results revealed that fishing production has a positive and significant effect on Gross Domestic Product in Nigeria. This is evidenced by the positive coefficient value (2.466463) of fishing production and its p-

value (0.0023) which is less than 0.05. This implies that an increase in fishing production by a unit will lead to 2.466463significant increase in Gross Domestic Product in the long-run

Interpretation of Coint Eq (-1) Result

The results of the short run dynamic coefficients associated with the long-run relationships obtained from the error correction model are given in Table 4.6. The signs of the short-run dynamic interactions are consistent with that of the long run relationship. The estimated error correction coefficient of -0.079618(with p-value of 0.0000) is highly significant, has the correct sign, and implies a low speed of adjustment to equilibrium after a shock. This implies that approximately 8% of disequilibria from the previous year's shock converge back to the long run equilibrium in the current year.

Interpretation of Adjusted R-Squared (Adj. R^2) Value

The Adjusted R-squared value of 0.754556from the results of the short-run estimates of the ARDL model in table 4.6 indicated that the estimated model is well fitted as the systematic changes in explanatory variables (crop production, livestock production, forestry production and fishing production) explained approximately 75 percent (R-squared) variation in Gross Domestic Product while the remaining 25% is explained by other variables of factors outside the model.

Interpretation of Durbin-Watson Statistic Value

Lastly, Durbin-Watson statistic of 2.556392which is greater than 2 indicates the absence of serial autocorrelation.

Post-Estimation Tests of Gross Domestic Product (GDP) Model

The results of the diagnostic tests are presented and discussed below:

Table 5: Post-Estimation Test Results

Test	Null Hypothesis	X^2 Value	X^2 Prob	Remark
Jarque-Bera	Normal distribution exists	1.522625	0.467053	Normal residuals
Breusch-Godfrey LM	Serial correlation does not exist	1.427812	0.2751	Serial independence
Breusch-Pagan-Godfrey	Homoscedasticity exists	0.705723	0.7803	Constant Variance
Ramsey RESET	Model is stable	4.135725	0.0698	correctly specified model

Source: Author's Computation, 2024 (E Views 12 Output).

The Jarque Bera (Normality) test result in Table 5 shows that the model is normally distributed, the Breusch-Godfrey Serial Correlation LM test result in Table 4.7 shows that the model has no serial correlation problem. Also, the Breusch-Pagan-Godfrey heteroskedasticity test result in Table 4.7 shows that the model has homoscedasticity. This implies that relevant variables were not omitted. Lastly, the Ramsey RESET test result in Table 4.7 shows that the model is correctly specified. This implies that the functional form of the model is correct.

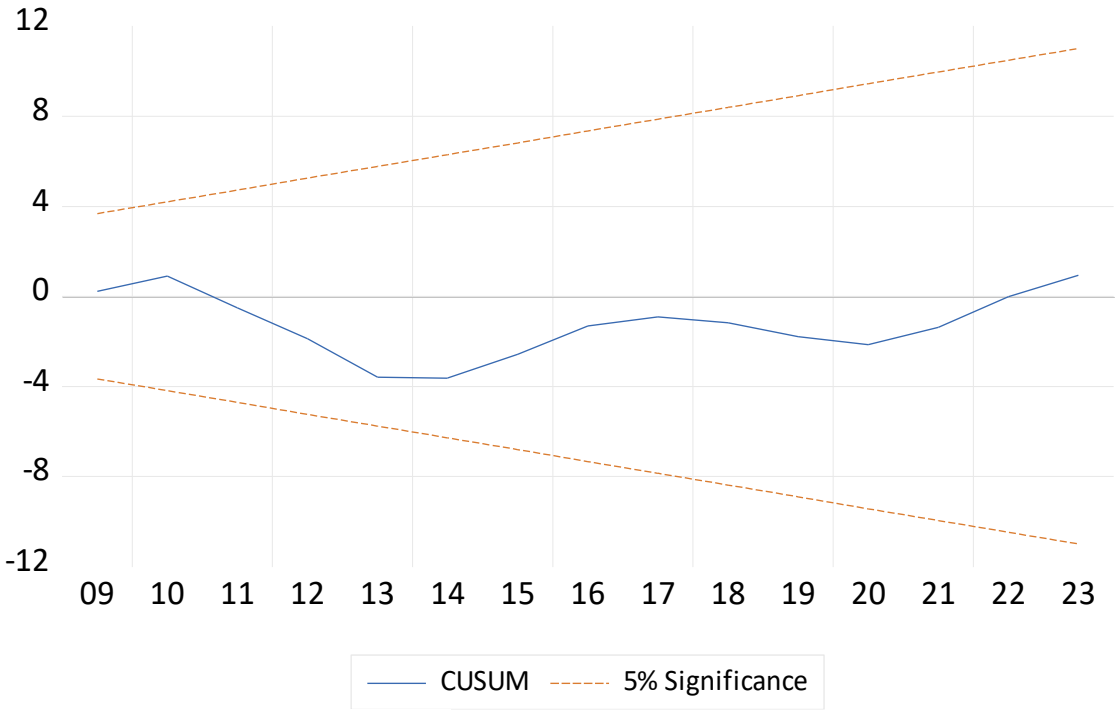

Figure 4.9: Stability Cusum Test

The cumulative sum (CUSUM) indicates that the CUSUM line stayed within the 5 percent critical bound while neither did CUSUM plot crosses the 5 percent critical lines. The implication of this is that there is stability of the long-run coefficients of the study variables.

Discussion of Findings

First, the results of the short-run and long-run estimates revealed that crop production, livestock production and fishing production has a positive and significant effect on Gross Domestic Product in Nigeria while forestry production has a positive and non-significant effect on Gross Domestic Product in Nigeria. This implies that an increase in crop production, livestock production, forestry production and fishing production will lead to increase in Gross Domestic Product. This finding is supported by the empirical results of Chukwu (2023) which showed that crop production and livestock production have significant impacts on economic growth in Nigeria while forestry production has no significant impacts on economic growth in Nigeria. The finding also relates to the finding of Agwu, Mohammed, Best and Udi (2022) who found that Agricultural output has a significantly positive relationship with Gross Domestic Product in the long run while Amaefula (2019) also established that agricultural sector contributes positively and significantly to economic growth in Nigeria.

4. CONCLUSION AND RECOMMENDATIONS

Conclusion

The agricultural sector serves as the cornerstone of Nigeria's economy, historically contributing substantially to employment, food security, and export revenue. Despite the advent of crude oil as the primary foreign exchange earner, agriculture remains vital, engaging over 70% of the population either directly or indirectly. This sector encompasses a diverse range of activities, including crop production, livestock farming, forestry, and fisheries, each with a unique contribution to national development. However, its performance in recent years has been hindered by structural challenges, policy inconsistencies, and environmental factors, limiting its potential to drive economic growth and development in Nigeria. Drawing from the

foregoing, this study empirically examined the effect of agricultural sector performance on the Nigerian economy. The findings of the study indicated that crop production, livestock production and fishing production as indicators of agricultural sector performance have significant effect on Gross Domestic Product, unemployment rate, inflation rate and balance of payment in Nigeria. Premised on the findings, the study concluded that agricultural sector performance significantly contributes to the Nigerian economy.

Recommendations

The following recommendations are proffered based on the findings of this study:

1. The government and private sector should prioritize investments in agricultural infrastructure, including irrigation systems, rural roads, storage facilities, and processing plants. For instance, enhanced irrigation can boost crop yields, while improved roads reduce transportation costs and waste, making Nigerian agricultural products more competitive domestically and internationally. Such infrastructure investments will reduce post-harvest losses, enhance market access for farmers, and improve productivity across crop production, livestock, forestry, and fisheries sectors.
2. Access to affordable credit is vital for agricultural growth. Hence, government should expand funding initiatives like Agricultural Fund Guarantee Scheme and incentivize commercial banks to offer low-interest loans to farmers. Also, there should be establishment of cooperatives or farmer-based organizations which can also help small-scale farmers access financial services and inputs such as seeds, fertilizers, and technology.
3. The government should enforce policies promoting sustainable farming practices, forestation programs, and climate-resilient techniques. Providing farmers with training and tools for sustainable crop rotation, livestock rearing, and efficient water usage can mitigate the adverse effects of climate change and environmental degradation. Also, programs encouraging sustainable fishing and forestry practices should also be implemented to preserve these resources for future generations.
4. To maximize the agricultural sector's contribution to the economy, Nigeria should focus on agro-processing industries. This should include creating incentives for establishing facilities that process raw agricultural products into finished goods. Value addition will not only enhance the export potential of agricultural products but will also create jobs, increase incomes, and reduce Nigeria's dependence on imported goods.

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