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Research Article

FOREIGN DIRECT INVESTMENT AND AGRICULTURAL SECTOR PERFORMANCE IN NIGERIA: A DISAGGREGATED APPROACH

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ABSTRACT

The study examined the effect of foreign direct investment (FDI) on agricultural sector performance in Nigeria. The specific objective was to determine the extent to which FDI affects crop production, livestock, forestry, and fishery real output. This study utilized an ex-post facto research design. Secondary data were obtained from the Central Bank of Nigeria from 1986 to 2023. The time series data were analyzed using the Ordinary Least Squares regression technique. The findings revealed that FDI has a significant (0.0002 < 0.05) positive effect on crop production; a significant (0.0004 < 0.05) positive effect on livestock; a significant (0.0044 < 0.05) positive effect on forestry; and a significant (0.0010 < 0.05) positive effect on fishery real output in Nigeria. The study concludes that FDI is a panacea for agricultural sector performance in Nigeria. It will be an innovative approach if the Federal Ministry of Agriculture and Rural Development actively seeks and attracts more FDI by creating favorable policies and incentives for foreign investors to continue enhancing crop production in Nigeria. The Nigerian Investment Promotion Commission should collaborate with international agribusiness firms to introduce more advanced livestock farming technologies and practices to further boost livestock output.

Keywords*:* Foreign direct investment, Crop production, Livestock, Forestry, Fishery.

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INTRODUCTION

Foreign direct investment (FDI) plays a crucial role in the economic development of many countries, particularly in the context of globalization, where capital flows freely across borders. In the global economic domain, FDI is seen as a significant driver of economic growth, technological advancement, and job creation. It allows for the transfer of technology, enhances managerial skills, and facilitates access to international markets (Rahman *et al*., 2024). Developing countries, in particular, view FDI as a means to bridge the gap between domestic savings and the required investment to achieve sustainable economic development (Dare, 2020). Nigeria, being one of the largest economies in Africa, has recognized the potential of FDI to transform its economic domain, including the critical agricultural sector, which remains a backbone of its economy (Adeagbo and Jimoh, 2023). Agriculture has historically been one of the mainstay of Nigeria's economy, providing employment to a significant portion of the population and contributing to the country's GDP (Ogbanje and Salami, 2022). Despite its importance, the sector has faced numerous challenges such as inadequate infrastructure, low productivity, and limited access to modern technology and finance. These issues have hindered the sector's performance and its ability to meet the growing food demands of the population. In today's highly interconnected and competitive global economy, effective FDI is paramount for sustainable development (Kastratović, 2024). FDI not only provides much-needed capital but also brings in new technologies, innovative practices, and managerial expertise that are essential for modernizing industries and enhancing productivity (Elmi, 2023). The role of FDI has become even more critical in the face of global challenges such as climate change, food insecurity, and economic uncertainties. By attracting FDI, countries can diversify their economies, reduce dependence on a single sector, and build resilience against external shocks (Sultana and Sadekin, 2023).

FDI has the potential to significantly influence agricultural performance in Nigeria by bringing in much-needed capital, through which FDI can address the issue of underinvestment in the sector (Dare, 2020), enabling the development of critical infrastructure such as irrigation systems, storage facilities, and transportation networks (Martin-Odoom, 2021). Improved infrastructure can reduce post-harvest losses, enhance market access, and increase the efficiency of agricultural value chains. In addition, FDI can facilitate the adoption of modern agricultural practices and technologies, such as precision farming, high-yield crop varieties, and advanced pest control methods. These innovations can lead to increased productivity, higher crop yields, and improved quality of agricultural products (Owutuamor and Arene, 2018). Thus, FDI has the potential to transform the agricultural sector in Nigeria by addressing key challenges, improving productivity, and promoting sustainable development (Fwah *et al*., 2017). By attracting FDI, Nigeria can leverage the expertise, technology, and capital of foreign investors to modernize its agricultural sector, enhance food security, and achieve sustainable economic growth. Therefore, policymakers need to create a conducive environment for FDI, implement supportive policies, and foster partnerships with international investors to unlock the full potential of the agricultural sector and drive the country's overall development.

Nigeria's agricultural sector is not yet a robust and thriving component of the national economy, as it has not been characterized by high productivity, modern farming techniques, and efficient value chains (Gavrilova, 2020). The sector is yet to ensure food security for the growing population, and up till now, it does not contribute meaningfully to GDP, nor create ample employment opportunities (Agba *et al.*, 2024; Bello *et al*., 2024). FDI is supposed to play a crucial role in achieving this ideal by providing much-needed capital, technology, and expertise (Elmi, 2023) since this investment enables the development of infrastructure, the adoption of innovative agricultural practices, and the integration of Nigerian agriculture into global markets (Adeagbo and Jimoh, 2023). In reality, however, Nigeria's agricultural sector faces significant challenges that impede its growth and development. Despite the government's efforts to attract FDI, the sector continues to

suffer from underinvestment, inadequate infrastructure, and outdated farming practices (Umar, 2024). Many foreign investors are hesitant to invest in Nigerian agriculture due to issues such as policy inconsistency, regulatory hurdles, and security concerns. As a result, the inflow of FDI into the agricultural sector has been insufficient to drive the needed transformation (Azri *et al*., 2023). This situation is exacerbated by limited access to finance for local farmers, poor post-harvest handling, and inefficiencies in the supply chain. Consequently, the sector remains largely subsistence-based, with low productivity levels and limited integration into global value chains.

The consequences of this situation are dire for Nigeria's economy and food security. The continued underperformance of the agricultural sector undermines efforts to diversify the economy away from oil dependency, making the country vulnerable to global oil price fluctuations. Low productivity and inefficiencies in the agricultural value chain result in high levels of food imports, exacerbating the trade deficit and putting pressure on foreign exchange reserves. Moreover, the lack of investment in infrastructure and modern technology leads to significant post-harvest losses, reducing the overall availability of food and increasing food prices. This scenario contributes to food insecurity, poverty, and unemployment, particularly in rural areas where agriculture is the primary source of livelihood (Agba *et al.*, 2024; Bello *et al*., 2024). Without substantial FDI to modernize the sector, Nigeria risks missing out on the potential benefits of a vibrant agricultural industry, which could otherwise drive sustainable economic growth, improve living standards, and ensure long-term food security for its population.

Existing studies such as Rahman *et al*. (2024), Kastratović (2024), Adeagbo and Jimoh (2023), Azri *et al*. (2023), Elmi (2023), Sultana and Sadekin (2023), Ogbanje and Salami (2022), Nur (2022), Martin-Odoom (2021), Dare (2020), Akinwale *et al*. (2018), Owutuamor and Arene (2018), and Fwah *et al*. (2017) among others have examined how FDI affects agricultural performance, providing useful hints into the overall impact of FDI on the sector. However, these studies have generally not employed a disaggregation of agricultural performance into specific sub-sectors such as crop production, livestock, forestry, and fishery. This lack of granularity leaves a gap in understanding how FDI influences each of these critical areas individually, limiting the ability to formulate targeted policies and strategies to maximize the benefits of FDI across the diverse components of Nigeria's agricultural sector. With the introduction in section one, the remainder of this study is structured as follows: section two reviews extant literature, section three dwells on the methodological framework utilized, section four discusses the results, while section five presents the conclusion and policy implications.

LITERATURE REVIEW

Conceptual exploration

FDI can be understood in several distinct ways. Foremost, it is the investment made by a firm or individual in one country into business interests located in another country, typically involving the acquisition of significant ownership stakes or establishing operations and assets (Han *et al*., 2024). FDI encompasses the long-term interest and control exerted by a foreign entity in an enterprise within the host country, often characterized by the investor's lasting influence and involvement in management decisions (Kastratović, 2024). Furthermore, FDI can be described as the movement of capital across international borders to purchase or establish income-generating assets, such as factories, equipment, or infrastructure, which contribute to economic growth and development (Ogbanje and Salami, 2022). Furthermore, FDI is often viewed as a strategic investment by multinational companies to gain access to new markets, resources, and production efficiencies, thereby enhancing their global competitiveness and fostering international economic integration (Rahman *et al*., 2024). FDI is a crucial component of international economics, representing a significant cross-border investment where a firm or individual from one country acquires a lasting interest in, or a substantial degree of influence over, a business entity in another country (Adeagbo and Jimoh, 2023). Unlike portfolio investments, which involve holding stocks or bonds without a direct managerial role, FDI implies a long-term relationship and a considerable degree of control over the foreign entity. Typically, this control is realized when the investing firm owns at least 10% of the foreign company's shares, a threshold often used to distinguish FDI from other types of investments. The primary goal of FDI is to establish a direct and enduring interest in the management and operations of the foreign enterprise (Elmi, 2023).

Agricultural sector performance is a comprehensive measure that reflects the productivity, efficiency, and overall output of the agricultural sector within an economy (Umar, 2024). This concept encompasses various elements, including crop yields, livestock production, forestry outputs, and fishing activities, which together contribute to the total agricultural output of a region or country (Bello *et al*., 2024). Assessing agricultural sector performance is crucial for understanding the health and sustainability of an agricultural system, as well as its capacity to meet the food, fiber, and bio-energy needs of a growing population. It also provides hints into the sector's ability to contribute to economic growth, rural development, and poverty alleviation. The concept of agricultural sector performance extends beyond mere production quantities to include factors such as the efficiency of resource use, technological innovation, and environmental sustainability. High agricultural performance is typically characterized by optimal use of inputs such as land, water, labor, and capital, resulting in high yields and output without depleting resources or causing ecological damage (Azri *et al*., 2023). For example, advancements in agricultural technology, such as precision farming, genetically modified crops, and sustainable farming practices, have significantly enhanced agricultural performance in many parts of the world. These innovations have led to increased productivity, reduced waste, and better management of natural resources (Bello *et al*., 2024). Agricultural sector performance is often evaluated through indicators such as yield per hectare, total factor productivity (TFP), and the value of agricultural exports (Umar, 2024). These indicators provide a snapshot of how well the agricultural sector is performing in relation to its potential and in comparison to other sectors within the economy. A high-performing agricultural sector is crucial for ensuring food security, particularly in regions that are prone to food shortages or where agriculture is a major source of livelihood (Akano *et al*., 2023).

Theoretical foundation

This study is pursued within the framework of the Endogenous Growth Theory. Endogenous Growth Theory emerged in the mid-1980s as a response to the limitations of traditional neoclassical growth theories, particularly the Solow-Swan growth model (Renault, 2024). The theory was primarily developed by economists Paul Romer, Robert Lucas, and others who sought to explain long-term economic growth by focusing on factors that are determined within the economy itself, rather than relying on external factors. Paul Romer, in his seminal 1986 paper "Increasing Returns and Long-Run Growth," laid the foundation for the theory by emphasizing the role of knowledge and innovation as key drivers of economic growth (Romer, 1986). Robert Lucas further expanded the theory in 1988 by introducing the concept of human capital as a central element in the growth process. The theory marked a significant shift in economic thought by integrating the roles of technology, innovation, and human capital into growth models, suggesting that these factors could sustain economic growth without relying solely on external influences (Roberts and Setterfield, 2007).

The core postulations of Endogenous Growth Theory revolve around the idea that economic growth is primarily driven by internal factors within an economy, rather than external shocks or diminishing returns to capital. The theory posits that investments in human capital, innovation, and knowledge creation lead to sustained economic growth because they generate increasing returns to scale. Unlike neoclassical theories, which emphasize diminishing returns to physical capital,

Endogenous Growth Theory argues that knowledge and technology, as non-rivalries and partially excludable goods, can lead to continuous improvements in productivity. In addition, the theory suggests that government policies, such as subsidies for Research and Development (R&D) and education, can positively influence long-term growth by fostering an environment conducive to innovation. The accumulation of human capital, technological advancements, and innovation is seen as a self-reinforcing processes that fuel sustained economic growth from within the economy.

Endogenous growth theory is highly relevant to the study of the effect of FDI on agricultural performance in Nigeria, particularly when taking a disaggregated approach. According to the theory, FDI can act as a catalyst for endogenous growth by introducing new technologies, management practices, and innovations that are crucial for enhancing agricultural productivity (Ozawa and Castello, 2003). When foreign investors bring advanced agricultural technologies and knowledge to Nigeria, it can lead to significant improvements in crop yields, livestock management, and overall agricultural efficiency. This aligns with the theory's emphasis on knowledge and innovation as key drivers of growth. Furthermore, the theory underscores the importance of human capital development, which is vital for the successful adoption and implementation of these new technologies in the agricultural sector. By improving the skills and knowledge of local farmers and agricultural workers through training and education, FDI can help sustain long-term growth in agricultural performance. Thus, Endogenous Growth Theory provides a valuable framework for understanding how FDI can contribute to the sustained development of Nigeria's agricultural sector by fostering innovation, technological advancement, and human capital accumulation from within the economy.

Empirical studies

Han *et al*. (2024) examined the impact of FDI spillover channels on the TFP of Chinese agricultural enterprises and investigated the moderating role of absorptive capacity (technological acumen) on TFP spillover effects. Based on data from 118 agricultural and related Chinese industries, they employed a multi-threshold regression model to empirically analyze the impact of FDI on the TFP of agricultural enterprises and the threshold effect of absorptive capacity. The results suggest that foreign-invested agricultural enterprises are more likely to benefit from FDI, while the overall FDI spillover effect is negative for domestic agricultural enterprises. However, once threshold effects are introduced, firms close to the technological frontier experience statistically significant positive spillover effects, while those far from the frontier experience negative spillover effects. Similar results are observed across almost all FDI spillover channels for firms in both upstream and downstream industries. FDI spillovers, when they occur, can be a two-edged sword, benefiting some firms at the expense of others.

Kastratović (2024) explored the effect of FDI inflows in agriculture on the agricultural exports of developing countries. The main objective was to identify and quantify the export effects of FDI in the sector, as well as the effects of other relevant export determinants, and to explore the possible long-run relationship between the variables. Using panel data on 80 developing countries observed from 2005 to 2017, the study employed the system-generalized method of moments (GMM) and the method of quasi-maximum likelihood to estimate a dynamic agricultural exports model. In addition, tests for co-integration between exports and FDI were conducted using the Pedroni and Kao approaches. The findings indicate that FDI inflows have a positive impact on agricultural exports in the analyzed countries in both the short run and the long run. This highlights the significance of both direct and spillover export effects, implying that the liberalization and promotion of foreign investment in agriculture could alleviate capital scarcity and constraints in developing countries and enhance their agricultural export competitiveness.

Rahman *et al*. (2024) investigated the effect of FDI inflow in agriculture on the agriculture sector's contribution to Bangladesh's economic development. The study utilized advanced econometric tools to analyze time series data obtained from the Bangladesh Bank and the Bangladesh Economic Review from 1996 to 2021. For the empirical analysis, the autoregressive distributed lag (ARDL) co-integration approach was used to measure the short-run dynamics and long-run relationship between FDI inflow in agriculture (AFDI) and agricultural share of GDP (AGDP) in Bangladesh. The findings confirm that AFDI has a statistically significant effect on AGDP in the short run; however, its long-run effect is insignificant. The study suggests that Bangladesh must improve its policies to attract more promising investments in the agricultural sector to boost productivity. This could involve reforms in taxation and agricultural investment policies to create an investment-friendly climate for attracting long-term foreign capital in agriculture.

Adeagbo and Jimoh (2023) examined the impact of FDI on agricultural and manufacturing outputs in Nigeria from 2017 to 2022. The study employed an ex-post facto research design and a judgmental sampling technique in selecting the years analyzed. Secondary data were obtained from the Federal Inland Revenue Service and CBN Statistical Bulletin. The data, covering 6 years, were analyzed using descriptive and inferential statistics. The study model assessed the impact of FDI and other variables on agricultural and manufacturing sector outputs using the augmented Dickey–Fuller (ADF) test and Engle-Granger co-integration for unit root and stationarity among the time series variables. It was discovered that FDI negatively impacts both manufacturing and agricultural output, indicating that FDI has been biased in favor of the extractive industry, rendering its impact on manufacturing and agricultural output insignificant. The study recommends that the government implement policies to attract more FDI into the manufacturing and agricultural sectors by creating incentives that would attract more investors.

Elmi (2023) assessed the effect of FDI s on Djibouti's agricultural production. The study analyzes 34 years of data, spanning from 1980 to 2014, sourced from Sesric's Djibouti Economic Data repository. To enhance econometric procedures, the researcher employs fundamental correlation and deterministic models. The data are evaluated, and all variables are examined for their unit roots, with findings indicating that the variables are stationary in the first-difference model but non-stationary in the level model. The study also utilizes descriptive statistics tests, the LMS test, the Unit root test, the ARDL model (ECM regression), the heteroskedasticity test (Breusch Pagan Godfrey), the Ramsey test, and model stability tests. In this research, agricultural production is the dependent variable, while FDI, labor, and capital serve as the independent variables. The study demonstrates a direct link between FDI and the productivity of Djibouti's agricultural sector, as evidenced by the data.

Sultana and Sadekin (2023) evaluated the relationship between FDI and the agricultural sector of Bangladesh. The study is based on time series data covering the period from 1972 to 2021. To analyze the relationship between the variables, the study employs the ARDL model and the F-Bound test. The empirical findings suggest that FDI has a considerable negative influence on Bangladesh's agricultural sector in the long term. Additionally, the study finds that FDI has no effect on the agricultural sector in the short run. The research recommends that the government adopt agriculture-friendly policies and provide training facilities for farmers to improve their skills, thereby enabling FDI to contribute positively to the development of the agricultural sector.

Ogbanje and Salami (2022) determined the impact of FDI on Nigeria's agricultural sector. The study utilized time series data from 1981 to 2019, sourced from the databases of the Central Bank and Food and Agriculture Organization. The ADF test results indicate that the variables were I (1), and Johansen's co-integration test suggested a long-run relationship among the variables. The findings reveal that agricultural productivity grew at a slower rate (6.28) compared to FDI (17.99). In general, FDI and the exchange rate had statistically significant ($p<0.05$) negative impacts on agricultural productivity,

while the implicit price deflator for the agricultural sector had a statistically significant ($p<0.001$) positive impact in the long run. The error correction term suggests a high speed of adjustment to the short-run equilibrium (79.71%). The study concludes that reliance on FDI could have an adverse effect on agricultural gross domestic product in the long run. It recommends that the Federal Ministry of Agriculture and Rural Development implement policies to ensure a steady inflow of FDI into agriculture in a manner that reverses the negative impact, or alternatively, explore other options.

Nur (2022) ascertained the effect of FDI on agricultural output in Somalia. The study utilized time-series secondary data from the World Bank Indicators, the United Nations Data website, SESRIC, the Central Banks of Somalia, and the IMF, covering the period from 1970 to 2020. The study adopts the Cobb-Douglas production function to estimate the effect of FDI on agricultural output in Somalia. Before estimation, the ADF test ensures that the data is stationary. The study employs the ARDL model to evaluate the co-integration approach for estimating long-run and short-run associations and dynamic interactions between the variables. FMOLS and DOLS methods are also used to assess the sensitivity and stability of the long-run characteristics. The Johansen co-integration analysis reveals the presence of three co-integrating equations in the long-run dynamics. The correlation findings demonstrate that the variables have a correlation coefficient higher than the threshold of 0.8. The major regression findings indicate a strong positive relationship between all explanatory variables and agricultural output in Somalia across all applied models (ARDL, DOLS, and FMOLS). In the short term, the study finds that Somalia's agricultural output is positively affected by all the estimated explanatory variables. The study suggests that, to enhance the sustainability of the country's economic growth, the government should create sufficient investment incentives to stimulate foreign investment in the development process of the agriculture sector.

Martin-Odoom (2021) analyzed the effect of FDI on the growth of the agricultural sector in Ghana. The existing literature on the FDI-Growth nexus, particularly concerning the impact of FDI on agricultural growth, is limited. Agriculture is a critical sector in developing economies like Ghana, employing the majority of the working population, including a significant portion of the poor. Therefore, understanding the impact of investment on this essential sector is crucial for informed policy-making. The study examines agriculture value added as the dependent variable, with FDI inflows as the independent variable, and inflation, gross fixed capital formation, and trade openness as control variables. Data on these variables were collected from 1984 to 2019. The study utilizes the ARDL model to assess the nature and significance of FDI's impact on Ghana's agricultural sector. Various diagnostic tests were conducted to ensure the model's robustness and fit. The findings reveal that in the long run, FDI has a negative and significant effect on the growth of the agricultural sector, while inflation has a positive and significant effect. In the short run, FDI shows a positive and significant association with the agricultural sector. The study suggests that the government should focus on improving human capital within the sector, investing in necessary infrastructure such as roads, and reforming restrictive laws and frameworks surrounding private business in agriculture.

Dare (2020) studied the impact of international foreign aid on agricultural development in Kabba/Bunu LGA. The study uses secondary data on foreign agricultural aid, agricultural GDP, and productivity indicators in Nigeria from 2000 to 2018, employing a GMM framework. The study reveals that the average sectoral aid allocation to agriculture during this period was 7%, increasing from 18 million USD in 2000 to about 47 million USD in 2018. Econometric analysis suggests that foreign agricultural aid has a positive and significant impact on agricultural GDP and productivity at a 10% significance level. In addition, the study finds that disaster and conflict positively and significantly influence aid receipt at a 5% significance level, indicating that foreign agricultural aid responds to such crises in the region.

Akinwale *et al*. (2018) explored the impact of FDI on agricultural productivity in Nigeria. The study employed the ADF test, Johansen test, and Error Correction Model to examine the effect of FDI and agricultural development. The unit root test results showed that all macroeconomic variables, including Agricultural Productivity, FDI, Bank Credit to the Agricultural Sector, and Government Expenditure on the Agricultural Sector, were stationary at first difference. The co-integration test results indicated long-run equilibrium relationships among the variables. The error correction model revealed that both FDI and bank credit to the agricultural sector had significant effects on agricultural productivity, while government expenditure on agriculture had an insignificant relationship with agricultural productivity. The study concluded that for Nigeria to benefit from the agricultural sector's potential, the sector must explore more opportunities offered by foreign investors. It is recommended that the government invest in infrastructure through a massive rural–urban infrastructure development scheme to attract foreign investment to agriculture.

Owutuamor and Arene (2018) looked into the impact of FDI and other macroeconomic variables on agricultural growth in Nigeria from 1981 to 2014, using annual time series data from the Central Bank of Nigeria (CBN), World Bank, and the U.S. Federal Reserve System. The data were analyzed using trend analysis, unit root tests, co-integration tests, ordinary least squares (OLS) regression, and Granger causality tests, with hypotheses tested using the F-test. The results revealed very low FDI inflows into agriculture, which were not commensurate with agriculture's share of GDP. The study found a positive but non-significant relationship between agricultural growth and FDI in agriculture, indicating that FDI in agriculture has no direct impact on agricultural growth, or its impact is masked by other macroeconomic variables. There was a significant positive relationship between agricultural growth and macroeconomic instability, while the interest rate differential had a significant negative relationship. Unidirectional causality was observed from FDI in agriculture, gross external debt stock, and variability of the consumer price index to agricultural growth, while agricultural growth significantly influenced macroeconomic instability. The study recommended that the government should not engage in business but seek and encourage more FDI in the agricultural sector, promote joint ventures between foreign and domestic investors, ensure stability and consistency in macroeconomic policies, and set monetary policy rates to attract appropriate investment in agriculture.

Agba *et al.* (2018) examined the impact of FDI on agricultural output in Nigeria. To achieve their objective, the study utilized time series data spanning 34 years (1981–2014) from credible sources. The analysis was conducted using an error correction model. The study found that FDI had an insignificantly positive effect on agricultural output in the short run but a significant effect in the long run. In addition, the study revealed that employment, exchange rates, and interest rates had significant effects on agricultural output in the long run. The study recommended the implementation of deliberate policies to reduce interest rates for agricultural purposes, encourage labor availability in agriculture, and stabilize exchange rates within the Nigerian economy. These measures would help attract foreign investors to import capital for agricultural production activities, ensuring a significant impact of FDI on agricultural output in the long run.

Fwah *et al*. (2017) assessed the impact of foreign trade and FDI on agricultural productivity in Nigeria using annual time series data from 1980 to 2014. Inferential statistics were used for the analysis. The ADF test showed that all variables were stationary at their first difference, necessitating the application of the Johansen co-integration test. The trace statistic of 59.28557 and the maximum Eigen statistic of 32.58741 were both greater than the critical values at the 5% significance level, indicating one co-integration equation. Further investigations based on the Johansen co-integration test indicated that a long-run equilibrium relationship exists among the variables of interest. The long-run results showed a positive coefficient for FDI and non-oil export, both significant at a 1% probability level. Conversely, the coefficient for non-oil imports

in the long run was negative and significant at a 1% probability level. The Vector Error Correction Model results indicated that there was no short-run effect of foreign trade and FDI on agricultural productivity.

Edewor *et al*. (2017) evaluated the contribution of FDI to the agricultural sector in Nigeria. The study used annual time series data on macroeconomic variables and agricultural productivity from 1990 to 2016. The data were analyzed using descriptive statistics and a multiple regression model. The data were also tested for stationarity using the ADF unit root test, which confirmed that all the hypothesized variables were stationary and significant at first difference ($p<0.01$). The study revealed that FDI allocations to the agricultural sector declined steadily over the years, with an all-time high in the 1990s. The determinants of agricultural productivity included exchange rates, interest rates, GDP, and FDI inflow into the agricultural sector. The study recommended creating an enabling environment through stable macroeconomic policies (monitoring of interest and exchange rates) and promoting political stability to attract both domestic and foreign investors to the country.

Ubom (2016) ascertained the distributive effect of FDI inflows on the performance of the Nigerian economy, focusing on the real sector. Data were collected on FDI inflows to various sectors such as mining and quarrying, manufacturing and processing, agriculture, transport and communication, building and construction, trading and business, as well as capacity utilization rates, export volume, and GDP growth from 1970 to 2013. The relationships were analyzed using the OLS multiple regression model. The study discovered inverse relationships between FDI inflows to manufacturing and processing and capacity utilization rates, as well as between FDI inflows to mining and quarrying, agriculture/fishery, transport and communication, trading/business, and export volume. In addition, negative relationships were found between FDI inflows to transport/communication, building/construction, and the GDP growth rate, while a few positive and direct relationships were established.

Hussain (2016) investigated the impact of foreign aid on agricultural productivity in developing countries, particularly in the context of the second sustainable development goal. The study collected data on productivity levels in low-income and lower-middle-income countries (77 developing countries) from 2002 to 2014. Agricultural productivity was considered the dependent variable, while the explanatory variables included agricultural aid (the main variable of interest), agricultural population, agricultural land, drought, primary gross enrollment, gross capital formation, gross fixed capital formation (in the agriculture sector), and government policy effectiveness during the same period. Regression analysis, including pooled OLS, fixed effect, and random effect regression, was employed. The results showed a positive and significant relationship between agricultural aid and productivity.

Iddrisu *et al*. (2015) determined the impact of FDI on the economic growth of Ghana from 1980 to 2013 using the Johansen co-integration test. The study found that FDI negatively impacts agricultural sector productivity in the long run but has a positive relationship in the short run. In addition, the depreciation of the cedi was found to negatively impact the growth of the agricultural sector in the long run. On the other hand, trade openness had a positive and significant long-run impact on the agricultural sector. The study recommended that the government harness trade relations, stabilize the local currency, and ensure that FDI inflows to agriculture and the broader economy do not harm the economy through capital flight and excessive profit repatriations.

Gunasekera *et al*. (2015) reviewed key issues surrounding FDI in agriculture and examined the potential impacts of FDI in African agriculture. The study used the dynamic global trade analysis project model to analyze the potential impacts of improvements in land productivity and FDI in Africa. The results indicated that combined efforts to improve land productivity and increase FDI could potentially boost Africa's share in global agricultural output and exports, particularly in oilseeds, sugar, and cotton.

Yusuf (2015) examined the impact of FDI on agricultural output in Nigeria from 1970 to 2012 using an ARDL model. Data were sourced from the National Bureau of Statistics, CBN, and World Development Indicators. The analysis revealed that FDI, government expenditure, and exchange rates during the study had significant positive effects on agricultural output, while interest rates and inflation had negative effects, though the inflation rate was not significant. The study recommended increasing the volume of FDI and urged the government and other stakeholders to seek FDI while also improving macroeconomic policies to enhance agricultural sector productivity in Nigeria.

RESEARCH METHODOLOGY

This study utilized an ex-post facto research design, which is well-suited for investigating causal relationships between past events to examine the effect of FDI on agricultural sector productivity in Nigeria from 1986 to 2023. The secondary data for this study were obtained from the CBN and the World Bank. The dependent variable is agricultural productivity and disaggregated into crop production, livestock, forestry, and fishing, while the independent variable is FDI. The time series data was analyzed using the OLS regression method and the Granger Causality test. The Ordinary Least Squares method was utilized to examine the effect of FDI on agricultural sector performance, whereas the Granger Causality test was applied to determine if there was a causal relationship between the dependent and independent variables.

Empirical model specification

The study adapted and modified the model by Agba *et al.* (2018), which was expressed as:

$$LASO = \alpha_0 + \alpha_1 FDI + \alpha_2 TO + \alpha_3 EXR + \alpha_4 INF + \alpha_5 GFCF + \alpha_6 NE + U_t \quad (I)$$

Where:
LASO=Log of Agricultural Sector Output
LMO=Log of manufacturing sector output
FDI=Foreign direct investment
TO=Trade openness
EXR=Exchange rate
INF=Inflation rate
GFCF=Gross fixed capital formation
NE=Net export
U_t=Error term

However, the researchers modified the above model to accommodate the variables for this study and stated functionally as:

$$CPRO=f(FDI) \quad (II)$$

$$LRO=f(FDI) \quad (III)$$

$$FORO=f(FDI) \quad (IV)$$

$$FIRO=f(FDI) \quad (V)$$

Equations (ii) to (v) are translated econometrically as follows:

$$CPRO_{it}=\alpha_0+\beta_1 FDI_{it}++\varepsilon_{it} \quad (VI)$$

$$LRO_{it}=\alpha_0+\beta_1 FDI_{it}++\varepsilon_{i} \quad (VII)$$

$$FORO_{it}=\alpha_0+\beta_1 FDI_{it}++\varepsilon_{it} \quad (VIII)$$

$$FIRO_{it}=\alpha_0+\beta_1 FDI_{it}++\varepsilon_{it} \quad (IX)$$

Where;
CPRO=Crop production real output
FDI=Foreign direct investment
LRO=Livestock real output
FORO=Forestry real output
FIRO=Fishery real output

α_0=A constant term
β_1=Coefficients of foreign direct investment
ε=The error term
it=The time trend

DISCUSSION OF RESULT

Descriptive characteristics of variable

The descriptive characteristics of the variables in the models are presented in Table 4.1. The average of the CPRO, LRO, FORO, FIRO, and FDI are 8713.698, 781.0579, 119.7832, 205.7479, and 2.920526, whereas the median are 8240.405, 685.4500, 98.71000, 178.2250, and 1.985000, respectively. The maximum values of the variables are 17260.75, 1247.720, 196.3600, 386.2400, and 8.840000 for CPRO, LRO, FORO, FIRO, and FDI, respectively. The minimum values are 2330.000 for CPRO, 421.6300 for LRO, 67.31000 for FORO, 40.65000 for FIRO, and 0.190000 for FDI. The variables' standard deviations are 5396.316 for CPRO, 308.4252 for LRO, 43.55068 for FORO, 119.3258 for FIRO, and 2.537617 for FDI. All the variables were positively skewed toward normality as evidenced by the positive values of the skewness statistic. The Kurtosis value shows that all the variables are leptokurtic in nature, as the Kurtosis statistic value is less than 3. The Jarque–Bera test suggests that all the variables are normally distributed, as the p-values are significant at a 5% level of significance.

Unit test result

The check for the presence of a unit root, the ADF and Phillips–Perron (PP) test were utilized. This is to make sure that variables are devoid of stationarity weakness that might impede on the result of the analysis. Table 2 and 3 summarize the ADF and PP, and it can be inferred from the result that all the variables were integrated of order one 1(1).

Long-run relationship

Tables 2 and 3 reveal the ADF and PP test results showing that the variables have a unit root, making it possible to establish the presence of a long-run relationship between the variables. The results of the long run relationship using the Johansen approach, as depicted in Tables 4-7, reveal that crop production, livestock, forestry, fishery real output, and FDI are not co-integrated. This gives the position that there is no long-run relationship between crop production, livestock, forestry, fishery real output, and FDI in Nigeria. This finding is supported by the trace test and Max-eigenvalue tests, each showing the presence of no co-integrating equations at a 5% level of significance in line with MacKinnon-Haug Michelis (1999) p-values.

Short-run relationship

The OLS regression technique was used in estimating the short-term relationship between crop production, livestock, forestry, fishery real output, and FDI in Nigeria. As shown in Table 8, FDI has a positive and statistically significant relationship with crop production, livestock, forestry, and fishery real output. With this result, the study agreed that FDI has a positive effect on agricultural sector performance disaggregated into crop production, livestock, forestry, and fishery real output. A percent increase in FDI would lead to 1211.16, 66.12, 7.75, and 24.04 units of increase in crop production, livestock, forestry, and fishery real output, respectively. When FDI is kept constant, crop production, livestock, forestry, and fishery real output would amount to 5176.46, 587.92, 97.13, and 135.51, respectively. The Adjusted R-squared unveils that FDI significantly explained the variation in crop production, livestock, forestry, and fishery real output. This is supported by the f-statistics (17.28) and p-value (0.00) for crop production; f-statistics (15.13) and p-value (0.00) for livestock; f-statistics (9.23) and p-value (0.00) for forestry, and f-statistics (12.75) and p-value

Table 1: Descriptive characteristics of variables

	Crop production real output	Livestock real output	Forestry real output	Fishery real output	Foreign direct investment
Mean	8713.698	781.0579	119.7832	205.7479	2.920526
Median	8240.405	685.4500	98.71000	178.2250	1.985000
Maximum	17260.75	1247.720	196.3600	386.2400	8.840000
Minimum	2330.000	421.6300	67.31000	40.65000	0.190000
Std. Dev.	5396.316	308.4252	43.55068	119.3258	2.537617
Skewness	0.239614	0.331243	0.569111	0.303756	0.900704
Kurtosis	1.495599	1.484788	1.756515	1.587452	2.705008
Jarque–Bera	9.947062	9.330030	8.499524	9.743576	10.75805
Probability	0.004965	0.044748	0.045424	0.043848	0.001511
Sum	331120.5	29680.20	4551.760	7818.420	110.9800
Sum Sq. Dev.	1.08E+09	3519665.	70176.50	526829.6	238.2616
Observations	38	38	38	38	38

Source: E-views 12.0 version data output

Table 2: Augmented Dickey–Fuller test result

Variables	Intercept	Trend and intercept	None	Order of integration/remark
Crop production real output	−5.084025 (0.00)*	−5.092824 (0.00)*	−3.323429 (0.00)*	1 (1)/Stationary
Livestock real output	−2.867796 (0.05)**	−5.784052 (0.00)*	−1.989748 (0.04)**	1 (1)/Stationary
Forestry real output	−4.715958 (0.00)*	−5.515177 (0.00)*	−3.767533 (0.00)*	1 (1)/Stationary
Fishery real output	−3.594029 (0.01)*	−3.640446 (0.05)**	−2.442278 (0.02)**	1 (1)/Stationary
Foreign direct investment	−7.011815 (0.00)*	−6.924024 (0.00)*	−7.064980 (0.00)*	1 (1)/Stationary

Source: E-views 12.0 version data output

Table 3: Phillips–Perron test result

Variables	Intercept	Trend and intercept	None	Order of integration/remark
Crop production real output	−5.093640 (0.00)*	−5.107844 (0.00)*	−3.309025 (0.00)*	1 (1)/Stationary
Livestock real output	−2.994525 (0.05)**	−3.726752 (0.04)**	−1.987443 (0.05)**	1 (1)/Stationary
Forestry real output	−4.807450 (0.00)*	−5.588304 (0.00)*	−3.997798 (0.00)*	1 (1)/Stationary
Fishery real output	−3.594029 (0.01)*	−3.640446 (0.05)**	−2.442278 (0.02)**	1 (1)/Stationary
Crop production real output	−6.937587 (0.00)*	−6.860101 (0.00)*	−6.981539 (0.00)*	1 (1)/Stationary

Source: E-views 12.0 version data output

Table 4: Johansen co-integration for CPRO and FDI

Unrestricted cointegration rank test (trace) CPRO and FDI				
Hypothesized number of CE (s)	**Eigen value**	**Trace statistic**	**0.05 critical value**	**Prob.****
None	0.109823	4.189163	15.49471	0.8877
At most 1	3.12E-05	0.001123	3.841466	0.9728
Unrestricted cointegration rank test (maximum eigenvalue) CPRO and FDI				
Hypothesized Number of CE (s)	**Eigen value**	**Max-Eigen statistic**	**0.05 Critical value**	**Prob.****
None	0.109823	4.188040	14.26460	0.8390
At most 1	3.12E-05	0.001123	3.841466	0.9728

Source: E-views 12.0 version data output
Trace test and Max-eigenvalue test each indicate (0) co-integrating eqn (s) at the 0.05 level;
*denotes rejection of the hypothesis at the 0.05 level;
**MacKinnon-Haug-Michelis (1999) *P* values
CPRO: Crop production real output, FDI: Foreign direct investment

Table 5: Johansen co-integration for LRO and FDI

Unrestricted cointegration rank test (trace) LRO and FDI				
Hypothesized number of CE (s)	**Eigen value**	**Trace statistic**	**0.05 critical value**	**Prob.****
None	0.217563	9.690880	15.49471	0.3053
At most 1	0.023567	0.858565	3.841466	0.3541
Unrestricted cointegration rank test (maximum eigenvalue) LRO and FDI				
Hypothesized number of CE (s)	**Eigen value**	**Max-eigen statistic**	**0.05 critical value**	**Prob.****
None	0.217563	8.832315	14.26460	0.3004
At most 1	0.023567	0.858565	3.841466	0.3541

Source: E-views 12.0 version data output
Trace test and Max-eigenvalue test each indicate (0) co-integrating eqn (s) at the 0.05 level;
*denotes rejection of the hypothesis at the 0.05 level;
**MacKinnon-Haug-Michelis (1999) *P* values
LRO: Livestock real output, FDI: Foreign direct investment

Table 6: Johansen co-integration for FORO and FDI

Unrestricted cointegration rank test (trace) FORO and FDI				
Hypothesized Number of CE (s)	**Eigen value**	**Trace statistic**	**0.05 critical value**	**Prob.****
None	0.297988	12.79176	15.49471	0.1227
At most 1	0.001521	0.054781	3.841466	0.8149
Unrestricted cointegration rank test (maximum eigenvalue) FORO and FDI				
Hypothesized number of CE (s)	**Eigen value**	**Max-eigen statistic**	**0.05 critical value**	**Prob.****
None	0.297988	12.73698	14.26460	0.0859
At most 1	0.001521	0.054781	3.841466	0.8149

Source: E-views 12.0 version data output
Trace test and Max-eigenvalue test each indicate (0) co-integrating eqn (s) at the 0.05 level;
*denotes rejection of the hypothesis at the 0.05 level;
**MacKinnon-Haug-Michelis (1999) *P* values
FORO: Forestry real output, FDI: Foreign direct investment

(0.00) for fishery. The Durbin–Watson coefficients (0.13), (0.11), (0.09), and (0.10), respectively, for crop production, livestock, forestry, and fishery real output point to an autocorrelation problem in the model. To correct this anomaly, the study relied on the serial correlation test

Table 7: Johansen co-integration for FIRO and FDI

Unrestricted cointegration rank test (trace) FIRO and FDI				
Hypothesized number of CE (s)	**Eigen value**	**Trace statistic**	**0.05 critical value**	**Prob.****
None	0.162952	7.250751	15.49471	0.5487
At most 1	0.023262	0.847309	3.841466	0.3573
Unrestricted cointegration rank test (maximum eigenvalue) FIRO and FDI				
Hypothesized number of CE (s)	**Eigen value**	**Max-eigen statistic**	**0.05 critical value**	**Prob.****
None	0.162952	6.403442	14.26460	0.5620
At most 1	0.023262	0.847309	3.841466	0.3573

Source: E-views 12.0 version data output
Trace test and Max-eigenvalue test each indicate (0) co-integrating eqn (s) at the 0.05 level;
*denotes rejection of the hypothesis at the 0.05 level;
**MacKinnon-Haug-Michelis (1999) *P* values
FIRO: Fishery real output, FDI: Foreign direct investment

Table 8: Autoregressive distributed lag short-run regression

Crop production and foreign direct investment				
Variable	**Coefficient**	**Std. error**	**t-statistic**	**Prob.**
C	5176.466	1120.709	4.618920	0.0000
FDI	1211.163	291.3192	4.157510	0.0002
Adjusted R-squared	0.305619		F-statistic	17.284
Durbin-Watson stat.	0.130841		Prob (F-statistic)	0.0001
Livestock and foreign direct investment				
Variable	**Coefficient**	**Std. error**	**t-Statistic**	**Prob.**
C	587.9296	65.38469	8.991854	0.0000
FDI	66.12791	16.99622	3.890742	0.0004
Adjusted R-squared	0.276466		F-statistic	15.137
Durbin-Watson stat.	0.117479		Prob (F-statistic)	0.0004
Forestry and foreign direct investment				
Variable	**Coefficient**	**Std. error**	**t-statistic**	**Prob.**
C	97.13352	9.816177	9.895249	0.0000
FDI	7.755328	2.551636	3.039356	0.0044
Adjusted R-squared	0.182098		F-statistic	9.2376
Durbin-Watson stat	0.093105		Prob (F-statistic)	0.0043
Fishery and foreign direct investment				
Variable	**Coefficient**	**Std. error**	**t-statistic**	**Prob.**
C	135.5148	25.90853	5.230509	0.0000
FDI	24.04810	6.734712	3.570769	0.0010
Adjusted R-squared	0.241032		F-statistic	12.750
Durbin-Watson stat.	0.107059		Prob (F-statistic)	0.0010

Source: E-views 12.0 version data output
FDI: Foreign direct investment

in Table 4.9, which absolves the estimated model of the autocorrelation problem. The result of the serial correlation LM test is superior and supersedes the traditional Durbin–Watson test.

Sensitivity analysis/model stability test

The study went forward to check for stability of the model, thus necessitated the diagnostic tests of serial correlation, heteroskedasticity,

and Ramsey reset specification tests as presented in Table 9. The presence of autocorrelation in the models would be detected by the serial correlation LM test. It was used in addition to Durbin–Watson to test for autocorrelation. The p-values of the Breusch-Godfrey serial correlation test are insignificant at a 5%, which suggests that variables are free from autocorrelation issues. In the classical linear assumption, a regression model should be devoid of a heteroskedasticity problem. As can be seen in Table 9, the p-values of the Chi-square statistic for the models are insignificant at a 5% level of significance, which shows evidence of the homoscedastic nature of the variables. The Ramsey Reset Specification determines if non-linear combinations of the independent variable(s) have any power in explaining the dependent variable or not. If the dependent variable is explained by the non-linear combinations of the independent variables, the model is not well specified. The p-values of the Ramsey Reset statistic are insignificant at a 5% level of significance, showing that the models were well specified.

Granger causality test

The essence of the Granger causality test was to ascertain whether there is a causal relationship between FDI and agricultural sector performance. The Granger causality test result in Table 10 indicates that there is no significant (0.2405 > 0.05) causal relationship between crop production real output and FDI in either direction (unidirectional or bidirectional). This suggests that changes in crop production do not predict changes in FDI, nor do changes in FDI predict changes in crop production. In contrast, the test results for livestock real output and FDI reveal a significant (0.0040 < 0.05) unidirectional causal relationship. This implies that FDI does have a predictive effect on livestock real output, suggesting that increases in FDI may lead to subsequent increases in livestock output. For fishing real output, the Granger causality test also shows a significant (0.0258 < 0.05) unidirectional relationship where FDI Granger causes fishing real output. This suggests that FDI inflows have a significant impact on fishing real output, implying that increased FDI can lead to higher fishing output. Similarly, the relationship between forestry real output and FDI follows the same pattern. Causality flows from FDI to forestry real output at a significance level of 5%. This envisages that FDI inflows are a predictor of increases in forestry output. This further emphasizes the importance of FDI in driving growth within various sectors of agricultural performance in Nigeria.

Table 9: Sensitivity analysis/model stability tests

Regressed models	Serial correlation LM test	F-statistic	Prob.
CPRO←FDI		0.122800	0.7282
LRO←FDI		0.014277	0.9057
FORO←FDI		0.123696	0.8841
FIRO←FDI		2.425942	0.0563
Regressed models	**Heteroskedasticity test**	**F-statistic**	**Prob.**
CPRO←FDI		0.277743	0.7592
LRO←FDI		1.703311	0.0741
FORO←FDI		0.370810	0.8276
FIRO←FDI		0.983671	0.4439
Regressed models	**Ramsey reset specification**	**F-statistic**	**Prob.**
CPRO←FDI		2.153257	0.1326
LRO←FDI		1.424790	0.0826
FORO←FDI		0.062766	0.9504
FIRO←FDI		1.299466	0.2040

Source: E-views 12.0 version data output

Table 10: Granger causality test

Null hypothesis	Obs	F-Statistic	Prob.	Remarks
FDI does not Granger-cause CPRO	37	1.42699	0.2405	No Causality
CPRO does not Granger-cause FDI		0.31258	0.5798	No Causality
FDI does not Granger-cause IRO	37	9.51411	0.0040	Causality
IRO does not granger-cause FDI		0.11865	0.7326	No Causality
FDI does not Granger-cause FORO	37	7.72568	0.0088	Causality
FORO does not granger-cause FDI		0.02901	0.8658	No Causality
FDI does not Granger-cause FIRO	37	5.43456	0.0258	Causality
FIRO does not granger cause FDI		0.06772	0.7963	No Causality

Source: E-views 12.0 version data output
CPRO: Crop production real output, FDI: Foreign direct investment, FORO: Forestry real output, FIRO: Fishery real output

Discussion of findings

The study revealed that FDI has had a significant positive effect on crop production real output in Nigeria. This result can be attributed to the influx of foreign capital, which has enabled the adoption of modern agricultural practices, improved seed varieties, and advanced irrigation techniques. FDI has also facilitated access to better fertilizers, pesticides, and machinery, which have collectively enhanced crop yields. In addition, the establishment of processing facilities by foreign investors has reduced post-harvest losses, further boosting the overall output. The positive impact of FDI on crop production reflects the critical role of external investments in transforming traditional farming methods into more productive and sustainable agricultural practices. The finding that FDI significantly boosts crop production in Nigeria aligns with Kastratović's (2024) study, which found that FDI positively impacts agricultural exports in developing countries, suggesting that FDI alleviates capital scarcity and enhances export competitiveness. Similarly, Nur (2022) demonstrated a strong positive relationship between FDI and agricultural output in Somalia, emphasizing the beneficial role of investment incentives in stimulating agricultural growth. On the other hand, Adeagbo and Jimoh (2023) found a negative impact of FDI on agricultural output in Nigeria, arguing that the investments are biased toward the extractive industry, thus not benefiting the agricultural sector. These mixed results highlight the varying impacts of FDI depending on sectoral and regional contexts.

Similarly, the findings show that FDI has significantly increased livestock real output in Nigeria over the same period. This positive effect is likely due to the introduction of advanced breeding techniques, better animal husbandry practices, and improved veterinary services, all made possible by foreign investments. The influx of FDI has also led to the establishment of large-scale livestock farms and processing plants, which have enhanced the efficiency and scale of production. Furthermore, FDI has facilitated the development of supply chains and distribution networks, ensuring that livestock products reach broader markets, both domestically and internationally. This expansion has contributed to the growth of the livestock subsector, making it a vital component of Nigeria's agricultural economy. This positive effect of FDI on livestock aligns with Dare's (2020) study, which noted that foreign agricultural aid positively impacts agricultural GDP and productivity, which can be extended to the livestock sector. Fwah *et al*. (2017) also found that FDI has a long-term positive effect on agricultural productivity in Nigeria, suggesting that investments enhance overall agricultural performance, including livestock. Contrarily, Sultana and Sadekin (2023) observed a long-term negative influence of FDI on Bangladesh's agriculture, recommending agriculture-friendly policies and farmer training to mitigate adverse effects. This disparity indicates that the success of FDI in livestock production may depend on complementary policies and infrastructure.

The study also found that FDI has significantly boosted fishery real output in Nigeria. This increase can be attributed to the development of aquaculture, driven by foreign investments that have introduced modern fish farming techniques and improved feed quality. FDI has also played a role in upgrading fishing infrastructure, including cold storage facilities, processing plants, and distribution networks, which have reduced losses and expanded market access. Furthermore, foreign investors have brought expertise in sustainable fishing practices, helping to preserve fish stocks and ensure the long-term viability of the fishing industry. The significant positive effect of FDI on fishing output highlights how external capital and knowledge can transform

traditional fishing practices into a more productive and sustainable sector. This significant positive effect on fishing aligns with Rahman *et al*. (2024) findings, which noted that FDI has a significant short-run effect on agricultural GDP, suggesting immediate benefits to sectors like fishing. Similarly, Yusuf (2015) found that FDI has significant positive effects on Nigeria's agricultural output, which can include fishing, by providing necessary capital and technology. Conversely, Ogbanje and Salami (2022) found a negative impact of FDI on Nigeria's agricultural productivity, including fishing, due to exchange rate fluctuations and policy inconsistencies. These conflicting findings highlight the importance of stable macroeconomic policies to ensure the positive impact of FDI on the fishing sector.

Finally, the study indicates that FDI has had a significant positive effect on forestry real output in Nigeria. This impact can be linked to the investments in sustainable forest management practices and the development of value-added products such as timber, paper, and furniture. Foreign investors have introduced advanced technologies for logging, reforestation, and forest conservation, which have not only increased the output but also ensured the sustainability of forest resources. In addition, FDI has supported the establishment of industries that process forest products, thereby adding value and creating jobs. The positive correlation between FDI and forestry output underscores the importance of foreign investments in promoting sustainable exploitation and conservation of forest resources. Elmi's (2023) research supports the positive impact of FDI on forestry, showing a direct link between FDI and productivity in Djibouti's agricultural sector, which includes forestry. This finding is also supported by Gunasekera *et al*. (2015), who argued that improving land productivity alongside increased FDI can boost Africa's share in global agricultural output, including forestry. However, Martin-Odoom (2021) found a long-term negative effect of FDI on agricultural growth in Ghana, which could extend to forestry if similar conditions prevail. These varying outcomes emphasize the need for targeted and supportive policies to maximize FDI benefits in forestry.

CONCLUSION AND POLICY IMPLICATIONS

FDI plays a crucial role in enhancing the agricultural sector's performance by providing capital, technology, and expertise that local economies might lack. In Nigeria, a country with vast agricultural potential, FDI has been increasingly targeted toward agriculture, contributing to various subsectors such as crop production, livestock, forestry, and fishing. The findings from the study indicated that FDI has had a significant positive effect on these subsectors, suggesting that the infusion of foreign capital has catalyzed growth and productivity in Nigerian agriculture. To this end, the study concludes that FDI is a panacea for agricultural sector performance in Nigeria.

It will be an innovative approach for the Federal Ministry of Agriculture and Rural Development should actively seek and attract more FDI by creating favorable policies and incentives for foreign investors to continue enhancing crop production in Nigeria. The Nigerian Investment Promotion Commission should collaborate with international agribusiness firms to introduce more advanced livestock farming technologies and practices to further boost livestock output. The Nigerian Forestry Department should partner with foreign investors to expand sustainable forest management initiatives, ensuring the continued growth and conservation of Nigeria's forest resources. The Federal Ministry of Industry, Trade, and Investment should encourage foreign investment in the fishing sector by providing incentives for the development of modern aquaculture facilities and sustainable fishing practices, thus increasing fishing output.

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