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DRIVERS OF AGRICULTURAL FOREIGN DIRECT INVESTMENT AND IT'S IMPACT ON FOOD PRODUCTION IN NIGERIA

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ABSTRACT
Foreign Direct Investment is one of the growth promoters in many sectors of the economy including the agricultural sector. The study analysed the drivers of agricultural FDI and gauge its impact on food production in Nigeria. Annual time series data spanning from 1975 to 2017 were obtained from Central Bank of Nigeria, National Bureau of Statistics and World Bank's Development Indicators Database. Descriptive analysis, stationarity analysis with Augmented Dickey Fuller and Philip Perrons' unit root tests, co-integration test with Autoregressive Distributed Lag Bound test, Autoregressive Distributed Lag-Error Correction Model analysis were done to obtain results for the study. ARDL-ECM results showed that GDP at P≤0.1, government expenditure on agriculture at P≤0.1, inflation rate at P≤0.01 and real exchange rate at P≤0.01 levels of significance were the significant determinants of FDI inflow to agricultural sector in Nigeria in the long run model. In the short run, GDP at P≤0.1, government expenditure on agriculture at P≤0.1 and real exchange rate at P≤0.01 levels of significance were the significant drivers of Agricultural FDI in Nigeria. The speed of adjustment (ECM (-)) was 102.74%. Agricultural FDI also had significant long run and short run impact on food production in Nigeria at 1% and 1% levels of significance, respectively. The study concluded that FDI inflow had significant positive impact on agricultural sector in Nigeria. It was recommended that government should promote policies that are directed at employing all promotional resources to attract more FDI inflow to the agricultural sector so as to boost its productivity and contribution to the overall economy of Nigeria.

Keywords: Agriculture, Foreign Direct Investment, Food production, Augmented Dickey Fuller Nigeria.

INTRODUCTION
The agricultural sector was considered the engine of growth of the Nigerian economy as noted by Shitu (2017). It contributes immensely to the nation's economic development in the past decades. According to the Central Bank of Nigeria (CBN, 2014), the contribution of agriculture to the nation's Gross Domestic Product (GDP) now stood at 24.18%, making it larger than manufacturing and oil sectors combined together. The sector is also considered as the largest non-oil contributor to GDP, for instance in 2016, agriculture accounted for 24.4 percent of the GDP (Oyaniran, 2020). The sector has rich and diverse agroecological conditions capable of supporting a variety of farming enterprise, supplies food and raw material, generates household income and provides jobs for about 60 percent of Nigeria's populace. But at the same time the agricultural sector is bedevilled with a lot of challenges ranging from low investment capital, inadequate inputs and crude planting materials, high post-harvest losses, amongst others.

Foreign direct investment (FDI) is an important vehicle of technology transfer from developed countries to developing countries. FDI refers to an investment made by a resident of one economy in another economy, and it is of a long-term nature or of "lasting interest." It

can also be defined as when a foreign organization has a 10% stake or more in the stock in an indigenous company or organization. FDI in Nigeria exist mostly in the form of "Greenfield" that is, establishment of new enterprises and some through existing new ones (Wafure and Nurudeen, 2010). FDI primarily involves the transfer of financial resources by a foreign firm into the Nigerian economy.

While foreign investment in agriculture is not a completely new trend, the current situation differs from more traditional forms of international investment in the agro-food-sector, which primarily aimed to provide a better access to markets or cheaper labour. Through the new investment forms, investors seek to gain access to natural resources, in particular land and water. The impact of FDI in agricultural production can be positive or negative. For instance, the investments by a company can increase the production of an economic crop in the host country (Gerlach and Liu, 2010). In terms of positive spillovers, the vertical and horizontal FDI inflows can also positively affect key sectors in the economy (Dries and Swinnen, 2004). Djokoto (2012) noted that food access and availability are the two factors connecting FDI and food security. FDI has the capacity to make significant contributions to the host country's development process especially through easing of the constraints of food insecurity and as such increases its economic improvement. As a result, the host country will not only have the financial means to boost its agricultural production, but also close any shortfall in domestic food production through importation of food.

Agricultural foreign direct investment is the most important and effective strategy for poverty reduction in rural areas, where the majority of the smallholder farmers live and work. Investing in agriculture reduces poverty and hunger through multiple pathways in all of the dimensions of food security (Pascal, 2014). One of the most crucial needs of man is food which is also required for economic development of a nation. Foreign direct investment has been identified as a major instrument in fostering economic growth and integration especially in developing countries like Nigeria. Most of the previous studies done in Nigeria are focused only on the nexus between FDI and agricultural output. Little or nothing is known about the impact of agricultural FDI to the various agriculture subsectors and especially on food production. These has created a gap to be filled in literature. Nigeria faces food security challenges despite the inflow of FDI into the Country. As a result, Nigeria's food import bill has been on the rise despite the country being one of the highest destinations of FDI in Africa. The study, therefore intends to revisit the drivers of agricultural FDI and analyse its impact on food production in Nigeria.

The output of this study will improve the existing research on the drivers of FDI into agricultural sector development. It will also provide important insight concerning the impact of agricultural FDI on food production as well as prove useful in designing relevant policies aimed at maximising both FDI inflows and gains into the sector. In other words, the study will be a valuable guide to policy makers and development partners to initiate, develop and manage economic strategies aimed at attracting FDI into the agricultural sector leading to economic growth and development.

MATERIALS AND METHODS

The Study Area

The study was conducted in Nigeria using available data from the national database. Nigeria is bordered by Republic of Chad and Niger to the North, the Republic of Cameroun to the east and the Republic of Benin to the west. It is located between Latitudes 4° to 14°N and Longitudes 3° to14°E of the equator with a total land area of 923,768km^2 including 13,000km^2 of water, a border length of 4,047km and a coastline of 853km (National Bureau of Statistics

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(NBS, 2010). Nigeria has an estimated population of about 196million (World Population Review (WPR, 2018) with about 350 ethnic groups. Agriculture is one of the mainstays of the country's economy. The map of the study area is presented in Figure 1.

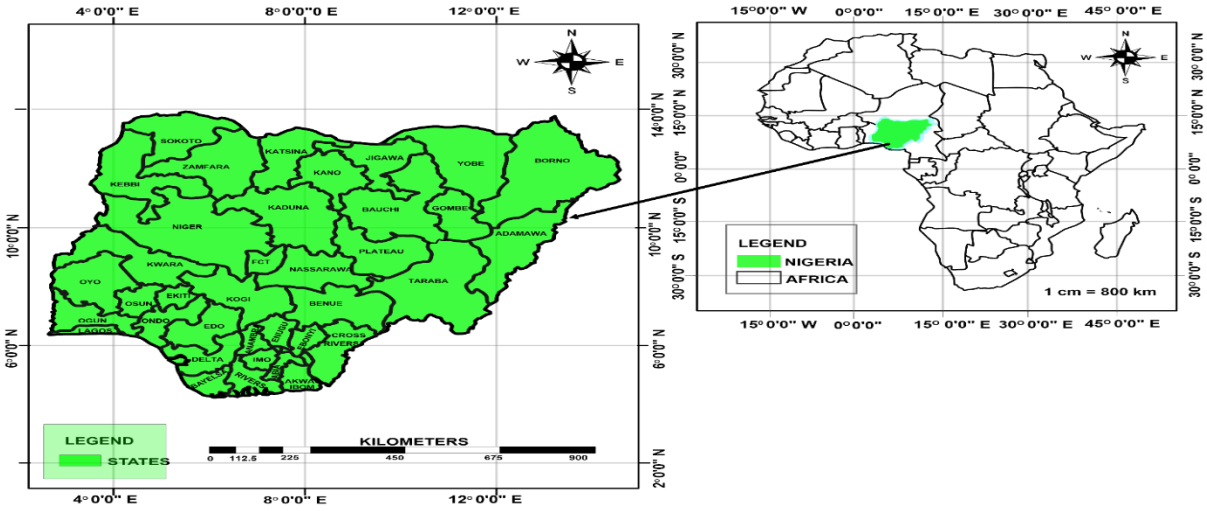

Figure 1: *Map of the study area*

Method of Data Collection

Secondary data were used for this study. These were annual time series data spanning from 1975-2017 (42 years). Agricultural output measured by the share of agriculture to GDP, FDI inflows into the agricultural sector and other macroeconomic variable such as exchange rate, inflation rate, openness of the economy, government expenditure on agriculture, population, GDP and arable land under cultivation. Data were obtained from the publications of National Bureau of Statistics (NBS), Central of Bank of Nigeria (CBN) Statistical bulletins, World Bank and FAO databank on the following variables presented in Table 1.

Table 1: Data variables by type and source

Variable	Type	Source
Food Production Index (%)	Annual	World Bank/FAO databank
Agricultural Foreign Direct Investment (₦)	Annual	NBS
Agricultural Gross Domestic Product (₦)	Annual	NBS
Gross Domestic Product (₦)	Annual	NBS
Government expenditure on agriculture (₦)	Annual	NBS
Arable land under cultivation (ha)	Annual	NBS/World Bank
Real exchange rate	Annual	World Bank
Annual inflation rate (%)	Annual	NBS
Population (numbers)	Annual	NBS
Rate at which the Naira is converted to the US dollar	Annual	CBN
Openness of the country to foreign trade	Annual	NBS

Method of Data Analysis

Data were analysed with descriptive and inferential statistics. All analysis were done using Microsoft Excel and Stata statistical analysis software. Augmented Dickey Fuller (ADF)

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test and Phillips-Peron technique were employed to test for stationarity of the properties of the data series and obtain the order of integration of the variables. Cointegration test was carried out to determine the existence of a long-run relationship between the dependent and explanatory variables before analysing the drivers of Agric FDI and its impact on food production in Nigeria. This was done using the Autoregressive Distributed Lag (ARDL) Bounds test. The rule of ARDL Bounds test of cointegration states that the null hypothesis should be rejected if the value of the computed F-statistic is greater than the upper bounds value and accepted if the F-statistic is less than the lower bounds value. The ARDL cointegration test would be inconclusive should the computed F-statistic fall between the lower and upper bound.

In ARDL bound test model or estimation, it is usually essential to ascertain whether the variables are co-integrated by restricting the coefficients of the lagged level variables to be equal to zero (0). Therefore, the null hypothesis (H_0) of no co-integration and alternative hypothesis (H_1) of the presence of co-integration are stated in equations 1 and 2, respectively:

$H_0: \beta_{1j} = \beta_{2j} = \beta_{nj} = 0$ …(1)

$H_1: \beta_{1j} \neq \beta_{2j} \neq \beta_{nj} \neq 0$ …(2)

where;

j = 1, 2, 3, 4 for drivers of Agric FDI and the impact of Agric FDI on food production models, respectively.

These tests were carried out using F-statistics and compared against the critical values at a given level of significance (1%, 5% or 10%). If the calculated F-statistics lies above the upper bound level, then the null hypothesis is rejected and therefore implying evidence of a long-run relationship among the variables. Variables that are not in rate and index were used in their natural logarithmic form to bring the variables to a more comparable form and also help to reduce issue of heteroscedasticity as argued by Osabuohien and Efobi (2011). The general conditional ARDL model used for the bound tests is specified in equation 3 as:

$$\Delta lnY_{jt} = \beta_{0j} + \delta_j lnY_{jt-1} + \sum_{i=1}^{n} \beta_{nj} \Delta lnX_{nt-1} + e_t \quad \ldots(3)$$

where;

Y_j = Dependent variables.

X_n = Independent variables.

ln = natural log.

β_{nj} and δ_j = coefficients.

Δ = the difference operator.

e_t = the vector of error term.

For the study, the general Vector Error Correction Models (ARDL-ECM) used is specified in equation 4 as:

$$\Delta lnY_{jt} = \beta_{0j} + \sum_{i=1}^{p} \beta_{1j} \Delta lnY_{jt-1} + \sum_{i=1}^{q} \beta_{nj} \Delta lnX_{nt-1} + \lambda ECT_{t-1} + e_t \quad \ldots(4)$$

where;

Y_j = Dependent variables.

X_n = Independent variables.

ln = natural log.

β_{nj} = coefficients.

λ = the speed of adjustment parameter with a negative sign.

ECT = the error correction term.

Δ = the difference operator.

e_t = the vector of error term.

The ARDL model for drivers of Agric FDI was also used in the study. The model expresses agricultural FDI (AFDI) as a function of the market size of the host country (GDP),

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government expenditure on agriculture (GEA), openness of the economy to foreign trade (TRDOPEN), rate of inflation (INFLATIO) and real exchange rate of the host country's currency (REXCHRAT). The model is specified in equation 5 as:

$$\Delta \ln AFDI_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta \ln AFDI_{t-1} + \sum_{i=1}^{q} \beta_2 \Delta \ln GDP_{t-1} + \sum_{i=1}^{q} \beta_3 \Delta \ln GEA_{t-1} + \sum_{i=1}^{q} \beta_4 \Delta \ln TRDOPEN_{t-1} + \sum_{i=1}^{q} \beta_5 \Delta \ln INFLATIO_{t-1} + \sum_{i=1}^{q} \beta_6 \Delta \ln REXCHRAT_{t-1} + \lambda ECT_{t-1} + e_t \quad \ldots(5)$$

where;
AFDI = Agricultural Foreign Direct Investment (₦).
GDP = Gross Domestic Product (₦).
GEA = Government expenditure on agriculture (₦).
TRDOPEN = Openness of the country to foreign trade.
INFLATIO = Annual inflation rate (%).
REXCHRAT = Real exchange rate.
ln = natural log.
$\beta_0, \beta_1 - \beta_6$ = coefficients.
λ = the speed of adjustment parameter with a negative sign.
ECT = the error correction term.
Δ = the difference operator.
e_t = the vector of error term.

ARDL model for the impact of Agric FDI on food production was equally used in the study. The model used to evaluate the impact of FDI on food production in Nigeria expresses food production index (FPI) as a function of FDI inflow into the agricultural sector (AFDI), government expenditure on agriculture (GEA), arable land under cultivation (ha) (ARL) and the country's population (POP). The empirical model is specified in equation 6 as:

$$\Delta FPI_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta FPI_{t-1} + \sum_{i=1}^{q} \beta_2 \Delta lnAFDI_{t-1} + \sum_{i=1}^{q} \beta_3 \Delta lnGEA_{t-1} + \sum_{i=1}^{q} \beta_4 \Delta lnARL_{t-1} + \sum_{i=1}^{q} \beta_5 \Delta lnPOP_{t-1} + \lambda ECT_{t-1} + e_t \quad \ldots(6)$$

where;
FPI = Food Production Index.
AFDI = Agricultural Foreign Direct Investment (₦).
GEA = Government expenditure on agriculture (₦).
ARL = Arable land under cultivation (ha).
POP = Population (numbers).
ln = natural log.
$\beta_0, \beta_1 - \beta_5$ = coefficients.
$\boldsymbol{\lambda}$ = the speed of adjustment parameter with a negative sign.
ECT = the error correction term.
Δ = the difference operator.
e_t = the vector of error term.

RESULTS AND DISCUSSION

Unit Root Test of Variables

It is essential to check for the stationarity of the time series variables by conducting unit root test. This study employed the Augmented Dickey-Fuller (ADF) and Philip Perron (PP) unit root test approaches.

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Table 2: Stationarity (unit root) test of variables

Variables	ADF test		Philip-Perron test	
	Level	First Difference	Level	First Difference
Agric FDI	-1.134	-6.970***	-0.834	-7.035***
Agric GDP	-2.466	-6.899***	-2.546	-6.918***
Food production index	-0.551	-8.444***	-0.372	-8.120***
Government Agric expenditure	-1.250	-8.536***	-0.892	-10.386***
Arable land	-0.904	-5.465***	-1.099	-5.504***
Exchange rate	-0.714	-5.348***	-0.731	-5.351***
Inflation rate	-3.972***	-6.754***	-3.908***	-7.296***
GDP	-2.616*	-6.829***	-2.704*	-6.842***
Population	-0.309	-6.226***	-0.288	-6.223***
Trade openness	-2.087	-7.034***	-2.258	-7.006***
Real exchange rate	-1.993	-4.591***	-2.192	-4.536***

Notes: ***, **, * denotes 1%, 5% and 10% level of probability.
Source: Authors' computation (2019)

The results are presented in Table 2 and it shows that after applying the ADF approach for variable stationarity test, all the variables for this study except, inflation rate and GDP were not stationary at levels but at first difference. Similarly, the result of the unit root test based on Philip-Perron approach shows that all the variables were not stationary at first levels except inflation rate and GDP. However, all the variables were stationary at 1(1) for ADF and Philip-Perron approach. Thus, this indicates that the data series are mixture of order zero (0) and one (1) which support the use of ARDL model and requires the estimation of short run and long run dynamic coefficients, thereby suggesting strong evidence for cointegration analysis.

Summary Statistics of Agricultural FDI in Nigeria

Ahead of the time series econometric analysis, a detailed analysis was carried out to determine the trend movement of the variables. The result of the summary statistics of foreign direct investment (FDI) into the Nigerian agricultural sector is presented in Table 3. The values presented are in the natural log form (to reduce the severity of multicollinearity and serial correlation that might happen among the variables). It also shows that over the period of 1975-2017, the annual average FDI inflow into Agricultural sector was estimated to be 20.21 with standard deviation of about 1.79 which implies that the agricultural sector had been growing thereby attracting more FDI into the sector. In addition, the sector had experienced wide variation over the 42-year period and this is evident in the wide gap between the minimum and maximum values of Agric FDI inflow as recorded to be 16.77 and 24.81, respectively. From The data also shows that the variables had normal values. Results in Table 3 shows that the skewness value for FDI is positively and moderately skewed (since the value lies between 0.5 and 1). A skewness statistic is a measure of where the data lies (either balanced around the mean or skewed to the right or left). In addition, the positive value of the FDI indicates that FDI is skewed to the right. A kurtosis statistic is a measure of flatness or peaking of the variables relative to their normality. It also determines the heaviness of the distribution. The negative value signifies that the distribution is not peaked but flat having an abnormal

distribution. It also indicates that FDI inflow into the agricultural sector has been irregular over the years.

Table 3: Summary statistics of agricultural FDI in Nigeria

Description	Value
Mean	20.21
Standard Deviation	1.79
Kurtosis	-0.05
Skewness	0.40
Minimum	16.77
Maximum	24.81

Source: Authors' computation (2019)

Summary Statistics of Food Production Index in Nigeria

The result of the summary statistics of food production index in Nigeria is presented in Table 4. As explained earlier, the values presented are in natural log form. It shows that over the period of 1975 – 2017, the mean production index was estimated to be 4.13 with the minimum value being 3.32 while the highest value being 4.99 with a standard deviation of 0.53. The low value of the standard deviation of 0.53 indicates that the country is being confronted with food security challenges. Despite the growth and contribution, the sector towards economic growth, the sector has not been able to produce enough food for its rising population. According to (Edewor, 2013), Nigeria spends about $22billion annually on food importation. This further attest to the fact that Nigeria agricultural sector has not been able to produce enough food to feed itself despite the huge investment in the sector. The skewness value of 0.26 signifies that the data is positively skewed but fairly symmetrical and is good for the analysis. The kurtosis value is signifying that the distribution is not peaked but flat having an abnormal distribution.

Table 4: Summary statistics of food production index in Nigeria

Description	Value
Mean	57.26
Standard Deviation	4.09
Kurtosis	-1.41
Skewness	0.09
Minimum	22.10
Maximum	103.29

Source: Authors' computation (2019).

Drivers of Agricultural FDI in Nigeria

Sequel to the outcome of the unit root test, cointegration test was carried out using ARDL Bounds Test approach. The ARDL approach was adopted given that it has the capacity to accommodate variables with different order of integration. It is more efficient using small sample size. It also has the capacity in obtaining unbiased estimates of the long run model (Harris and Sollis, 2003). Thus, the study was then proceeded with the test for short and long run dynamic coefficient before estimating the determinants of FDI using ARDL technique developed by Peseran and Shin (1999). However, before estimating the short and long run dynamic coefficients, it is necessary to ascertain the optimum lag which was established using

a combination of Akaike Information Criterion (AIC) and Final Prediction Error (FPE) for a small sample (60 observations and below) because they minimize the chance of underestimation while maximizing the chance of recovering the true lag length as noted by Liew (2004).

The result of the ARDL Bound Test is presented in Table 5. It shows that the null hypothesis of Agric FDI not having significant long run and short run relationship with the specified determinants in the model should be rejected given that the value of the computed F-statistics (11.46) is greater than the upper bound critical values of 4.68, 3.79 and 3.35 at 1%, 5% and 10% levels of significance respectively. This implies that FDI inflow into the agricultural sector has a significant long run and short run relationship with the corresponding specified determinants.

Table 5: ARDL bounds test for cointegration

Critical value	Lower bound value	Upper bound value
1%	3.41	4.68
5%	2.62	3.79
10%	2.26	3.35
F-value = 11.46***		
Lag = (1,0,0,0,1,0)		

Notes: ***, **, * denotes 1%, 5% and 10% level of probability
Source: Authors' computation (2019).

Estimation of the Long Run and Short Run Parameters of Drivers of Agric FDI

The study proceeded to evaluate the long run and short run estimation parameters after finding out the existence of the variables from the ARDL bound test. The influx of FDI into the agricultural sector has the capacity to trigger the growth and development of the overall economy of a nation. Since the empirical findings led to the conclusion that there exist a long run and short run relationship among the variables in the model, the ARDL-ECM model was eventually used to estimate the short run and long run relationship between the variables. The marginal impacts of GDP, government agricultural expenditure, inflation rate and real exchange rate on foreign direct investment inflow into agriculture are estimated for the long run, while the impact GDP, government agricultural expenditure, and real exchange rate were estimated in the short run relationship and the results are presented in Table 6.

The results of the estimation shows that GDP has a positive and significant influence on the inflow of FDI into the agricultural sector in both the short-run and long-run equations respectively. This implies that the larger the size of the economy in terms of the market size the higher the flow of FDI into the Nigerian economy which in turn propels economic activities in the country by making real income available for investment opportunities in Nigeria. This finding is in line with the *a priori* expectation. Precisely, a one percent increase in GDP leads to approximately 15 percent and 16 percent growth in foreign direct investment inflow into the agricultural sector in the long-run and short-run, respectively. This finding is in line with the findings of Addo (2010) and Adel (2010) who reported that GDP had positive and significant influence in attracting FDI in Tanzania and Hungary, respectively.

Similarly, the study reveals that real exchange rate has a negative and significant influence on the inflow of FDI into the agricultural sector in the long-run and short-run respectively. Negative exchange rate devalues a country's currency making it less attractive to foreign investment. Negative exchange rate depicts the unstable and high depreciation of the

naira. This also indicates that higher exchange rate will make cost of doing business high which discourages the inflow of foreign direct investment. This also implies that a one percent decrease in the real exchange rate will lead to approximately 85 percent and 87 percent decline in foreign direct investment inflow into the agricultural sector in the long-run and short-run respectively at 1% and 1% levels of significance. This also suggests that the real exchange rate over the period under study has not favoured FDI inflow into the agricultural sector in Nigeria. This may be due to constant devaluation of the Nigerian currency at the international exchange market. This finding is similar to that of Addo (2010) and Narayan (2014) who reported that real exchange rate has a negative influence on FDI inflows to agriculture in Tanzania. This finding is in line with the *a priori* expectation.

However, the result of the study indicates that government expenditure on agriculture has a positive and significant effect on the flow of foreign direct investment into the agricultural sector which conforms to the *a priori* expectations. This implies that as government increases its expenditure into the agricultural sector, it induces the inflow of FDI into the agricultural sector of the country. This finding is also in line with Suleiman *et al.* (2015). A one percent rise in government expenditure on agriculture led to approximately 10 per cent rise in the inflow of FDI into the agricultural sector in the long and short run respectively. This is an indication that there is need for the government at all levels in Nigeria to fully implement the 2003 Maputo declaration of 10% budgetary allocation to the agricultural sector.

Table 6: Results of the ARDL Long-run and short-run relationship

Variable	Coefficient	Standard error	t-ratio	p-value
Long-run relationship				
GDP	0.1526	0.0893	1.71*	0.098
Government Agric expenditure	0.1034	0.0581	1.78*	0.085
Trade openness	0.1240	0.2295	0.54	0.593
Inflation rate	0.3580	0.1213	2.95***	0.006
Real exchange rate	-0.8469	0.1742	-4.86***	0.000
Constant	5.3676	2.9573	1.82*	0.080
Short-run relationship				
GDP	0.1568	0.0873	1.80*	0.083
Government Agric expenditure	0.1063	0.0601	1.77*	0.087
Trade openness	0.1274	0.2408	0.53	0.601
Inflation rate	0.0813	0.1231	0.66	0.514
Real exchange rate	-0.8701	0.1672	-5.20***	0.000
ECM (-)	-1.0274	0.1393	-7.38***	0.000
Diagnostic statistics				
R-squared	0.6963			
Adjusted R-squared	0.6255			
Log likelihood	-17.6027			
Root MSE	0.4328			
Durbin-Watson d-statistic	1.9765			

Notes: ***, **, * denotes 1%, 5% and 10% level of probability.
Source: Authors' computation (2019).

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In addition, the results of Table 6 reveals that the inflation rate is positive and significant in the long run. This is a condition where the prices of goods and services are on the average rising. In other words, the rise in prices of goods and services are being experienced on some goods and not all the goods and services. This has positive effect on the economy in that it helps to boost consumer demand and consumption, driving economic growth which invariably attract FDI into the country. From the study, a one percent average rise in inflation rate can lead to 36 percent rise in the flow of FDI into the economy. This is tandem with the result of the study conducted by Andinuur (2013) who investigated the link between inflation, FDI and economic growth in Ghana. He revealed that low rate of inflation internally stabilizes the host country which would in turn encourage FDI and boost its returns. This finding is similar to those of Addo (2010) and Epaphra and Mwakalasya (2017) who reported that increase in inflation rate favours FDI inflow to Tanzanian agriculture. It however contradicts the previous findings of Ngaruko (2002) who reported a negative influence on inflation rate on agricultural FDI in Tanzania.

The highly significant and negatively signed coefficient of ECM (-1) indicates that there is a relative speed of the model adjusting to long-run equilibrium. The value of the coefficient (-1.0274) implies that the model will be corrected from the short-run towards the long-run equilibrium by 102.74%. This therefore further suggest that the findings of short-run and ECM (-) strongly indicates that there is a significant relationship between variables in the model. Additionally, the result of the diagnostic test carried out as presented in Table 7 shows that the variables are properly cointegrated and do not suffer any form of autocorrelation or heteroskedasticity since their probability values are higher than the 5 percent significant level. In all it suggests good fit of the model. More so the positive values for skewness and kurtosis also indicates that the variables are normally distributed since their probability values are higher than the 5 percent significant level.

Table 7: ARDL model diagnostic tests

LM test	**F-value**	**Prob.**
Autocorrelation	0.054	0.816
	Chi-square value	**Prob**
Heteroskedasticity	37.810	0.342
Skewness	6.060	0.533
Kurtosis	0.000	0.993

Source: Authors' computation (2019).

Evaluating the Impact of Agric FDI on Food Production in Nigeria

As earlier stated, food production is represented by food production index and has been determined by the World Bank. The ARDL Bounds test for cointegration was also carried out as a preamble in evaluating the impact of FDI on food production in Nigeria. As earlier specified, the rule of ARDL Bounds test of cointegration states that the null hypothesis should be rejected if the value of the computed F-statistic is greater than the upper bounds value and accepted if the F-statistic is less than the lower bounds value. Consequently, the result of the ARDL Bound Tests as presented in Table 8 indicates that the null hypothesis of FDI inflow into the agricultural sector has no significant long run and short run relationship with food production in Nigeria should be rejected since the value of the computed F-statistic (6.49) is greater than the upper bound critical values of 5.06, 4.01 and 3.52 at 1 per cent, 5 per cent and 10 per cent levels of significance. This implies that Agric FDI has a significant long run and short run relationship with food production in Nigeria.

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Table 8: ARDL bounds test for cointegration

Critical value	Lower bound value	Upper bound value
1%	3.74	5.06
5%	2.86	4.01
10%	2.45	3.52
F-value = 6.49***		

Notes: *** denotes 1% level of probability.
Source: Authors' computation (2019).

The ARDL-ECM model was applied to estimate the short run and long run relationship between the variables and the peripheral impact of FDI on food production in Nigeria both in the long-run and short run. The results are presented in Table 9. The results of the estimation of the long-run coefficient indicates that agricultural FDI, arable land and population has a positive and significant influence on food production as one percent increase in agricultural FDI, arable land and population will ultimately lead to approximately 0.09 percent, 0.93 percent and 0.47 percent increase in food production in the long-run. These findings, especially for agricultural FDI contradicts that of Rakotoarisoa (2011) who reported that agricultural FDI have a negative impact of the food sector in sub-Saharan Africa in that it would lead to an increase in food prices and a decline in domestic food supply that would in turn cause an increase in food imports.

Table 9: ARDL estimates of the long-run and short-run impacts of Agric FDI on food production

Variable	Coefficient	Standard error	t-ratio	p-value
Long-run relationship				
Agric FDI	0.0942	0.0243	3.88***	0.001
Government Agric expenditure	0.0239	0.0384	0.62	0.539
Arable land	0.9264	0.1794	5.16***	0.000
Population	0.4705	0.1813	2.60**	0.015
Constant	-4.6730	1.2482	-3.74***	0.001
Short-run relationship				
Agric FDI	0.0270	0.0073	3.68***	0.001
Government Agric expenditure	0.0068	0.0127	0.54	0.595
Arable land	0.2652	0.0683	3.89***	0.001
Population	-0.3102	0.1226	-2.53**	0.017
ECM (-)	-0.2863	0.0866	-3.31***	0.003
Diagnostic statistics				
R-squared	0.6575			
Adjusted R-squared	0.5630			
Log likelihood	76.7390			
Root MSE	0.0368			
Durbin-Watson d-statistic	2.1341			

Notes: ***, **, * denotes 1%, 5% and 10% level of probability.
Source: Authors' computation (2019).

In addition, the results (Table 9) of the short-run equation show that agricultural FDI and arable land has a positive and significant influence on food production as a one percent increase in agricultural FDI and arable land will lead to approximately 0.03 percent and 0.27 percent increase in food production in the short run respectively. Nevertheless, population has a negative and significant influence on food production as one percent increase in population will lead to approximately 0.31 percent decline in food production. This implies that food produced is not meeting up with the increasing population.

Furthermore, the coefficient of ECM (-1) was significant at 1% level of significance and negatively signed which indicates that there is a relative speed of achieving the long-run equilibrium. Specifically, the value of the coefficient (-0.2863) implies that the model will be corrected from the short-run towards the long-run equilibrium by 28.63%. This therefore further suggest that the findings of short-run and ECM (-) strongly indicative that there is a significant relationship between food production, agriculture FDI inflows, arable land and population on agriculture in Nigeria.

The result of the diagnostic tests carried out as presented in Table 10 illustrates that the variables are properly cointegrated and do not suffer any form of autocorrelation or heteroskedasticity since their probability values are higher than the 5 percent significant level. In also suggest good fit of the model. More so the positive values for skewness and kurtosis also indicates that the variables are normally distributed since their probability values are higher than the 5 percent significant level.

Table 10: ARDL model diagnostic tests

LM test	**F-value**	**Prob**
Autocorrelation	0.54	0.4624
	Chi-square value	**Prob**
Heteroskedasticity	38.00	0.4192
Skewness	4.71	0.7883
Kurtosis	1.22	0.2692

Source: Authors' computation (2019).

CONCLUSION AND RECOMEMDATIONS

The study primarily examined the drivers of agricultural FDI and its impact on food production in Nigeria. Based on the empirical findings of this study, it was concluded that GDP, government expenditure on agriculture, inflation rate and real exchange rate were the significant drivers of Agric FDI in Nigeria. Agricultural FDI had significant positive long-run and negative short-run impact on food production in Nigeria. Consequently, Agric FDI could provide numerous opportunities such as farm knowledge transfer and improved infrastructures that have the potentiality to influence food production in Nigeria. thus, the following recommendations were made based on the findings of this study:

1. The government should promote policies that are directed at employing promotional resources to attract more agricultural FDI so as to boost its contribution to food production and the overall economy of Nigeria.
2. Government at all levels should increase the budgetary allocation to the agricultural sector by at least fully implement the 2003 Maputo declaration of 10% budgetary allocation to the agricultural sector.

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