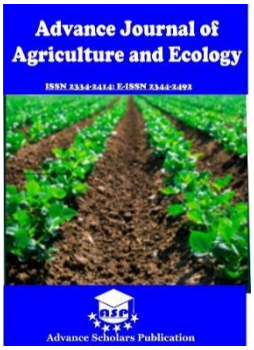
Advance Journal of Agriculture and Ecology
Adv. J. Agric. & Eco.
Volume: 9; Issue: 11
November-2024
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index



IMPACT OF FOREIGN DIRECT INVESTMENT ON AGRICULTURAL OUTPUT IN NIGERIA (1981-2021)

[1]Adekeye Emmanuel Segun, [2]Abegunde Joseph Kayode and [3]Oyelakun Oyetola Bukunmi

[1,2,]Department of Economics, Faculty of Management and Social Science, Thomas Adewumi University Oko Irese, Nigeria
[3,]Department of Accounting, Faculty of Management and Social Science, Thomas Adewumi University Oko Irese, Nigeria
Corresponding Author: emmanuel.adekeye@tau.edu.ng, Mobile Number.: +2348060190001

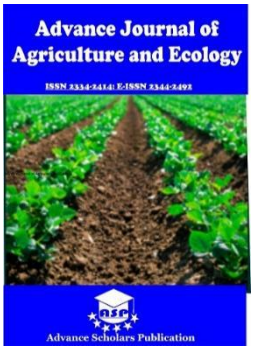
Keywords: *Foreign Direct Investment, Agricultural Output, Production*

Abstract: *The study examines the effect of foreign direct investment on agricultural output in Nigeria. Cobb-Douglas production function was used as the theoretical framework. Based on the result of unit root test, using Augmented Dickey Fuller, the study adopts autoregressive (ARDL) bound test. Result from the ADRL test shows that there is a long-run co-integration among the variables, leading to co-integrating regression analysis which was used to examine the effect of Foreign Direct Investment on agricultural output with annual data set covering 1981 to 2021. The findings show that while capital and labor employed in agricultural sector significantly boost agricultural output, while agricultural foreign direct investment inflows have no significant impact. Based on the results, the study recommend policies that will encourage rural youth to engage in farming, ensure continuous access to capital for farmers, and investigate why Foreign Direct Investment is having influence in the agricultural sector.*

1.0 INTRODUCTION

The growth in foreign direct investment (FDI) that has taken place since 1990 is the most notable example of globalization, according to Furtan (2014), Global FDI flows have increased dramatically over the past 20 years. This is a result of the fact that many nations, particularly developing nations, view FDI as a crucial component of their economic growth strategies (Ayanwale, 2017). Over the years, Nigeria has drawn enormous amounts of foreign direct investment, with the extractive sector receiving the majority of these inflows. The fact that the agriculture industry receives the least amount of foreign direct investment is unexpected. Approximately 70% of Nigeria's workforce is employed in the country's agriculture sector. Agriculture made for as much as 64% of the GDP in the 1960s. Due to the oil glut of the 1980s, agriculture's share of the GDP fell from 64

Advance Journal of Agriculture and Ecology
Adv. J. Agric. & Eco.
Volume: 9; Issue: 11
November-2024
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index



percent in the 1960s to 48 percent in the 1970s, 20 percent in 1980, and 19 percent in 1985 (Ukeje, 2003).

Numerous studies have been conducted to examine the impact of foreign direct investment on Nigeria's economy; yet, the majority of these studies focus on the oil and gas industry which receives the majority of these investments. One of the main reasons that not much research has been done to examine the effects of foreign direct investment (FDI) in Nigeria's agriculture industry is the low level of FDI in the sector. The main shortcoming that this study highlights and aims to fill is that previous attempts to empirically investigate the effects of foreign direct investment (FDI) in Nigeria's agricultural sector have used FDI that is obtained in the entire economy rather than FDI that flows directly to the sector.

The question that then comes to mind is what effect foreign direct investment which goes directly into the agriculture sector has on the agricultural output and productivity. With the use of empirical models, this study aims to close this gap by analyzing the relationship between agricultural output and foreign direct investment in Nigeria.

Based on the aforementioned research, it is anticipated that foreign direct investment inflow into Nigeria's agricultural sector will significantly increase agricultural output especially if foreign investors are encouraged to participate in the agricultural sector through incentives. Therefore, the aim of this study is to identify further channel and possible factors responsible for increase in agricultural output and proffer solutions on how agricultural output can be improved.

This study seeks to address a main research question on the impact of foreign direct investment inflow in agricultural sector on agricultural output in Nigeria. The specific research question the study seeks to address is whether foreign direct investment is a channel of increasing agricultural output in Nigeria. The research question above has served as a guide for this study's objectives. The primary objective of this study is to investigate how foreign direct investment flows into Nigeria's agriculture sector affect the country's agricultural output, while the specific objective is to determine whether foreign direct investment (FDI) is a means of boosting agricultural output in Nigeria.

In terms of the study's significance, it will give academics new perspectives. The results of this study will also be very important for policy makers as they will provide guidance on how to create policies that will boost Nigeria's agricultural output.

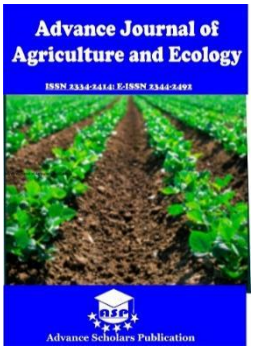
2.0 LITERATURE REVIEW

This section reviews theory of production and empirical findings of previous studies. The last part of this section highlights gaps in the existing literature.

2.1 Theory of Production

Production, according to Carlson (1956), is the process through which certain products and services referred to as inputs are transformed

Advance Journal of Agriculture and Ecology
Adv. J. Agric. & Eco.
Volume: 9; Issue: 11
November-2024
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index



into other products and services, referred to as outputs. Creating enough of these changed items to meet demand is the primary goal of manufacturing. The input-output relationship is the foundation of production theory. Anything a company uses in its production process is considered an input in economics. Production theory, according to Shephard (1976), is developed during two distinct time periods:

(i) the short-run production theory is the first; it is developed when some production factors are seen as flexible and others as fixed, meaning that they are not easily variable over the time period under discussion. This implies that there are two categories of input in the short run, fixed and variable inputs. Basically, in agricultural production, a typical example of fixed input is land, and a variable input is labour. This can be specified as:

$Q=f(L,K)$.....1

where:

Q = quantity of output

L= quantity of labour input – variable factor

K = quantity of capital input – fixed factor

(ii) The second theory is called long-run production theory, and it is developed over an extended period of time when all production elements can be changed while staying within the limitations of current technology. Over time, every aspect is subject to change. Furthermore, factor substitution is also allowed in the long run. A fixed amount of production can be produced with a combination of more labor and less capital or more capital and less labor. This can be represented as:

$Q = f(x_1, x_2.....,x_n)$.....2

where:

Q = output, while $x_1, x_2,.....x_n$ are variables factors.

This study describes three different forms of production functions, which are: Cobb-Douglas production function, constant elasticity of substitution production function and linear homogeneous production function.

2.2.1 Cobb-Douglas Production Function

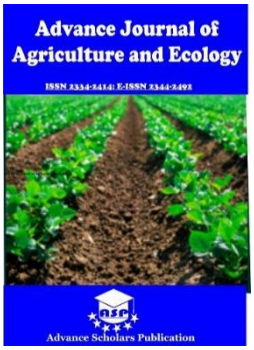
After researching the link between inputs and outputs, Charles W. Cobb and Paul H. Douglas (1928) developed the empirical production function, also referred to as the Cobb-Douglas production function. The Cobb-Douglas production function was initially applied to the entire manufacturing production process, not just the production process of a single company. The Cobb-Douglas production function is expressed as:

$Q = AL^{\alpha}K^{\beta}$.....3

where:

Q = output

Advance Journal of Agriculture and Ecology
Adv. J. Agric. & Eco.
Volume: 9; Issue: 11
November-2024
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index



L = labour inputs
K = Capital input (monetary worth of all machinery, buildings and equipment)
A = productivity index
α and β are parameters, where α > 0, β > 0.
The formula makes the assumption that output is closely correlated with L and K, and that the "residual," also known as the productivity index, accounts for the portion of output that L and K are unable to explain.

2.2.2 Constant Elasticity of Substitution Production Function

A different term for the homohighplagic production function is the CES production function. Ar-row, Chenery, Minhas, and Solow first presented the Constant Elasticity of Substitution (CES) function in 1961. Three parameters, A, a, and 0, as well as three variables, Q, K, and L, are needed for this function. It may be expressed in this form:

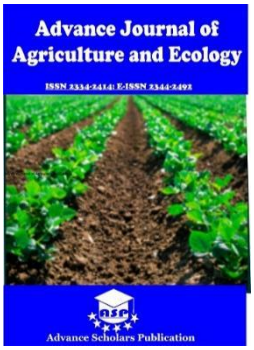
$Q = A [\alpha L^{-\theta} + (1- \alpha) K^{-\theta}]^{-1/\theta}$ 4

where Q is the total output, K is capital, and L is labour. A is the efficiency parameter indicating the state of technology and organizational aspects of production. It shows that with technological or organizational changes, the efficiency parameter leads to a shift in the production function, α (alpha) is the distribution parameter or capital intensity factor coefficient concerned with the relative factor shares in the total output, and β (theta) is the substitution parameter which determines the elasticity of substitution and A > 0; 0 < α <1; θ > -1.
In the CES production function, the elasticity of substitution is constant and not necessarily equal to unity.
According to Pearl (1975), CES production function has the following properties:
(i) The value of elasticity of substitution depends upon the value of substitution parameter.
(ii) The marginal products of labour and capital are always positive if we assume constant returns to scale.
(iii) The marginal product of an input will increase when other factor inputs increase.
(iv)When the elasticity substitution is less than unity, the function does reach a finite maximum as one factor increases while other is held constant.
(v) The marginal product curves are sloping downward.
(vi)The estimation of the elasticity of substitution parameter requires the assumption of perfect competition.

2.2.3 Linear Homogeneous Production Function

The output increases proportionately to the proportionate change in each of the production components, according to the linear homogeneous production function. For example, when the factor inputs are doubled, so is the result. Another name for this is continuous returns to scale. When the elasticity of substitution is one, the production function is

Advance Journal of Agriculture and Ecology
Adv. J. Agric. & Eco.
Volume: 9; Issue: 11
November-2024
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index



referred to as homogenous. It is simple to manage and apply the linear homogeneous production function in empirical research. It is therefore frequently utilized in input-output analysis and linear programming.

This production function can be shown symbolically:

nP = f(nK, nL)..... .....**5**

where:

n = number of times

np = number of times the output is increased

nK = number of times the capital is increased

nL = number of times the labor is increased

Thus, with the increase in labor and capital by "n" multiple the output also increases by the same multiple.

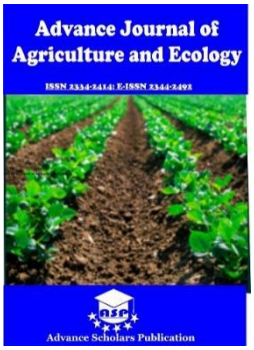
2.3 Review of Empirical Studies

The majority of the empirical research on foreign direct investment concentrated on how it affected economic growth. Typical studies along this line include, Olokoyo (2012). Other research, such as Osuka (2020), has also looked at the impact of foreign direct investment at the sector-based level, in this study, we concentrate on the agriculture sector. The researches that are most pertinent to this analysis are the more recent ones that examine how agricultural foreign direct investment inflows affect agricultural output.

Birhanu (2019) used time series data from the Central Statistical Agency of Ethiopia (CSA) spanning the years 1993 to 2010 to conduct research on the effects of foreign direct investment (FDI) on agricultural output in Ethiopia. The study estimated the model employing the two-stage least squares approach (TSLS) and the ordinary least squares method (OLS) (log-linear model). Agricultural exports, loan availability, and dummy variables for political and economic instability are the explanatory factors, and he gathered data on agricultural output as a stand-in for its growth. The findings demonstrated that there is a 0.2 percent rise in agricultural output for every unit change in FDI inflows into the agricultural sector. It also demonstrated that other factors, such as political and economic instability, had the greatest impact on agricultural production. Despite the relative significance of the study, a weakness identified with it is that the study is not conducted for Nigeria; implying that, the outcome of their findings may not be applicable to Nigeria.

A study by Olomola (2006) on the sectoral analysis of the impact of exchange rate on agricultural output in Nigeria, using seemingly unrelated regression estimation technique found that exchange rate had a significant effect on agricultural output. In a related study by Suleiman, Samuel, and Achi (2023), using descriptive statistical analysis, it is found that change in monetary policy instruments causes changes in agricultural output, with existence of a long-run equilibrium relationship between the monetary policy variables and growth in agricultural output. According to the study, the

Advance Journal of Agriculture and Ecology
Adv. J. Agric. & Eco.
Volume: 9; Issue: 11
November-2024
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index



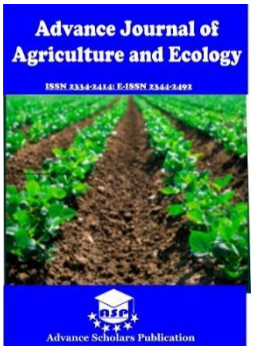
first step in encouraging farmers and agro-businesses to take an active role in the policy-making process is to educate them on how changes in monetary policy impact agricultural output. However, the shortcoming identified with the study is that it did not examine the FDI which is the focus of the present study.

Lawal (2021) studied the relationship between government spending in the agriculture sector and GDP using trend analysis and simple linear regression. The study's conclusion demonstrates that government expenditure does not follow a predictable pattern and that government support for the agriculture sector directly correlates with the sector's GDP contribution. Lawal's conclusion is noteworthy because it clarifies that when the government invests in the agricultural sector with low quantity and low quality, it cannot expect the sector to produce high output. Similarly, Oyinlola (2019) examined the effects of public spending on agricultural output in Nigeria using the limits test and the Autoregressive distributed lag (ARDL) modeling approach. Their results indicate that a risse in public expenditure has a positive influence on agricultural output. However, a possible weakness identified in the two studies is that did not analyze the impact of foreign direct investment on agricultural output, which is the main focus of this study.

Edewor (2018) examined the impact of foreign direct investment on agricultural output in Nigeria. They used time series data covering 1960 to 2008 that were sourced from CBN Statistical Bulletin for variables like agricultural output, FDI and inflation. For data analysis, the study used the Granger causality test, impulse response, error correction models, Johansen cointegration process, and the Augmented Dickey-Fuller (ADF) test. The findings indicated that there is no sustained correlation, with or without inflation shocks, between FDI in agriculture and agricultural output. The study comes to the conclusion that foreign direct investment has a positive impact on agricultural output. According to the report, the government should boost FDI into the agriculture sector. However, the study fail to recommend what policy the government need to put in place to encourage foreign direct flow to agricultural sector.

In a study published in 2013, Kareem and Bakare examined the macroeconomic variables affecting Nigeria's agricultural productivity. They employed time series data on agricultural output from 1977 to 2012 that they acquired from the CBN Statistical Bulletin. The explanatory variables included trade exports, interest rates, FDI, and commercial bank loans. The semi-log form model of the connection between the output and its macroeconomic factors was estimated using the OLS method. The study showed that one of the key macroeconomic factors influencing agricultural output in Nigeria is foreign direct investment (FDI), since inflows of FDI were found to favorably influence the rate

Advance Journal of Agriculture and Ecology
Adv. J. Agric. & Eco.
Volume: 9; Issue: 11
November-2024
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index



of agricultural output. The study did not, however, specify the percentage by which FDI affects Nigeria's agricultural output.

2.4 Literature Gap

Based on the reviews of the literature, we found that earlier research did not investigate the effect of agricultural FDI on the flow of foreign direct investment into Nigeria's agricultural sector. Consequently, the goal of this work is to close this gap. Data on the flow of foreign direct investment into the agricultural sector would be used to achieve this.

3.0 METHODOLOGY

3.1 Theoretical Framework

The production theory is used as the theoretical foundation for the investigation. A mathematical equation that illustrates the relationship between the inputs used in production and the final result which is called the production function. The Cobb Douglas production function is one of several functions that highlight the connection between the inputs used and the output produced during production. In our study, we make use of Cobb Douglas production function. We have chosen to adopt this because statistical tools make it simple to estimate the function.

Cobb Douglas production can be represented as:

$$Q = AK^{\alpha}L^{\beta} \quad \ldots\ldots 6$$

where, Q = Output, L = Labour input, K = Capital input, A = Other factor input.

α and β are positive parameters where α > 0, β > 0.

Equation (6) can be transformed into its log-linear form as: $\ln Q = \ln A + \alpha \ln K + \beta \ln L$ 7

Cob Douglas production function has the following characteristics:

(i) In Cobb-Douglas production function, it allow for for the measurement output elasticity:

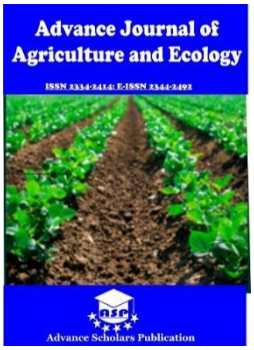
Output elasticity is the percentage change in output in respond to a change in levels of either labor or capital. This can be expressed as:

$$(\partial Q/Q) / (\partial L/L) = (\partial Q/\partial L) / (Q/L) \quad \ldots\ldots 8$$

The production function is elastic if the output elasticity is larger than 1, and vice versa. The Cobb-Douglas production function has constant output elasticity with regard to labor, denoted by β. If labor increases by 10% and β is 0.2, output will increase by 2%. The constant output elasticities of labor and capital are denoted by β and β.

(ii) It additionally displays returns to scale: The amount of extra output that will be produced when all components change proportionately is measured by returns to scale. When the output increases faster than it is proportionate, we have rising return to scale. We refer to a situation in which the output growth is less than proportionate as declining returns to scale. When examining the Cobb-Douglas production function, we multiply each input by a fixed factor

Advance Journal of Agriculture and Ecology
Adv. J. Agric. & Eco.
Volume: 9; Issue: 11
November-2024
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index



to determine the amount that the output will rise when all factors increase proportionately. In Cobb-Douglas production function:

If $\beta+\alpha=1$, the production function has constant returns to sca

If $\beta+\alpha > 1$, the production function has increasing returns to scale.

If $\beta+\alpha < 1$, the production function has decreasing returns to scale.

(ii) In the Cobb-Douglas production function, the elasticity of the sub-situation between labor and capital is equal to unity. Isoquants are convex to the origin as a result of this unit elasticity of substitution between two elements in the production function.

3.2 Model Specification

In analyzing the impact of FDI on agricultural output in Nigeria, this study uses Cobb Douglas production model which is specified as:

$Q_t = AL_t^{\beta 1} K_t^{\beta 2} \varepsilon_t$ 9

To capture the effect of foreign direct investment, we incorporate FDI in the Cobb-Douglas model as a component of A in (equation 9 above) which is represented as:

$Q_t = AL_t^{\beta 1} K_t^{\beta 2} FDI_t^{\beta 3} \varepsilon_t$ 10

Equation (6) is expressed in natural logarithm form as:

$\ln Q_t = \beta_0 + \beta_1 \ln L_t + \beta_2 \ln K_t + \beta_3 \ln FDI_t + \varepsilon_t$.....11

where:

ln = natural logarithm

Q_t = agricultural output

L_t = laour force in agricultural sector

K_t = capital formation in agricultural sector

FDI = foreign direct investment flow in agricultural sector

β_1, β_2, β_3, are the parameters to be estimated.

Therefore, for the purpose of this study, equation (11) will be used to examine the impact of foreign direct investment on agricultural output in Nigeria

3.3 Data types and Sources

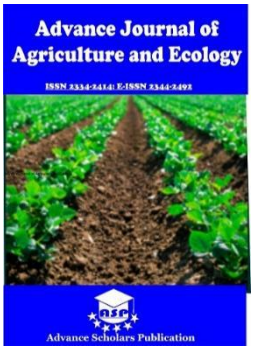
The study used annual time series data covering 1981 to 2021 to examine the impact of foreign direct investment flow to agricultural sector on agricultural output.

Agricultural output (Q): Agricultural output represents the dependent variable of the study. Data on agricultural output was obtained from Statistical Bulletin / Annual Report of the Central Bank of Nigeria.

Labour force (L): Data on agricultural employment as a percentage of total employment, which is obtained from the World Bank, is used to proxy total labour force in the agricultural sector. It is expected that an increase in total labour force in the agricultural sector will increase agricultural output.

Capital formation in agricultural sector (K): Data on capital formation is used to proxy data for capital stock in the model. Data was sourced from the Central Bank of Nigeria

Advance Journal of Agriculture and Ecology
Adv. J. Agric. & Eco.
Volume: 9; Issue: 11
November-2024
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index



Statistical Bulletin and it is measured as a share of GDP. Due to non-availability of data on capital stock in agricultural sector, data on capital formation is used to proxy for capital employed in agricultural sector. We see this as a major limitation but there is nothing we can do in view of lack of data on capital stock. It is expected that an increase in capital formation will lead to increase in agricultural growth.

Foreign direct investment flow to agricultural sector (FDI): This measures the amount of FDI flow to agricultural sector over a period of time. Data on this were in their nominal values in billion Naira and were sourced from the World Development Indicators. It is then expressed as a share of value added in agricultural sector.

4.0 PRESENTATION AND DISCUSSION OF EMPIRICAL RESULTS

4.1 Trend Analysis

We present below some charts on agricultural output (Q), labour (L), capital (K) and foreign direct investment flow to agricultural sector (FDI). The rationale behind this is to see how the variables have been moving over time.

4.1.1 Chart on LNQ

First, we present chart on agricultural output (Q). On the vertical axis we measure agricultural output values and the horizontal axis shows the year under review.

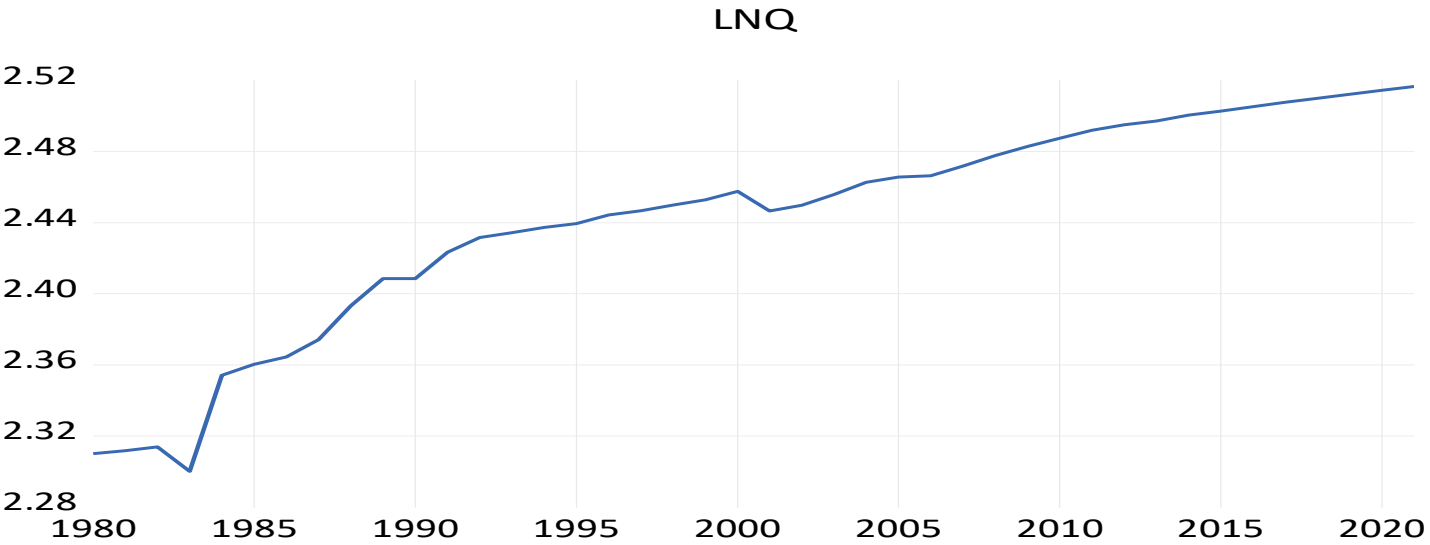
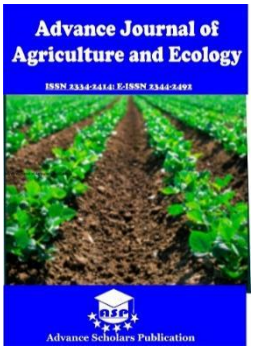


Figure 1.*Trend of agricultural output between 1981 and 2021*

The results shows that agricultural output has been rising gradually from 1981 and it falls at a point in 1983 and between 1984 and 1990 there was a gradual increase in the output but it rose sharply between 2005 and 2021

Advance Journal of Agriculture and Ecology
Adv. J. Agric. & Eco.
Volume: 9; Issue: 11
November-2024
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index



4.1.2 Chart on LNL

Secondly, we present chart on labour force (L). On the vertical axis we measure labour values and the horizontal axis shows the years under review.

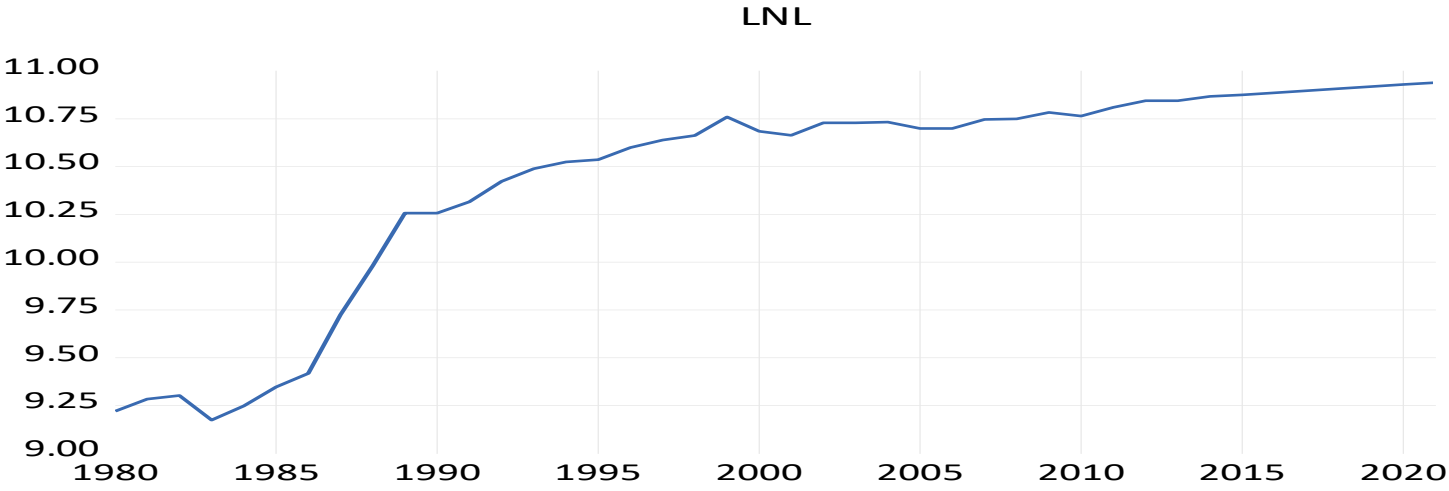


Figure 2.*Trend of labour force between 1981 and 2021*

Figure 2 shows the trend of labour force over the years. It shows that labour rose from 1981 and fell back in 1983; it rises again between 1990 and 2010 and rose continuously over the years.

4.1.3 Chart on LNK

Thirdly, we present chart on capital (K). On the vertical axis we measure capital values and the horizontal axis shows the years under review.

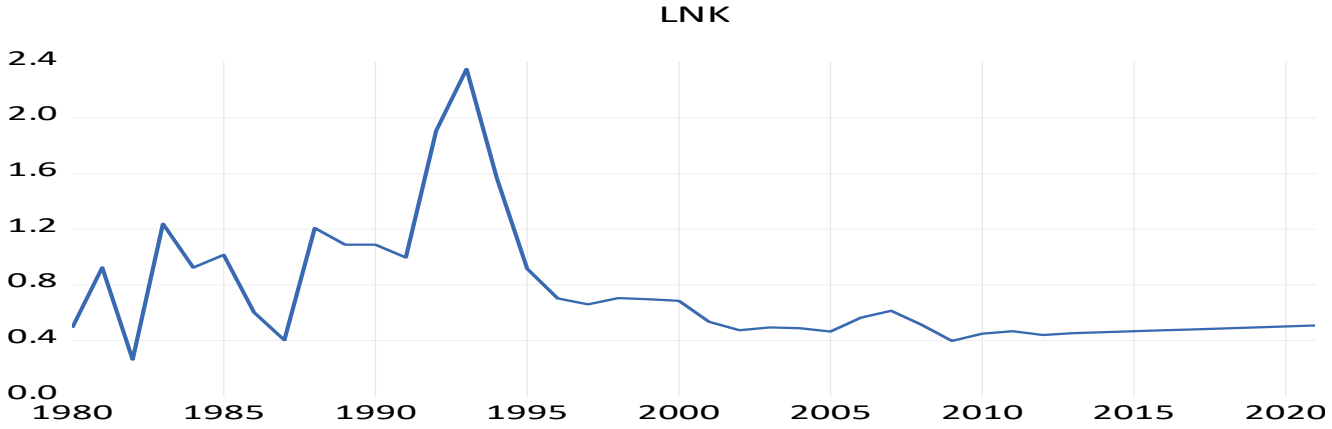


Figure 3.*Trend of capital between 1981 and 2021*

Advance Journal of Agriculture and Ecology
Adv. J. Agric. & Eco.
Volume: 9; Issue: 11
November-2024
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index

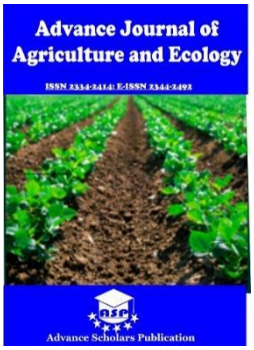


Figure 3 shows capital (K) trend over the years. In 1981, capital increases and decrease in 1985, and it later rose in 1986 and dropped in 1988, it continued until it finally dropped in 2011.

4.1.4 Chart on LNFDI

Lastly, we present chart on foreign direct investment flow in agricultural sector (FDI). On the vertical axis we measure FDI values and the horizontal axis shows the years under review.

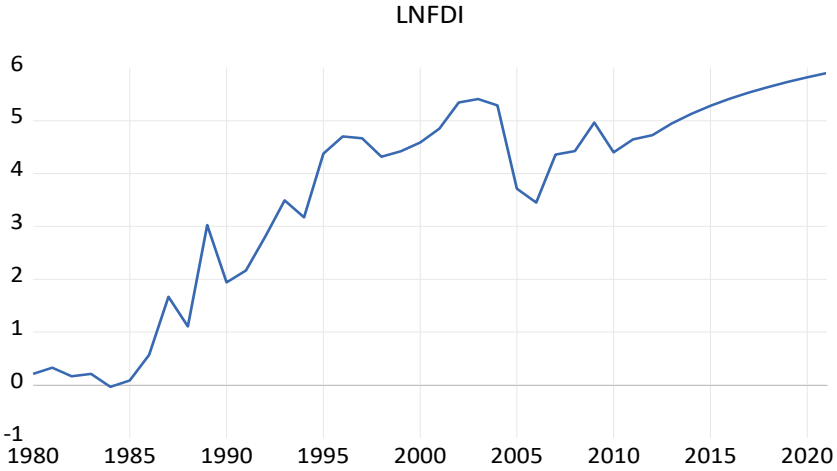


Figure 3.*Trend of foreign direct investment between 1981 and 2021*

Figure 3 shows the trend of foreign direct investment (FDI) over the years. It shows that FDI rose from 1981 and fell in 1989; it rises again in 2004 and fell drastically in 2005, again, in 2009, it rises continuously over the years.

4.2 Pre-Estimation Test

4.2.1 Unit Root Test

(a) *Presentation of Results of Unit Root Test*

Below, we present the unit root test using Augmented Dickey-Fuller procedure. The test was carried out to examine the stationary nature of each of the variables used in the model in order to avoid the consequence of having a spurious regression result arising from conducting Ordinary Least Squares method with non-stationary series.

We presented in the first column variables, in the next column is stationary, this is followed by t-statistic in the third column, column four (4) contained critical value, while column five (5) and six (6) has p-value and order of integration.

Advance Journal of Agriculture and Ecology
Adv. J. Agric. & Eco.
Volume: 9; Issue: 11
November-2024
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index

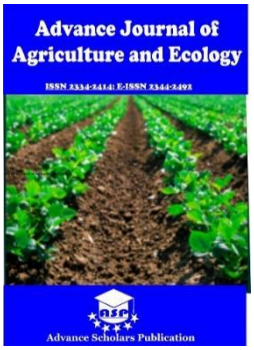


Table 4.1 Augmented Dickey Fuller Unit Root Test

Variables (1)	Stationary (2)	T-Statistics (3)	Crit. Val. At 5% level (4)	P-value (5)	Order of Integration (6)
Q_t	At level	-1.862	-2.948	0.345	I(0)
	At First Diff.	-6.659	-2.951	0.000	I(1)
L_t	At level	-3.914	-2.914	0.005	I(0)
	At First Diff.	-	-	-	-
K_t	At level	-2.861	-2.951	0.061	I(0)
	At First Diff.	-5.742	-2.957	0.000	I(1)
FDI_t	At level	-1.825	-2.951	0.363	I(0)
	At First Diff.	-8.025	-2.954	0.000	I(1)

Source: Author's Computation from Eview 12

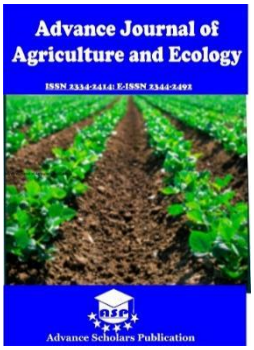
where:
Q = agricultural Output
L = labour force in agricultural sector
K = capital in agricultural sector
FDI = foreign direct investment in agricultural sector.

(b) ***Evaluation and Discussion of the Unit Root Test***

In table 4.1 above is result of the test for the presence of unit root in each of the variables used in the model to ascertain whether the variables are stationary or non-stationary series, using the Augmented Dickey-Fuller (ADF) procedure.

The ADF results reveal that only a variable (Labour force in agricultural sector - L) is stationary at level. Hence, labour is not trending with time and is regarded as I(0) series, while other three variables (Agricultural output - Q, Capital in agricultural sector - K and Foreign direct investment - FDI) are not stationary at level, implying that they are trending upward with time and are regarded as I(1) series. The implication of this result is that using Ordinary Least Squares (OLS) method to estimate the parameters will lead to a spurious regression results if there is no long run cointegration. This necessitates the test of cointegration to check if at all there is a long-run relationship among the non-stationary variables used in the model.

Advance Journal of Agriculture and Ecology
Adv. J. Agric. & Eco.
Volume: 9; Issue: 11
November-2024
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index



4.2.2 Autoregressive Distributive Lag Co-Integration Test Results

(a) *Presentation of the ARDL Results*

Given the order of integration of these variables (i.e combination of I(0) and I(1) series), an appropriate technique to be used to conduct the cointegration test is the autoregressive (ARDL) bounds testing approach. The result is therefore presented in the table 4.2 below.

Table 4.2 Autoregressive Distributive Lag Co-Integration Test

Test Statistic	**Value**	**K**	**α Level**
F-statistic	14.91247	3	5%
Critical Value Bound			
Significance	**I(0) Bound**	**I(1) Bound**	
10%	2.72	3.77	
5%	3.23	4.35	
2.5%	3.69	4.89	
1%	4.29	5.61	

Source: Author's computation (Using Eview 12)

(b) *Discussion of the ARDL Test*

From the test above, the F statistics generated is greater (at 14.912) than the I(1) critical bound (4.35) at 5%.

4.3 Long-run Cointgration Regression Analysis

Based on the ARDL test in table 4.2 above, we conclude that there is co-integration and, hence, there is long-run relationship among the variables. Therefore, Autoregressive Distributed Lag (ARDL) model will be used to examine the effect of independent variables on the dependent variable.

4.3.1 Presentation of Regression Equation Estimates

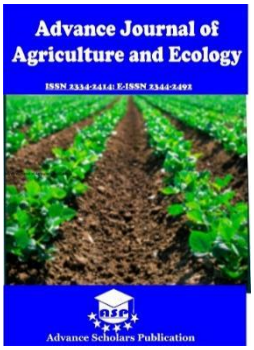
The estimates of the impact of foreign direct investment on agricultural output, using Autoregressive Distributed Lag (ARDL) model procedure are presented in table 4.3 below.

Table 4.3 Autoregressive Distributed Lag (ARDL) model

Variable (1)	**Coefficient (2)**	**Std. Error (3)**	**t-statistic (4)**	**P-value (5)**
LNL_t	1.049	0.237	4.419	0.000
LNK_t	0.264	0.134	1.976	0.058
$LNFDI_t$	0.022	0.052	0.426	0.673
C	-0.336	2.142	-0.157	0.876

R-squared	0.910
Adjusted R-squared	0.902
Durbin-Watson stat	1.698
F-statistic	731.451
Prob. Of F-statistic	0.000
Significance Level	5%

Advance Journal of Agriculture and Ecology
Adv. J. Agric. & Eco.
Volume: 9; Issue: 11
November-2024
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index



Source: Author's computation (using Eview 12)

Where:
LN = natural logarithm
L_t = labour employed in the agricultural sector
K_t = capital used in the agricultural sector
FDI_t = foreign direct investment flow in agricultural sector

4.3.2 Evaluation of the Regression Equation Estimates

As it can be seen from table 4.3 above, the estimates shows that the coefficient of determination (R^2) is 0.910, which implies that about 91% variation in agricultural output is explained by the independent variables and the F-statistics value at 731.451 is significant at 5%, judging by the p-value. Also, the Durbin Watson value of 1.698 suggests an absence of auto-correlation**.** Therefore, the general diagnostic statistics of the model is robust.

Having evaluated the overall performance of the model above, the followings are the performance of each of the specific explanatory variables:

Labour employed in the agricultural sector (L): Table 4.3 above shows that this variable has a coefficient of 1.049 and is statistically significant at 5% based on the t-statistic and p-value. Thus, we may conclude that a 1.049% rise in agricultural output will occur after a percentage increase in the number of workers employed in the agricultural sector. This complies with the model's apriori expectation. According to the estimation, labor employed in the agricultural sector significantly and favorably affects agricultural output.

Capital used in the agricultural sector (K): In the agriculture industry, the coefficient of capital is 5%, positive, and statistically significant. Based on the assumption, there will be a 0.264% rise in agricultural output for every percentage increase in capital. This also complies with the model's apriori expectation. According to the estimate, capital in the agricultural sector significantly and favorably affects agricultural output.

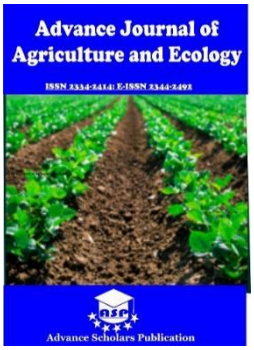
Foreign Direct Investment (FDI): Additionally, although statistically not significant, the agriculture sector's coefficient of foreign direct investment flow is positive. According to the assessment, there will be a 0.022% rise in agricultural output for every percentage increase in foreign direct investment flow in the agricultural sector. The analysis suggests that foreign direct investment in the agricultural sector has no appreciable impact on agricultural output, even though the sign is consistent with apriori expectations. The results contradict those of Njoki (2016), who concluded that foreign direct investment had a major impact on Kenya's agricultural industry. Lack of uniform measurement of the variables can be the cause of such insignificant effect as pointed out by Shihong & Ya (2021).

5.0 CONCLUSION AND RECOMMENDATIONS

5.2 Conclusion

We can conclude that labor engaged in the agricultural sector and capitals used in the

Advance Journal of Agriculture and Ecology
Adv. J. Agric. & Eco.
Volume: 9; Issue: 11
November-2024
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index



agricultural sector have a positive and considerable impact on agricultural output in light of the data previously mentioned. Additionally, we can draw the conclusion that there is no strong evidence linking foreign direct investment (FDI) to agricultural output in Nigeria, indicating that FDI has no appreciable impact on agricultural output.

5.3 Recommendations

It is thus advised that the government should not bother trying to draw FDI into the agricultural sector in an attempt to raise output, given the study's conclusion that FDI has no appreciable impact on agricultural output. Instead, before determining the best course of action, the government should ascertain why FDI is not positively impacting agricultural output as anticipated.

Given the labor force's positive and large impact on agricultural productivity, policymakers should evolve a policy which aims at inducing young people to remain in the rural areas and work on the farms.

Equally, in view of the finding that capital has positive significant effect on agricultural output, government should ensure continuous availability of capital for every individual that has interest in farming so as to increase agricultural output.

Finally, on recommendation for further study, this study is not an attempt to provide all the answers to why FDI is not significant in the agricultural sector of Nigeria. To provide further answer along this direction, a more detailed research into the various sub-sectors i.e. crop, livestock, fishery and forestry should be conducted to ascertain the sub-sector to which FDI can best be channeled in order to maximize agricultural output.

REFERENCES

Abubakar, S. A. (2023). Impact of government expenditure on agricultural productivity in Nigeria. *Gusau Journal of Economics and Development Studies, 3*(1), 15-15.

Ayanwale, A. B. (2017). FDI and economic growth: Evidence from Nigeria. AERC Research Paper 165. African Economic Research Consortium, Nairobi.

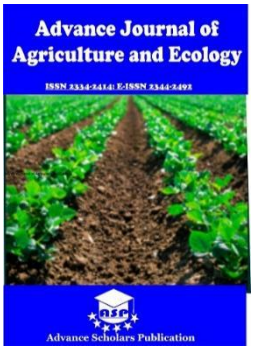
Arrow, K. J., Chenery, H. B., Minhas, B. S., & Solow, R. M. (1961). Capital-labor substitution and economic efficiency. The Review of Economics and Statistics, 43(3), 225-250. https://doi.org/10.2307/1927286

Birhanu, M. (2019). The impact of investment climate constraints on manufacturing industry performance: The case of Dire Dawa City, Eastern Ethiopia.

Carlson, S. (1956). *A study on the pure theory of production.* New York: Kelley and Millman Inc.

Central Bank of Nigeria. (various issues). *Annual report and statement of accounts.* Abuja Nigeria: CBN Publication. http://www.cenbank.org.

Advance Journal of Agriculture and Ecology
Adv. J. Agric. & Eco.
Volume: 9; Issue: 11
November-2024
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index



Cobb, C. W., & Douglas, P. H. (1928). A theory of production. *American Economic Review, 18*.

Edewor, S. E., Dipeolu, A. O., Ashaolu, O. F., Akinbode, S. O., Ogbe, A. O., Edewor, A. O., ... & Oladeji, S. O. (2018). Contribution of foreign direct investment and other selected variables to agricultural productivity in Nigeria: 1990-2016. *Nigerian Journal of Agricultural Economics, 8*(1), 50-61.

Furtan, W. H. (2004). The effect of FDI on agriculture and food trade: Effect of foreign direct investment on agriculture and food trade.

Kareem, R. O., Bakare, H. A., Raheem, K. A., Ologunla, S. E., Alawode, O. O., & Ademoyewa, G. R. (2013). Analysis of factors influencing agricultural output in Nigeria: Macroeconomic perspectives. *American Journal of Business, Economics and Management, 1*(1), 9-15.

Lawal, W. A. (2021). An analysis of government spending on agricultural sector and its contribution to GDP in Nigeria. *International Journal of Business and Social Science, 2*(20).

Njoki, R. R. (2016). *The Effect Of Foreign Direct Investment On Long Term Growth In Kenya Services And Agricultural Economic Sectors* (Doctoral dissertation, University Of Nairobi).

Olokoyo, F. O. (2012). Foreign direct investment and economic growth: A case of Nigeria. *BVIMSR's Journal of Management Research, 4*(1), 1-30.

Olomola, A. A., & Akintoye, F. A. (2006). Sectoral analysis of the impact of exchange rate fluctuations on agricultural output in Nigeria. *African Journal of Economic Policy, 13*(1), 35-62.

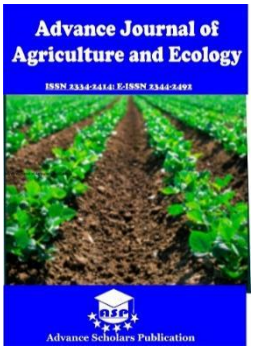
Oyinlola, O. M., Adeniyi, O. A., & Raheem, I. D. (2019). Effect of public spending on agricultural production in Nigeria (1980-2014). *Journal of Social Economics Research, 6*(2), 182-194.

Pearl, D. and Enos, J. (1975) Engineering production functions and technological progress, *The Journal of Industrial Economics*, vol 24, September 1975, pp 55–72.

Shephard, R. W. (1976). Cost and production functions: A survey. In *Modern Trends in Logistics Research: Proceedings of a Conference Held at the George Washington University* (p. 99). MIT Press (MA).

Shihong, Z., & Ya, Z. (2021). Foreign direct investment's impact on China's economic growth, technological innovation and pollution. *International Journal of Environmental Research and Public Health*. https://doi.org/10.3390/IJERPH18062839

Advance Journal of Agriculture and Ecology
Adv. J. Agric. & Eco.
Volume: 9; Issue: 11
November-2024
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index



Suleiman, M., Samuel, Y., & Achi, P. O. (2023). Impact of agricultural loans by deposit money banks on agricultural output in Nigeria. *International Journal of Investment and Business Research*. https://doi.org/10.54099/ijibr.v2i2.449

Ukeje, R. O. (2003). *Macroeconomics: An introduction*. Port Harcourt: Davidson Publication.

World Bank. (2022). Foreign direct investment, net inflow (BOP, current US$) /Data/Table. *World Bank*. http://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD

Njoki, R. R. (2016). *The Effect Of Foreign Direct Investment On Long Term Growth In Kenya Services And Agricultural Economic Sectors* (Doctoral dissertation, University Of Nairobi).