FOREIGN DIRECT INVESTMENT AND AGRICULTURAL GROWTH IN ECOWAS COUNTRIES: 1970-2022

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ABSTRACT

This study examined foreign direct investment and agricultural growth in ECOWAS between 1970 and 2022, and employed panel *data estimators such as the panel two steps system generalised method of moments (GMM) regression technique under the random effect assumption to investigate the impact of foreign direct investment and agricultural growth in ECOWAS. The Results of the study revealed that foreign direct investment in agriculture (FDIA) had negative and statistically significant impact on agricultural gross domestic product (GDPA) with a coefficient of -2.5647 (and p-value of 0.0265). This means that a 1-unit increase in lagged FDIA was associated with a 2.56-unit reduction in GDPA. This implies that FDI had adverse effects, possibly due to inefficient allocation, dependence on foreign capital, or crowding out of domestic investment, on GDPA across ECOWAS, between 1970 and 2022. The significance (p = 0.0265) suggests this relationship was not due to random chance. The small and statistically insignificant coefficient of labour force (LEF) implies that it did not significantly influence GDPA in the ECOWAS region. This result (p = 0.6487) suggests that variations in the labour force did not have a measurable short-term effect on GDPA, which might be explained by low productivity or underemployment in some cross-sections. Based on the findings, the study recommended that Policymakers across ECOWAS should review the allocation of FDI in agriculture by encouraging domestic investment in agriculture and providing incentives such as tax holiday, subsidies, and access to credit. Also, ECOWAS governments should invest in training programmes to improve the skills of agricultural workers which will increase labour productivity in agriculture. Mechanisation and the adoption of modern agricultural practices should also be prioritised to optimise labour efficiency.*

Keywords: Investment, Agriculture, labour
JEL Classification: Q14, Q24, J21, Y7

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INTRODUCTION

Globally, Foreign Direct Investment (FDI) has been recognised as a potent source of external finance to support the development of different sectors of the economy which is supposed to translate into improved welfare and standard of living for the citizens. The contributions of foreign investment to Japan after the World War II and in South Korea after the Korean War are of great importance. The emerging economic 'Tigers' of Asia namely; Thailand, Singapore, Malaysia, Taiwan, and Indonesia, owe their successes to heavy inflows of FDI over the years. The economic growth of these countries has been enhanced by providing the local economy with a source of foreign skill, technology, management expertise and human resource development through international training and collaboration (Caves, 1996).

FDI has long been considered a critical catalyst for economic development in emerging economies, including those in Africa. The agricultural sector, being a mainstay of many African economies, is particularly significant due to its potential to drive inclusive growth, reduce poverty, and enhance food security. FDI is considered as a valuable source of finance and capital formation, technology-transfer and know-how, as well as a viable medium for trade among countries. The spillover effect also allows for the transfer of innovations and invention to the receiving countries, including countries within the Economic Community of West African States (ECOWAS). According to the requirement for accelerated growth in association with the Sustainable Development Goals (SDGs), for economies to experience sustainable and inclusive development, cross-border trade is paramount (UNCTAD, 2019).

According to Omosefunmi (2018), the ECOWAS region has received some important FDI inflows which have generally risen from US$1,990 million in 2001 to a peak of US$19,543 million in 2011. However, from 2012 onward, FDI inflows to ECOWAS started decreasing, reaching US$8,051 million in 2020. Several factors could explain such decreases, including poor macroeconomic performance, political instability, slow infrastructure development, business environment, and unfavourable economic policies and climate, among others.

Channeling FDI to agriculture often leads to the development of infrastructure such as farm access roads, storage facilities, and processing plants, which benefits the entire agricultural value chain. This is more so that agriculture provides food and nutrition for humans and raw materials for industry which underscores the importance of the sector (Djokoto, 2021). In 2018, the agricultural sector represented 4 per cent of global gross domestic product (GDP) and in some developing countries; agriculture contributed more than 25% of GDP (World Bank, 2021).

According to Djokoto (2021) and World Bank (2021), the agricultural sector's growth is up to four times more effective in increasing wealth among the poorest compared to other sectors. The above works claim that in 2016, 65% of poor working adults made a living through agriculture. Thus, developing agriculture is one of the most potent tools for ending extreme poverty, enhancing shared prosperity, and feeding a projected 9.7 billion people by 2050.

Despite the inflow of FDI to ECOWAS agriculture, the sector has not taken its rightful place of being a major contributor to the region's economy. This is shown by high food imports and unemployment which indicates that agriculture is yet to contribute optimally to the development of the economy of ECOWAS (Omosefunmi 2018). It is in this connection that this study investigates foreign direct investment and agricultural growth in ECOWAS. This study seeks to investigate the extent to which FDI influences agricultural growth in ECOWAS countries.

LITERATURE REVIEW

Conceptual Review

Foreign Direct Investment (FDI)

Foreign direct investment has several definitions by different authors depending on the conceptualisation of the term. Thirlwall (1994) defines Foreign Direct Investment as an investment by multinational companies with headquarters in developed countries. According to him, this investment involves not only a transfer of funds (including the investment of profits) but also a whole package of physical capital, techniques of production, managerial and marketing expertise, products, advertising and business practices for the maximisation of global profits.

International Monetary Fund (2012) defines foreign direct investment as investments made to acquire a lasting interest in enterprises operating outside of the economy of the investor (Ridgeway, 2004). The IMF also considers an investment to be classified as foreign direct investment if the investor holds a partial ownership share of at least 10% and exercises a significant amount of management control.

The United Nations Committee on Trade and Development (2012) refers to foreign direct investment (FDI) as an investment involving a long-term relationship and reflecting a lasting interest and control by a resident entity in one economy (foreign direct investor or parent enterprise) in an enterprise resident in an economy other than that of the foreign direct investor (FDI enterprise or affiliate enterprise or foreign affiliate).

Farrell (2018) succinctly captures the concept of foreign direct investment as "the combination of technology, capital, management, and entrepreneurs' that a firm deploys in order to operate and supply products and services in a foreign market. Aremu (2005) categorises the various types of Foreign Investment in Nigeria into five thus: wholly Foreign owned joint ventures; special contract arrangement; technology management and marketing arrangements, and subcontract co-production and specialisation.

This study adopts the definition of foreign direct investment by the International monetary fund (2012), which defines FDI as investments made to acquire a lasting interest in enterprises operating outside of the economy of the investor. This is because the definition advanced by IMF best aligns with the objective of this study.

Concept of Agricultural Output

According to Idowu (2013), agriculture is the art, science and business of growing crops and rearing animals. Apparently, it is man's oldest occupation and served credibly as a solid foundation for socio-economic advancement across ECOWAS by way of employment generation and wealth creation, provision of food for man and feed for his livestock, provision of raw materials for agro-based industries and foreign income for government (Idowu, 2013).

Agriculture can be advanced beyond its primary function of supplying food, and its

primary cultural sector has the potential to shape and guarantee the sustainable management of renewable resources of many rural areas (Obansa & Maduekwe, 2013). The agricultural sector occupies an essential position in the West African sub-region, and this sector is recognisably the heartbeat of the region's economy (Osabohien, Osabuohien et al., 2018). Such recognition emanates because its impact cuts across societies at various stages of the regional economies and labour force, incomes and access to food rely mainly on the sector such that the ECOWAS agricultural sector generates over 35% of gross domestic product (GDP) (Food and Agriculture Organisation [FAO], 2017).

Agricultural output is the value of agricultural products which, free of intrabranch consumption, are produced during the accounting period and before processing; are available for export and consumption(Obansa & Maduekwe, 2013). Securing the rapid growth of agricultural output across the ECOWAS region is therefore a prerequisite for the market-mediated linkages to be mutually beneficial. Growth of agricultural output has had enormous impact on food supplies, prices and consequent beneficial impacts on food security and poverty reduction (Osabohien, Osabuohien et al., 2018).

Growth in agricultural output also triggers the generation of non-market mediated linkages between agriculture and the rest of the economy. These include the indirect contribution to food security and poverty alleviation, safety nets and buffer role, and the supply of environmental services (FAO, 2003). For this study, agricultural output means the output from agriculture, resulting from a combination of inputs such as labour and skills computed as agricultural gross domestic product (GDPA).

Economic Community of West African States (ECOWAS)

The Economic Community of West African States (ECOWAS) formally came into existence on 28 of May, 1975 in Lagos, Nigeria and marked the beginning of a new era in the history of economic cooperation in West Africa. ECOWAS was formed with the representation of fifteen heads of state, which were present when the Treaty was signed. In 1976, Cape Verde joined the organisation as the 16th member (ECOWAS Website). However, in 2002, Mauritania left the organisation and

currently there are only 15 members of the organisation (ECOWAS Website).

The ECOWAS was established primarily to foster inter-state economic and political cooperation and since the formation of ECOWAS in 1975, there have been 32 chairmen as the body is headed by a Chairman (ECOWAS, 2021). In terms of the development of member states, there are different levels of development concerning per capita income. The economic process of ECOWAS is driven by Nigeria, the community's largest economy, that in 2014 accounted for approximately 79.1% of the combined value, followed by Ghana 5.3% and Cote d'Ivoire 4.7% (Development, 2018). Conversely, in the aspect of export, the community exports stood at $87.9 billion as of 2015 and it accounted for 0.53% of the world total of which agricultural and extractive industries remain the backbone of economic and social development in the West African region. The aggregate worth of ECOWAS trade in goods (sum of exports and imports) is calculable at $190 billion in 2015 while the regional trade depicted solely $19.1 billion that is about 10% of total trade (ECOWAS, 2021).

Theoretical Review

Cobb-Douglas Production Function

The Cobb-Douglas production function is a substantial guidance for specifying supply-side agricultural potential output primarily determined by measurable input factor ($X = AL^{\beta}K^{\alpha}$). This theory is to a large extent consistent with the theory of supply of production function that underlies specification of the supply side of agricultural output. The Cobb-Douglas production function was derived from the observation by Cobb and Douglas (1928) that over the long-run, the relative share of national output earned by labour (L) and Capital (K) tends to be constant. The Cobb-Douglas production function further assumes constant returns to scale and unitary elasticity of substitution. The Cobb-Douglas production function is stated as thus:

$$X = AL^{\beta}K^{\alpha} \quad (1)$$

where:

X= Total Output

L= Labour

K= Capital

β and α = substitution parameter

β= (1-α) and β+α =1.

The quantity of output is a function of the quantity of labour and capital used in production. Output refers to the number of units of the commodity produced. Labour refers to the number of workers employed. Capital refers to the equipment used in production. It is assumed that all units of L and K are homogenous. The Cobb-Douglas production function is linearly homogenous in labour and capital. This means that, if we increase all inputs by a constant multiple (λ), output will increase by that same constant. The Cobb-Douglas production function is therefore characterised by constant return to scale. This is stated as thus:

$$Q = A(\lambda L)^{\beta}(\lambda K)^{\alpha} \quad (2)$$

$$Q = A\lambda^{\beta+\alpha}L^{\beta}K^{\alpha} \quad (3)$$

Since β+α =1, we have

$$Q = \lambda AK^{\beta}L^{\alpha} \quad (4)$$

Therefore, λ=1.

The performance of the supply side of an economy is often identified with the growth rate of potential output. Potential output is not observed in reality; however, it has to be approximated (Dana & Jaromir, 2007). The use of the production function method for the measurement of potential output growth takes into account different sources of an economy's productive capacity, namely; the contributions of labour, capital and total factor productivity, the latter containing information about technological and allocative efficiency and hence about the supply-side performance on the basis of the observed simultaneous developments in the quantity of labour, capital and total factor productivity. For example, an increase in the rate of capital growth accompanied by a rise in trend total factor productivity may signal some improvements in the supply-side performance. Observing an increase in the rate of

the capital growth while trend total factor productivity stagnates, one can, in contrast, deduce that the supply side is functioning inefficiently. The production function thus represents a useful and powerful tool for the macroeconomic analysis and evaluation of the governmental structural policies.

Empirical review

Empirical evidence from literature posits varying views regarding the exact impact of FDI on agricultural growth. Though the agricultural FDI-growth nexus has been empirically explored, focus has been more on growth across developing countries. One of such studies is Iritie and Tiemele (2023) who analysed the contribution of FDI to economic growth in Côte d'Ivoire, for the period 1980–2019. The study made use of the World Development Indicators (World Bank) database and employed the Autoregressive Distributed Lag (ARDL) co-integration approach. The results of the study revealed that, in the short and long-run, FDI negatively impacts economic growth in Côte d'Ivoire. This is largely due to the predominance of extractive FDI in Côte d'Ivoire. This is especially that, the extractive sector is weakly linked to the national economy and is subject to practices of fraud and corruption. The results also showed the importance of education (human capital) in the country's economic growth. It recommended the need for selective FDI attraction policies, the integration of the enclave extractive sector into the national economy and the strengthening of the education system for a more efficient human capital capable of absorbing and using new knowledge and high technologies transferred by FDI.

In a similar study carried out in South Africa, Mbiakop, Khobai and Fani (2023) investigated the impact of public agricultural spending on FDI inflows in agriculture in South Africa over the period 1991-2019. The Autoregressive distributed lag (ARDL) Bounds test and Granger causality were used to investigate both short-run and long-run impact of public agricultural spending on foreign direct investment inflows in agriculture. The results of the long-run model revealed that agricultural production had a positive and significant impact on foreign direct investment. However, public spending in agriculture showed a negative and significant influence on the foreign direct investment inflows in agriculture. In addition, Granger

causality results showed causality flowing from public agriculture spending, net export and inflation to foreign direct investment inflows in agriculture.

Djokoto, Kofi, Agyei and Badu-Prah (2022) examined the welfare effects of agricultural foreign direct investment in developing countries between 1990 and 2019. The study used an unbalanced panel data of 51 developing countries from 1990 to 2019 with a fixed-effects estimator and found that agricultural foreign direct investment promotes welfare in developing countries. Openness to trade, population growth, human capital, and infrastructure enhanced welfare. Based on the findings, the study recommended that governments across developing countries should promote foreign direct investment into agriculture and improve human capital, develop infrastructure, and pursue trade openness policies. Furthermore, the study recommended that government expenditure on goods and services needs to be redirected into funding projects and programmes that improve the health, education, and income of citizens, especially the poor.

Ogbanje and Salami (2022) investigated the impact of foreign direct investment on Nigeria's agricultural sector. Time series data between 1981 and 2019 were obtained from the databases of the Central Bank and Food and Agriculture Organisation. The Augmented Dickey-Fuller test shows that the variables were I(1). Johansen's co-integration test suggested long-run relationship among the variables. Findings revealed slower acceleration of agricultural productivity (6.28) than FDI (17.99). Also, FDI and exchange rate had statistically significant ($p < 0.05$) and negative impact on the agricultural productivity, while implicit price deflator for the agricultural sector had statistically significant ($p < 0.001$) and positive impact on agricultural productivity in the long-run. Hence, reliance on foreign direct investment would have adverse effect on agricultural gross domestic product in the long-run.

Osabohien, Iqbal, Osabuohien, Khan and Nguyen (2022) studied the influence of agricultural trade and Foreign Direct Investment (FDI) on inclusive growth in developing countries, using the case of West Africa. The study engaged data from various World Bank sources for 15 West African countries that are members of the Economic Community of West African States (ECOWAS) for the period

2000–2019. The study calculated inclusive growth using the Principal Component Analysis (PCA) and applied the two stage Least Squares (2SLS) to resolve the possible issue of endogeneity. Findings showed that, agricultural trade was significant in explaining the level of inclusive growth. This implied that a 1% increase in agricultural trade may increase inclusive growth by 0.88% (first stage) and 0.99% (second stage), respectively. In contrast, FDI was insignificant in explaining inclusive growth. Based on the result, the study recommended that effective policies such as flexible trade policies to enhance the exchange of goods and services should be implemented, which is crucial, given the need for more resilience in post-COVID-19 ECOWAS.

Adedokun, Aliu and Omotosho (2022) empirically investigated the relationship between Foreign Direct Investment (FDI) and economic growth in Nigeria. Employing Ordinary Least Square (OLS) regression, Johansen Co-integration and Granger Causality Techniques, annual secondary time series data for the period 1986 to 2018 (obtained from World Bank and OECD National Account Data files accessed at www.indexmundi.com/facts/nigeria), was used to analyse the relationship and causal nexus between Foreign Direct Investment (FDI) and Nigeria's economic growth (GDP), on one hand, and Gross Fixed Capital Formation (GFCF) and Nigeria's economic growth, on the other hand. While a positive but insignificant relationship was found between FDI and GDP, there was evidence of positive and significant relationship between GFCF and GDP. Johansen co-integration result evidenced a long run equilibrium relationship between the dependent and independent model variables and the Granger causality test revealed a unidirectional causal link flowing from FDI to GDP but no evidence of causality between GFCF and GDP was found within the period under review.

Yeboah, Agyei, Li, Tetteh and Amankwa (2022) investigated the significance of foreign direct investment on registered projects and employment generation in the sectors of Ghana's economy. The data for the study was obtained from the Ghana Investment Promotion Centre (GIPC) for the period 2001 to 2018. The Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test methodology was employed and showed a unit root existence in the time series. The regression results showed no

significant impact of registered investment projects on the agriculture and manufacturing sectors at a 5% significance level. The findings also indicated that employment creation through registered investment projects has no effect on the manufacturing industry and that the service sector benefits more from FDI than the other sectors. It recommended that the government should boost these non-performing sectors with incentives to attract more investors.

Nyiwul and Koirala (2022) examined the role that foreign capital inflows plays in the development of the agricultural, forestry and fishing sectors in developing countries. The study employed the panel vector autoregression approach that accounts for endogeneity. Using data from sixteen developing economies, the study found out that there exists bidirectional causality between foreign direct investments in agriculture, forestry and fishing. These bidirectional relationships reflect a cyclical effect between FDI and value added in the agriculture, forestry and fishing. The effect of FDI on value added in agriculture, forestry and fishing remained positive for up to five years in the model. This means that FDI has a medium to long-term positive impact on value added in agriculture, forestry and fishing.

Kubik (2021) studied the role of agricultural sector performance in attracting foreign direct investment in the food and beverages sector. Evidence from planned investments in Africa, using a novel dataset on foreign direct investment (FDI), the study analysed the correlates of planned FDI in the food and beverages sector in 49 African countries over the period 2003–2017. It applied the random effects model and augmented the standard specification of FDI determinants with a set of factors related to the agricultural sector performance, hypothesised to be essential from the perspective of supply chain linkages and access to raw materials. The results indicated that well performing and well capitalised agricultural sector of the host country is a key factor associated with the choice of investment location by foreign investors, especially those from the Global North. Capital investment in agriculture, as proxied by agricultural gross fixed capital formation and net capital stock, is particularly important. Public investment in agriculture, in the form of government expenditure and official development assistance, was also associated with higher FDI. These factors, however, are not significant in case of the least developed

countries where only market potential appears to matter for foreign investors. The results suggest that complementarities may exist between different types of investments and recommended that policymakers willing to attract food and beverages FDI should prioritise agricultural sector development.

The empirical works reviewed show that most of the research carried out are majorly in Nigeria and centre around foreign direct investment and agricultural growth as well as foreign direct investment and economic growth in Nigeria, while the ECOWAS framework and other African countries have scanty literature on the subject matter. This study will augment literature in the area of study.

METHODOLOGY

Data and Source

The nature of data used in this study is secondary data, sourced from the publications of the Central Bank of Nigeria and World Bank development indicators (2023). The variables for which data was sourced include: Real Agricultural Gross Domestic Product (GDPA), Foreign Direct Investment in Agriculture (FDIA), Labour Force (LEF) and Agricultural machinery, tractors per 100KM in ECOWAS as proxy for Innovation Index (INNO) for the period of 1970 to 2022 across the 15 ECOWAS countries. For purposes of uniformity, this study considered all monetary values in US dollars.

Model Specification

The model adopted for this study to test the relationship between Foreign Direct Investment and Agricultural growth in ECOWAS countries is premised on the Cobb-Douglas Production function. The Cobb-Douglas production function bases its tenets on the input-output relationship of labour and capital. Based on the foregoing, this study adapted the models of previous study of Nyiwul and Koiraja (2022) and Kubik (2021). The model specified by these is thus:

$$AGR_{it} = \beta_0 + \beta_1 FDI_{it} + \beta_2 GDPgr_{it} + \beta_3 GPDpc_{it} + \beta_4 POP_{it} + \beta_5 ELE_{it} + \beta_6 LL_{it} + \beta_7 TAX_{it} + \beta_8 DEL_{it} + \beta_9 DEM_{it} + + U_{it} \quad (5)$$

where:

FDI_{it}=planned FDI in the food and beverages sector in country i in year t.

$GDPgr_{it}$=is GDP per capita growth.

$GDPpc_{it}$ = is GDP growth level.

POP_{it}=population size.

ELE_{it}=the share of population with access to electricity and is employed as a proxy of infrastructure.

LL_{it},=dummy equal to one if a country is landlocked.

TAX_{it}= the corporate tax rate.

DEL_{it} andDEM_{it} are proxies of institutional quality,

AGR_{it} = agriculture

ε_{it} = the disturbance.

Therefore, in line with the above models, the model for this study is specified to capture the relationship between foreign direct investment and agricultural growth in ECOWAS countries. The functional form of the model is stated below:

GDPA=f(FDIA,LEF,INNO) (6)

where,

GDPA = Agricultural Gross Domestic Product

FDIA = Foreign Direct Investment in Agriculture

LEF = Labour Force

INNO = Innovation Index

Specifically, to achieve the objective of this study and based on the property of the linearity of variables, the functional relationship is modelled in a linear equation as follows:

$$GDPA_{it} = \beta_0 + \beta_1 FDIA_{it} + \beta_2 LEF_{it} + \beta_3 INNO_{it} + U_{it} \quad (7)$$

Where GDPA stands for Agricultural gross domestic product, FDIA for Foreign direct investment in agriculture, LEF for Labour force, and INNO for Innovation index (proxied by agricultural machinery, tractors per 100KM in ECOWAS countries).U_{it} is the error term which denotes other variables that are not specified in the model, i represents the number of countries and t is the number of years.

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Table 1:
Descriptive statistics

	Observations	Mean	Maximum	Minimum	Std. Dev.	Jarque-Bera	Probability
GDPA	489	26.45366	57.3956	9.863468	11.55939	0.7232	0.534679
FDIA	489	1.228544	9.104238	-1.11892	1.632261	1.6528	0.092011
INNO	489	5.708056	32.075	0.092963	7.058171	0.9074	0.598923
LEF	489	4954940	39760820	119861	8069570	0.5718	0.736665

Source: Researchers' Computation using Eviews 9.5, 2024

Correlation Analysis

The covariance analysis (see Table 2), which provides insights into the relationships between four variables, shows that a weak negative correlation exists between GDPA and FDIA. The negative value suggests that, as FDIA increases, GDPA tends to decrease, though the relationship is not strong. In terms of the relationship between GDPA and INNO, a weak positive correlation was noticed, implying that higher levels of INNO are associated with high GDPA, though the relationship is not strong. Also, there is a weak positive correlation between GDPA and LEF. The weak and non-significant correlation between the independent variables gives an indication of the absence of multicollinearity in further analysis involving the data.

Table 2:
Correlation matrix

Variables	GDPA	FDIA	INNO	LEF
GDPA	1.0000			
FDIA	-0.2641***	1.0000		
INNO	0.3160	0.1909**	1.0000	
LEF	0.055216	-0.011889	-0.121933*	1.0000

Source: Researchers' Computation using Eviews 9.5, 2024

Note: The asterisks *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels respectively, meaning the correlation is unlikely to have occurred by chance at those levels.

Regression Analysis

The results of the panel two steps system generalised method of moments (GMM) regression in column (1) of Table 3 show that foreign direct investment in agriculture (FDIA) with a coefficient of -2.5647 (and p-value of 0.0265) had negative and statistically significant impacts on agricultural gross domestic product (GDPA). A 1-

unit increase in lagged FDIA was associated with a 2.56-unit reduction in GDPA. This implies that FDI had adverse effects, possibly due to inefficient allocation, dependence on foreign capital, or crowding out of domestic investment, on GDPA in ECOWAS countries, at least in the study period. The significance (p = 0.0265) suggests this relationship was not due to random chance. The small and statistically insignificant coefficient of labour force (LEF) implies that it does not significantly influence GDPA in the ECOWAS region. This result (p = 0.6487) suggests that variations in the labour force did not have a measurable short-term effect on GDPA, which might be explained by low productivity or underemployment in some cross-sections.

Innovation, on the other hand, has a positive and significant effect on GDPA in this context. It is observable from the results that a 1-unit increase in innovation index is associated with a 0.38-unit increase in GDPA. This result reflects the costly nature of innovation in the agricultural sector or efficiencies in innovation systems that translate technological advancements into immediate agricultural growth. The significance (p = 0.0110) underscores the need to boost innovation policies and their implementation in agriculture.

Summary of Results

Variable	(1) System GMM-2 steps	(2) Robust Least Squares
FDIA	-2.5647** (1.1424)	-1.4873** (0.5993)
LEF	5.49E-08 (1.20E-07)	3.63E-08 (1.20E-07)
INNO	0.3776** (0.1462)	0.4308*** (0.1396)
Constant	31.4252*** (1.8492)	30.3566*** (1.5253)
Observations	489	489
Adj. R-squared	0.5711	0.6563
Durbin-Watson stat.	2.0121	
J-statistic	3.86E-28 (0.0000)	-
F-statistic	6.4596 (0.0004)	6.6092 (0.0003)
AR(1)	-2.654 (0.008)	-
AR(2)	-1.7837 (0.075)	-

Source: Researchers' Computation using Eviews 9.5, 2024

An observation of the overall model performance revealed that an adjusted R-squared of 0.5711implies that the model explains about 57.11% of the variation in GDPA, indicating that other factors outside of FDI, LEF, and INNO account for the remaining 42.89% of the variation in GDPA. The Durbin-Watson statistic of 2.012 dismissed the likelihood of autocorrelation in the residuals, which would have signal issues in the model's assumptions.

A negative impact of FDIA on GDPA, noticed from the results, is in conformity with earlier findings from studies like those of Iritie and Tiemele (2023), Ogbanje and Salami (2022), Osabohien *et al*. (2022), and Kadmiel (2021) which variously found FDI to have a negative impact in stimulating the performance of various economic variables in the African region. It is, however, at variance with the findings of works like those of Djokoto *et al*. (2022) and Adedokun *et al*. (2022) who in contrast found a positive impact of FDI on certain macroeconomic variables like GDP. The adverse impact of FDIA could stem from the inefficient allocation of foreign investments in the agricultural sector, thus leading to low productivity. It could also result from over-reliance on foreign investment with the consequence of stifling local initiatives, leading to reduced domestic investment in agriculture. Another source of this negative impact could be that those foreign investments might have crowded out domestic firms, limiting their growth potential.

The results indicate that FDI in agriculture, while typically considered beneficial, may have adverse effects in the ECOWAS region due to structural inefficiencies. In contrast, innovation plays a critical role in driving agricultural growth, though it may require more investment. The labour force does not have a significant short-term effect, possibly due to low productivity challenges. These findings can inform policymakers to focus more on enhancing innovation and addressing the inefficiencies in FDI allocation.

The weak impact of labour force on agriculture in ECOWAS reflects deep structural and institutional challenges, such as a large workforce being unable to translate into proportional agricultural productivity due to low investment in modernisation, policy gaps, and external factors like climate change and rural-urban migration. The lack of significance could also suggest that labour productivity improvements in this context are either minimal or that other factors are overshadowing its effect. And the positive of INNO on GDPA suggests that fostering innovation can lead to enhanced productivity and growth in the agricultural sector. The positive impact of innovation reflects the fact that an effective innovation system is capable of facilitating the translation of technological advancements into increased agricultural productivity, thus contributing positively to GDPA in the ECOWAS region.

Test of Robustness

To ensure the effectiveness of the estimates, the study started with observing the J-statistic, which tests for the validity of the model's instruments used in GMM. The J-statistic of 3.86E-28 (with a p-value of 0.0000) in Table 3 clearly shows that the model's instruments used in GMM are valid. The Wald test (represented by the F-statistics) was carried out with the results indicating a joint significance of the regressors. Also, the results of the GMM were analysed using Variance Inflation Factors (VIF), which assess the degree of multicollinearity among the independent variables in the regression model. According to the commonly accepted guideline, a VIF value exceeding 10 indicates a significant level of multicollinearity that may hinder reliable coefficient estimation. Fortunately, all the models passed this test, with no VIF values exceeding 10. Additionally, the GMM results passed the test for serial correlation using the widely adopted Arellano and Bond estimators—AR(1) and AR(2)—for dynamic panel data models. The results indicate that the study's models are free from autocorrelation issues, particularly the absence of second-order serial correlation. These model diagnostics indicate that the models are rightly specified and the model's estimators are consistent and reliable, thus with valid policy implications.

Furthermore, the Robust Least Squares analysis, presented in column (2) of Table 3, was utilised to gain deeper insights into the effects of our independent variables on GDPA. The relevance of the Robust Least Squares analysis is in its ability to minimise the high sensitivity data to outliers, which can distort estimates of the regression coefficients, and provide more reliable results in such scenarios. In essence, Robust Least Squares enhance model reliability by addressing the limitations of traditional least squares, especially in data with anomalies or non-ideal conditions. Thus, the model estimated the impact of independent variables on GDPA, using robust least squares with M-estimation to control for outliers or heteroscedasticity in the data.

It was found that the results, however, did not differ significantly from those of the system GMM with Foreign direct investment in agriculture (FDIA) (with a value of 1.49) having a negative and statistically significant impact on GDPA. The impact of LEF and INNO also remained similar in both magnitude and sign.

CONCLUSION AND POLICY RECOMMENDATIONS

The study set out to investigate foreign direct investment and agricultural growth in ECOWAS countries. The results of the panel generalised method of moments

(GMM) and Robust Least Squares analyses showed that foreign direct investment in agriculture (FDIA) had a negative and statistically significant impact on agricultural GDP (GDPA) in ECOWAS countries. Also, labour force (LEF) did not have a statistically significant impact on GDPA, suggesting that labour productivity in agriculture remains low in the region. Meanwhile, innovation (INNO) showed a positive and significant impact on GDPA. This emphasises the crucial role of technological advancements and innovation systems in enhancing agricultural productivity in the region.

Arising from the findings and conclusion, it is recommended that:

1. Policymakers across ECOWAS should review the allocation of foreign direct investment in agriculture. The negative impact of FDI on GDPA suggests that ECOWAS countries do not properly scrutinise the types of FDI they attract, by focusing more on quality and productive investments rather than sheer volume; or that the current investments may not be optimally utilised. As such, governments of ECOWAS countries should ensure that FDIA is properly scrutinised and directed towards productive areas such as agricultural modernisation, infrastructure, and value chain development, which can contribute to long-term agricultural growth.
2. Over-reliance on FDIA could stifle local initiatives. Governments of ECOWAS should encourage domestic investment in agriculture by providing incentives such as tax breaks, subsidies, and access to credit. This would help boost local entrepreneurship and reduce the crowding-out effect of foreign investment.
3. The positive impact of innovation on agricultural growth highlights the need for increased investment in research and development, agricultural technologies, and extension services. ECOWAS governments should develop policies that foster innovation, including financial support for startups and innovators in the agricultural sector, as well as creating partnerships between research institutions and farmers.
4. The insignificant impact of the labour force on agricultural GDP suggests low labour productivity in agriculture. Hence, ECOWAS governments should invest in training programmes to improve the skills of agricultural workers which will increase labour productivity in agriculture. Mechanisation and the adoption of modern agricultural practices should also be prioritised to optimise labour efficiency.

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