

## **FOREIGN DIRECT INVESTMENT AND AGRICULTURAL OUTPUT FOR FOOD SECURITY IN NIGERIA**

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### **ABSTRACT**

Agriculture is known as the engine and panacea for economic growth in most developing nations of the world. As once asserted by Nobel laureate in economics Gunnar Myrdal "The battle for long-run economic growth is either won or lost in the agricultural sector". This study empirically examines the effect of Foreign Direct Investment (FDI) on agricultural output for food security in the Nigerian economy. The study is conducted using annual time series data running from 1980 to 2014. The study employs Johansen cointegration test, over parameterized and error correction model (ECM) as the estimation techniques. The results of the study reveals that Agricultural output, Foreign Direct Investment, Interest rate, labour employment, Primary School Enrolment and Foreign Exchange rate have a long-run equilibrium relationship according to the Johansen cointegration test. Whereas, the ECM result shows that the speed of adjustment of the variables towards their long-run equilibrium path was low, estimated as 29.09%. Based on the empirical outcomes of the result obtained, the following recommendations were offered: Firstly, more FDI to be sought for the agricultural sector of Nigeria with focus on improve existing or introduce new technology in the agricultural sector and enhance domestic capacity or domestic investment. Secondly, the government should also work at stabilizing the local currency (naira), the depreciation of which has made farming inputs very expensive (as they are imported).

**Keywords:** Agricultural output, Cointegration, Error correction model, Foreign Direct Investment.

### **1.0 Introduction**

One of the basic needs of mankind is food. The need for, and access to aid availability of food cannot be overemphasized. Food security exists when all people at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food

preferences for an active and healthy life(FAO,2012). Agriculture has suffered from years of mismanagement, inconsistent and poorly conceived government policies, neglect and the lack of basic infrastructure. Still, the sector accounts for over 26.8% of GDP and two-thirds of employment (NBS,2013). Nigeria is no longer a major exporter of cocoa, groundnuts (peanuts), rubber, and palm oil. Cocoa production, mostly from obsolete varieties and over-age trees, is stagnant at around 180,000 tons annually; 25 years ago it was 300,000 tons. An even more dramatic decline in groundnut and palm oil production also has taken place. Once the biggest poultry producer in Africa, corporate poultry output has reduced from 40 million birds annually to about 18 million(NBS2013). Import constraints limit the availability of many agricultural and food processing inputs for poultry and other sectors. Fisheries are poorly managed and most critical for the country's future, land tenure system which does not encourage long-term investment in technology or modern production methods do not inspire the availability of rural credit.

Agricultural products include crops(root and tree), livestock (animals and birds)and fisheries (artisanal, industrial and aquaculture) The agricultural sector suffers from extremely low productivity, reflecting reliance on antiquated methods. Emeka (2007) asserts that the agricultural sector creates jobs for a large number of the teeming unemployed population in Nigeria, which accounts for over 65 percent of the entire population. Foreign Direct Investment (FDI) comprises international capital flows in which a firm in country creates or expands a subsidiary in another. It involves a parent enterprise injecting equity capital by purchasing shares in Foreign affiliates. Foreign Direct Investment can also be conceived as an investment involving a long-term relationship and reflecting a lasting interest and control of a resident entity in one economy in an enterprise resident in another economy (Rotjandpan, 2005). Saggy (2002) observed that there are several important expectation of positive contribution of direct foreign investment and economic growth in cross country.

Foreign Direct Investment is arguably an important source of employment opportunities for developing countries like Nigeria. It is therefore imperative that a healthy private sector that can earn a reasonable rate of return is promoted by the Federal Government. Developing Countries that wish to attract FDI flows should consider measures such as establishing a transparent legal frame-work that does not discriminate between local and foreign investors, adopting liberal foreign exchange regime; creating simple Investor-friendly regulations and institutions and effectively administering them. The major contribution of this study to knowledge lies in the disaggregate of the FDI and agricultural output growth in terms of sector and sub sectors of the Nigerian economy because most others studies examine the aggregate impact of FDI on the Nigeria economic growth. The objective of the paper was to investigate the effect of FDI on agricultural output for food security in the Nigerian economy.

### **1.1 Statement of the Problem**

The contribution of agriculture to the Nigerian economic growth is very low compared to what it used to be in the past. Nigerian agriculture to a large extent still possesses the characteristics of a peasant economy that was prominent in the pre-independence period. Agricultural productivity has seriously declined over the past five decades and has resulted into high incidence of rural poverty. Nigeria as a country, given her natural resource base and large market size, qualifies to be a major recipient of FDI in Africa and indeed is one of the top three leading African countries that has consistently received FDI in the past decade (Asiedu, 2003). The UNCTAD World Investment Report (2003) showed Nigeria as the country second top FDI recipient after Angola in 2001 and 2002 in Africa. In 2006 UNCTAD shows that FDI inflow to West Africa is mainly dominated by inflow to Nigeria, who received 70% of the sub-regional total. However despite the enormous flow of FDI to Nigeria and the theoretical assumption that it contribute to developmental effort of the recipient country, her economy has been characterized by low level of agricultural output, high level of inflation, heavy debt burden, high unemployment rate, high level of income inequality, poverty to mention a few.

### **Justification of the Study**

It is a known fact that, the economic and physical wellbeing of a country will depend on increasing and stabilizing agricultural productivity through more effective practices and technologies (NEPAD 2002).

The increase in the productivity and the growth of the agriculture sector is critical for reducing poverty and enhancing sustainability prospects of the country. In Nigeria where the agricultural sector employs a large number of the labour force and a major contributor to the gross domestic products of the country, a growth in the sector would go a long way to propel the developmental agenda.

Msuya (2007) argues that growth in productivity in the agriculture sector which is enhanced by adoption of modern and sophisticated technologies has become imperative in view of the falling per capita arable land, rising costs of production, increasing population and increasing migration to urban centres. Although the adoption of the modern and sophisticated technologies are necessary to improve productivity in the agriculture sector, the said adoption by farmers is largely limited by meagre incomes of the farmers and the unavailability of credit, a gap FDI is believed to fill by bringing new technologies and the required financial investments (Msuya, 2007).

The ability of agriculture in developing economies to meet food requirements by the year 2050, according to FAO estimates, demands an annual investment of USD 83 billion (Hallam, 2009).

He argues further that these developing countries do not have the capacity to make such investments in agriculture as spending by governments of these developing nations on agriculture has declined to 7% of their total spending. Lending by commercial banks to agriculture has fallen across developing nations with sub-Saharan African countries recording commercial lending to agriculture of less than 10%. Additionally, the nature of capital required to boost the agricultural sector makes microfinance loans unsuitable either. Worse still, the development assistance that is directed to agriculture in developing countries has dipped to 5% (Hallam, 2009) thereby making FDI a substantial lifeline to the development of agricultural sector in the developing countries like Nigeria. Therefore, the role of agriculture in transforming the economic framework of any economy cannot be overemphasized given that it is the source of food for man and animal and provides raw materials for the industrial sector. Thus, it plays a significant role in the reduction of poverty of most nations (Nwankwo, 1993).

## **2.1 Conceptual Literature**

Foreign direct investment, a major component of international capital flows, refers to investment by multinational companies with headquarters in developed countries. This investment ranges from transfer of funds to whole package of physical capital, techniques of production, managerial and marketing expertise, products, advertising and business practices for the maximization of global profits. The Organization for Economic Cooperation and Development (OECD) conceptualized FDI as net financing by an entity in a developed country with the objective of retaining a lasting interest in an entity resident in a developing country (Oyeranti, 2003). The implications of this definition are: First, FDI flows from developed country to developing countries; and second, the investor has a significant influence on the management of the enterprise. There are three main determinants of FDI, namely firm-specific advantages, internalization advantages, and locational advantages.

In the view of Shiro (2007), FDI consists of external resources, including technology, managerial and marketing expertise and capital which generate a considerable impact on host nation's production capabilities. Shiro (2007), argues that at the current level of gross domestic product, the success of government's policies of stimulating the productive base of the economy depends largely on her ability to control adequate amount of foreign direct investments comprising of managerial, capital and technological resources to boost the existing production capabilities. The Nigerian government had in the past endeavored to provide foreign investors with a healthy climate as well as generous tax incentives, but the result had not been sufficiently encouraging. Nigeria still requires foreign assistance in the form of managerial, entrepreneurial and technical skills that often accompany foreign direct investments.

Generally, there are two broad categories of foreign investments namely official (public) and private foreign investments. Official foreign investments are undertaken at the bilateral and multilateral levels. The former refers to investment arrangements between two countries by means of direct government to government transfers, while the later relates to investments originating from such international organizations such as the IMF and the World Bank (Okafor, 2012).

Official capital flows are largely driven by strategic and political motivations (Iyoha, 2001). However, the private capital flows are basically of three strands; the foreign direct investment, the portfolio investment and the short-term capital flows: bank credit and bond lending commercial loans (Okafor, 2012). FDI is the distinctive feature of multinational enterprise. It is not simply an international transfer of capital but rather the extension of enterprise from its home country. This extension of enterprise involves flows of capital technology and entrepreneurial skills to the host economy where they are combined with local factors in the production of goods for the local and export market.

## **2.2 The Contribution of Agricultural Investment to Food Security**

Agricultural investment is the most important and most effective strategy for poverty reduction in rural areas, where the majority of the world's poorest people live (World Bank 2008, FAO 2012). Investing in agriculture reduces poverty and hunger through multiple pathways. Farmers invest to enhance their productivity and incomes. From society's point of view, this in turn generates demand for other rural goods and services and creates employment and incomes for the people who provide them, who tend to be the landless rural poor. These benefits ripple from the village to the broader economy.

Agricultural investment by farmers or the public sector that increases productivity at the farm level can also increase the availability of food on the market and help keep consumer prices low, making food more accessible to rural and urban consumers (Alston et al. 2000). Lower priced staple foods enable consumers to supplement their diets with a more diverse array of foods, such as vegetables, fruit, eggs, and milk, which improves the utilization of nutrients in the diet (Bouis, Graham and Welch 2000).

Finally, agricultural investments can also reduce the vulnerability of food supplies to shocks, promoting stability in consumption. Insufficient investment in the agricultural sector of most developing countries over the past 30 years has resulted in low productivity and stagnant production. World agriculture must meet the major challenge of feeding some 2.5 billion more people by 2050. Adding to this challenge, most of the growth in population will occur in countries where hunger and natural resource degradation are already widespread.

Crop, Fishery and livestock production systems must become more intensive to meet growing demand but they must also become more sustainable (FAO 2011). Sustainable intensive production systems are capital-intensive; they require more physical, human, intellectual and social capital in order to sustain and rebuild the natural capital embodied in land and water resources. Net investments of at least US\$83 billion annually are needed in agriculture to meet targets for reducing poverty and the numbers of malnourished (Schmidhuber, et al 2009). Doing so in a sustainable manner that preserves natural resources and is conducive to long-term development will require even more funds.

Increased investment by the public sector in developing countries will be necessary, which implies a reversal of the declining trend observed over the past decades. The share of public spending on agriculture in developing countries has fallen to around 7 percent, and even less in Africa (Hallam 2011).

Higher and more volatile food prices have reawakened policymakers to the importance of agriculture, and they have responded by increasing commitments to supporting the sector. This renewed attention to agriculture offers an opportunity to prepare for these challenges. Public investment by governments plays an essential role in creating the necessary conditions and enabling environment in which farmers can thrive, and in catalyzing and channeling private investment towards socially beneficial outcomes. The public sector also provides public goods which benefit society but for which private incentives are lacking. Given the limitations of alternative sources, foreign direct investment could make a contribution to bridging the investment gap in developing countries' agriculture. The available data show that agricultural FDI is very small compared with domestic agricultural investment. Further, the agricultural sector still accounts for a very small percentage of total FDI inflows in most developing countries. A review of case studies on sub-Saharan Africa suggests that less than 5 percent of FDI goes to agriculture (Gerlach and Liu 2010). There is a potential for growth if more investments can be directed to the sector. FDI can be potentially generate various types of benefits for the agricultural sector of the host country such as employment creation, technology transfer and better access to capital and markets.

Consequently, the challenge for policy makers, development agencies and local communities is to maximize the benefits of foreign agricultural investment while minimizing its risks. This requires the capacity to orient foreign investments towards the right type of projects. Whether this objective can be met will depend on a large number of factors, among which the legal and institutional framework in place in the host country and the local context are critical.

### **2.3 Theoretical Framework**

Solow's (1957) pioneering contribution of growth theory has generated the theoretical basis for the standard growth accounting framework. In this neoclassical view, we can thus decompose the contribution to output growth rates of inputs such as technology, capital, labour, and FDI etc. The growth accounting approach can be derived from the following equation:

$$Y = A(K, L, \pi) \dots\dots\dots(1)$$

Where Y, K, L and A are output, capital, labour and the efficiency of production respectively; and  $\pi$  is a vector of ancillary variables. Thus, the basic Solows (exogenous) growth model gives the growth rate of output or income as depending on the rate of growth of technical change, labour or population, and capital stock. In empirical applications, the basic Solow model has been modified to obtain the augmented Solow growth model where the ratio of growth of income depends not only on technical change, labour, capital but also on policy variables like interest rate, inflation, trade opener see Ologun (2003). In this paper, we adjure the policy variables to include foreign direct investment, agricultural output and human capital.

The augmented Solow Neoclassical theory of economic growth modified for agricultural growth in Nigeria as follows:

$$\text{Agric} = F(\text{FDI}, \text{Lab}, \text{INT}, \text{PSER}, \text{EXCH.}) \quad (2)$$

Where:

Agric: agricultural output

FDI : Agricultural foreign direct investment

PSER: Primary schooling enrolment as a measure of human capital

INT: Interest rate

LAB: Agricultural employment

EXCH: Exchange rate

A modified form of equation (2) is the starting point of our empirical estimates of the augmented Cobb-Douglas production function, with FDI incorporated as one of the factor inputs:

$$\text{Agric} = \alpha + \beta_1 \text{FDI} + \beta_2 \text{LAB} + \beta_3 \text{INT} + \beta_4 \text{EXCH} + \beta_5 \text{PSER} + \mu_i \quad (3)$$

In order to be able to estimate the model, equation (3) was specified as follows in their logarithmic form. This was to ensure that the variables were in common units. The operational model is :-

$$\ln \text{Agric} = \alpha + \beta_1 \ln \text{FDI} + \beta_2 \ln \text{LAB} + \beta_3 \ln \text{INT} + \beta_4 \ln \text{EXCH} + \beta_5 \ln \text{PSER} + \mu_i \quad (4)$$

Where  $\mu_i$  is a time-varying idiosyncratic shock with the standard independently and identically distributed (iid) assumption.

From a prior expectation, foreign direct investment, human capital labour are expected to be positively related to growth of agricultural output, while the interest rate coefficient is expected to be negative, that is inverse relationship with the growth of agricultural output. These sign expectations come from economic theory. Foreign direct investment transfer technology and access to foreign exchange, promote innovation and greater competition increased know-how for host country and thus increasing the productivity. Increased human capital promotes growth through increasing higher productivity of the work-force and the higher will be the rate of agricultural output growth. The inverse relationship interest rate with agricultural output growth means the reduction in cost of capital will attract more investment and an increase on agricultural output. The higher the labour employed, the less will be unemployed, the more rapid will be economic growth in general.

### **3.0 Methodology**

#### **3.1 Sources of data**

The data used was obtained from the Central bank of Nigeria statistical bulletin (CBN bulletin) of various issues FAOSTAT UNDP human Development Indicators. The study was defined to cover a period of 34 years (1980-2014). Secondary data were employed.

#### **3.2 Method of Data Analysis**

In order to investigate the relationship that exist between the dependent variable and explanatory variables, this research adopted the following procedures.

#### **3.3 Unit Root Test**

The paper conducted the unit root test on the variables by employing the Augmented Dickey Fuller (ADF) to test the characteristics of the variables with a view to determining the order of integration. E-views 7.0 software were used for analysis.

#### **Augmented Dickey Fuller**

The results of unit root test using Augmented- Dickey Fuller Root is presented below. The variable under consideration were :Agricultural output (AGRIC) Agricultural Foreign Direct Investment (FDI) ,Agricultural Employment (LAB) ,Primary School Enrolment (PSER), Interest Rate (INTR),and Foreign Exchange Rate (EXCH). The Augmented- Dickey Fuller (ADF) was used to determine the time series characteristics of variables used in the regression. The results shows that all the variables were significant (stationary) at 1<sup>st</sup> difference.

**Table 1: Result of unit Root test of Variables**

	<b>ADF test Statistics</b>	<b>1 %</b>	<b>5%</b>	<b>10%</b>	<b>Order Of Integration</b>
AGRIC	-3.90492	-3.6463	-2.9540	-2.6158	1(1)
FDI	-5.26356	-3.6463	-2.9540	-2.6158	1(1)
LAB	-1649.300	-3.6463	-2.9540	-2.6158	1(1)
PSER	-3.93527	-3.6463	-2.9540	-2.6158	1(1)
INTR	-4.30192	-3.6463	-2.9571	-2.6174	1(1)
EXCH	-4.91734	-3.6463	-2.9540	-2.6158	1(1)

**Table 2: Result of Johanson co-integration of the variables.**

Unrestricted Cointegration Rank Test (Trace)

<b>Hypothesized No. of CE(s)</b>	<b>Eigenvalue</b>	<b>Trace Statistic</b>	<b>0.05 Critical Value</b>	<b>Prob.**</b>
<b>None *</b>	<b>0.713798</b>	<b>119.8742</b>	<b>95.75366</b>	<b>0.0004</b>
<b>At most 1 *</b>	<b>0.592973</b>	<b>78.58934</b>	<b>69.81889</b>	<b>0.0085</b>
<b>At most 2 *</b>	<b>0.421867</b>	<b>48.92646</b>	<b>47.85613</b>	<b>0.0395</b>
<b>At most 3 *</b>	<b>0.406317</b>	<b>30.84404</b>	<b>29.79707</b>	<b>0.0378</b>
<b>At most 4</b>	<b>0.275243</b>	<b>13.63751</b>	<b>15.49471</b>	<b>0.0934</b>
<b>At most 5</b>	<b>0.087292</b>	<b>3.014187</b>	<b>3.841466</b>	<b>0.0825</b>

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

<b>Hypothesized No. of CE(s)</b>	<b>Eigenvalue</b>	<b>Max-Eigen Statistic</b>	<b>0.05 Critical Value</b>	<b>Prob.**</b>
<b>None *</b>	<b>0.713798</b>	<b>41.28491</b>	<b>40.07757</b>	<b>0.0364</b>
<b>At most 1</b>	<b>0.592973</b>	<b>29.66288</b>	<b>33.87687</b>	<b>0.1468</b>
<b>At most 2</b>	<b>0.421867</b>	<b>18.08242</b>	<b>27.58434</b>	<b>0.4883</b>
<b>At most 3</b>	<b>0.406317</b>	<b>17.20653</b>	<b>21.13162</b>	<b>0.1625</b>
<b>At most 4</b>	<b>0.275243</b>	<b>10.62332</b>	<b>14.26460</b>	<b>0.1741</b>

At most 5      0.087292      3.014187      3.841466      0.0825

Max-eigenvalue test indicates 1 cointegrating equation(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

**Co – integration**

Co- integration test was used to determine the long run relationship among variables (Agric, Fdi, Lab., Exch., Intr., and Pser). The result of Trace test indicates 4 cointegrating equations at the 5% level of significance, while the max-eigenvalue test indicates 1 co-integrating equations at 5% significance. From the result, the variables were found to be co-integrated.

**4.0 RESULTS AND DISCUSSION**

With co-integration confirmed, the over-parameterized error correction model is estimated whose results are presented in table 3. Although the model looks fairly well estimated, it appears cumbersome to be interpreted in its present form. The number of lag in table 4 is an empirical issue. The lag length was set at two bearing in mind the possible problems of low degrees of freedom if higher order lags are used.

**Table 3: Over-parameterized Error Correction Model**

Dependent Variable: D (AGRIC)

Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.116531	0.068764	1.694654	0.1210
D(AGRIC(-1))	0.147467	0.221654	0.665304	0.5209
D(AGRIC(-2))	0.356268	0.222528	1.601003	0.1405
D(FDI)	0.166363	0.068745	2.420009	0.0361
D(FDI(-1))	0.127616	0.072344	-1.764005	0.1082
D(FDI(-2))	0.056728	0.076266	-0.743811	0.4741
D(EXCH)	0.098692	0.100061	0.986313	0.3472
D(EXCH(-1))	0.041770	0.150054	-0.278368	0.7864
D(EXCH(-2))	0.159511	0.131461	-1.213370	0.2529
D(LAB)	0.126328	5.180517	-0.024385	0.9810
D(LAB(-1))	7.656376	6.826994	1.121486	0.2883
D(LAB(-2))	7.813824	5.867738	1.331659	0.2125
D(PSER)	-1.114310	0.737151	-1.511644	0.1616
D(PSER(-1))	-0.180049	0.829360	-0.217094	0.8325
D(PSER(-2))	0.117431	0.706542	0.166205	0.8713
D(INTR)	0.0217706	0.101164	0.214567	0.8344

D(INTR(-1))	0.063278	0.066149	0.956592	0.3613
D(INTR(-2))	0.015937	0.062402	0.255401	0.8036
ECM(-1)	-0.344343	0.105637	-3.259675	0.0086
R <sup>2</sup> = 0.7299, F.STAT. = 2.1, DW = 2.17				

Since our variables are only stationary after being differenced once and they were also found to be co-integrated, the equation was estimated with parsimonious error correction model (ECM). The ECM facilitates the combination of short-run and the long-run in a single equation. Four diagnostic tests were applied to the model in order to test the validity of its estimates and their suitability for policy discussions. The p-values in parenthesis of table 4 are presented alongside with the F-statistics. If the p-value is greater than the chosen level then we will accept the null hypothesis and conclude that there is no residual problem in the study. Thus, the Jarque-Bera normality test indicated by the level of significance shows that the model is normally specified. Furthermore, the Breusch-Godfrey serial correlation Lagrange Multiplier (LM) test for higher order serial correlation could also not reject the null hypothesis of absence of serial correlation in the residuals. Finally, both the Autoregressive Conditional Heteroskedasticity (ARCH) and the White Heteroskedasticity Tests were used to test for heteroskedasticity in the error process and the results indicated absence of heteroskedasticity in the model.

**Table 4: Parsimonious Error Correction Model**

Dependent Variable: D(AGRIC)

Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.084232	0.053219	1.582741	0.1330
D(AGRIC(-2))	0.459108	0.158080	2.904278	0.0103
D(FDI)	0.128762	0.063393	2.031159	0.0592
D(FDI(-1))	-0.081249	0.058110	1.398190	0.1811
D(EXCH)	0.014846	0.070702	0.209979	0.8363
D(EXCH(-1))	0.072639	0.117082	0.620411	0.5437
D(LAB)	3.460192	4.810277	0.719333	0.4823
D(LAB(-1))	3.444216	4.816695	0.715058	0.4849
D(PSER)	-0.489532	0.497707	-0.983573	0.3400
D(PSER(-1))	-0.811889	0.692636	-1.172173	0.2583
D(INTR)	-0.107520	0.075124	-1.431226	0.1716
D(INTR(-2))	0.017592	0.060352	0.291485	0.7744
ECM(-1)	-0.290924	0.062944	-4.6211951	0.0003
R <sup>2</sup> = 0.67, F.STAT. = 2.53, DW = 2.10				

<b>Diagnostic Test</b>		
Jarque- Bera (Normality)Test F-stat	= 17.179	(0.000186)
Breusch- Godfrey serial correlation LM Test F-stat	= 2.516864	(0.1087)
ARCH LM F-stat	= 0.0003668	(0.9521)
White Heteroskedasticity Test F-stat	= 0.31440	(0.9737)

Table 4 depicts the parsimonious error-correction model. Clearly, the interpretation of the dynamic process in this model is easy. Thus, we base the discussion on the parameter estimates on this model.

The value of  $R^2$  is 0.6723 implying that approximately 67.23% of all the changes in the dependent variable are brought about by the changes in the explanatory variables (the explanatory power is about 67.23%). The value of Durbin Watson test is 2.10 which can be approximated to 2 meaning that there is no problem of serial correlation of the residuals.

From the results presented in table 4 the coefficient of the error term ECM (-1) is negative and significant and this confirms the expected results from economic theory. The ECM (-1) coefficient of -0.2909 is interpreted as speed of adjustment to the long run equilibrium.

Therefore, this implies that approximately 29% of all the deviations in the past will be corrected (adjusted to the equilibrium) during the present period. The value of the error term indicates that the economic agents remove a large percentage of disequilibrium in each period.

The coefficient of foreign direct investment was found to be positive and statistically significant in the determination of agricultural output both in the long run and short run, is confirming to our a priori expectation of the study. This means foreign direct investment is a crucial determinant of growth in agricultural output in Nigeria. Since this is a double log regression equation, the coefficients are elasticity's. The result obtained means that the elasticity of agricultural output with respect to foreign direct investment is 0.13 indicates that a 10% increase in foreign direct investment will raise agricultural output by 1,3 % holding all other factors constant in the short run. These findings were in agreement with the findings of a study by Lens ink and Morrissey (2002). Therefore foreign direct investment should be attracted as it is a critical ingredient for stimulating investment and economic growth.

The coefficient of labour force is positive but statistically insignificant both in the long run and short run, implying that labour force does not have any significant impact on the agricultural output for the period under study. These finding was in agreement with Borensztein et al (1998)

who argued that an educated labour force (human capital) is necessary for absorption of new technology and management skills.

We also find that exchange rate negatively impacts the agricultural sector. That is, an increase in exchange rate (depreciation of the naira) by 1% causes productivity in the agricultural sector to fall by 0.16%. Our finding is not surprising considering the fact that many agricultural inputs in Nigeria as well as machines needed to mechanize and boost agricultural productivity are all imported to Nigeria. An increase in the exchange rate (depreciation of the naira) makes imports expensive thereby affecting the imports of these inputs and machinery with inverse impact on productivity.

Human capital had a wrong sign and not significant. It is possible that the unexpected result arises from the measure of human capital (primary school enrolment) used. An alternative measure in future studies would be enrolment in secondary and tertiary institutions.

The coefficient of interest rate is positive but not significantly different from zero. The weak response to the interest rate variable may be attributed to the lack of financial depth in the economy and the structural rigidities in the economy

#### **4.2 Conclusion**

The empirical results reveal that foreign direct investment was found to be positive and statistically significant in the determination of agricultural output both in the long run and short run. Similarly, labour force does not have any significant impact on the agricultural output for the period under study.

On the other hand, it was discovered that exchange rate negatively impacts the agricultural sector, that is, an increase in exchange rate (depreciation of the naira) causes productivity in the agricultural sector to fall.

Thus, we conclude that if Nigeria wants to increase the level of production and holistically develop its agricultural sector, open policies towards FDI are important. However, the expansion of agriculture production, reduction in reliance of import, and attainment of food security requires capital, energy, technology, and international business connections. We therefore recommend for more FDI to be sought for the agricultural sector of Nigeria with focus on improve existing or introduce new technology in the agricultural sector and enhance domestic capacity or domestic investment.

The government should also work at stabilizing the local currency (naira), the depreciation of which has made farming inputs very expensive (as they are imported). Policy makers should

ensure that FDI inflows to agriculture and the entire economy for that matter should not be harmful to the economy by way of capital and excessive profit repatriations.

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