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Effect of Land Grabbing on Growth in Nigeria's Agricultural Sector (1980 -2015)

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I. Introduction

The global financial crises in the twenty-first century has contributed in large part to a change in focus from industrialization to agriculture. Several reasons have been adduced as being responsible for this shift and these ranging from fear of food insecurity within the developed world, the shift from fossil fuel to agrofuel especially in Europe, and new found economic opportunities for agricultural investors and speculators (Kachika, 2010; Graham *et al* 2009). The food price crisis which resulted from the financial crises of the early 2000s caused a dramatic spike in large-scale agricultural investments, primarily foreign, in the global south for the purposes of food and biofuels production. Also, consumption targets in the European Union (EU) and financial incentives have been a key driving force for demand for investment in agrofuels (Cotula *et al*. 2009).The Renewal Energy Sources Directive also known as The EU *Directive* 2009/28EC which came into effect in April 2009 set new mandatory targets for member states. A minimum ten percent (10%) share of renewable energies, which in the end will be supplied mainly by agrofuels within the total consumption of fuel for transport in every member state by 2020 has stimulated increased interest and demand for agrofuel and hence land for agricultural production.

Speculation on land and other natural resources according to the Food and Agriculture Organization (FAO) (2013) has also been fuelled by the poor market performance of more traditional asset classes such as equity and bonds in the wake of the financial crisis that started in 2007. The need to meet up with world energy demand coupled with the fear of food insecurity among the developed nations has led to an inward search for alternative energy sources which agrofuels provide. This recourse to agriculture and large scale land acquisition as a viable, and dependable strategy and means for enhancing food security as well as meeting fuel needs, employment generation and wealth creation have brought intense pressure to bear on resources in the agricultural sector. The most important of which is land. Developing countries especially those in Africa and South America are under much pressure as demand for their lands for agricultural purposes is gradually increasing in response to this pressure.

According to karlsson (2012), the global demand for agricultural land in 2008 was just about 4 million hectares (Ha). This figure rose within a space of one year to about 56 million hectares in 2009 with 70 percent of the increase from Africa alone. FAO reported that between 2007 and 2009, 20 million hectares of land were acquired by foreign investors in Africa (Hallam, 2009). The United Nations Conference on Trade and Development (UNCTAD) (2009) also reported that investors from countries in Europe including Italy, Norway, Germany, Denmark, the United Kingdom, and France form the bulk of those investing in agriculture. However, the Europeans are not the only group involved in land acquisition on the continent. Emerging economies in Asia are not left out. Kachika (2010)

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estimated that as of 2011, 70 percent of land grabs occurred in Africa and the main grabbers were China, the Gulf States, India and Korea. Vicol (2015) concurred to these other authors and further described the trend of recent large-scale land acquisitions in the global south which includes Africa by both foreign and domestic actors as highly significant.

Hallam further noted that the late 2000s witnessed a surge in foreign direct investment (FDI) into agriculture in developing countries and this was largely channelled towards primary agricultural production. According to UNCTAD (2014), FDI has been on the rise in those countries that are targets of Large Scale Land Acquisitions (LSLAs), especially since approximately 2004, and the primary sector has played a major role in this rise. Foreign Direct Investment (FDI) coming into the agricultural sector in developing countries is no doubt for the acquisition of land for production purposes. Foreign investors with the active connivance of indigenous governments on the continent pay so little to acquire such large expanse of land. Productive activities on these land is driven by the desire to produce for the home country of the investors. So, even though the local farmers are dispossessed of their land, the output from such land still does not contribute much to the total agricultural output in the host nation (Friis and Reenberg, 2010). It may be also be inferred that the returns of the investors do not seem to add to the income of the local farming communities neither do they contribute to strengthening food security in the host nation. Garlich and Liu (2010) reported that foreign investments in agriculture in some African countries have removed income opportunities from local farmers thereby plunging them into severe poverty. According to Lee and Neves (2009), most rural poor depend on agriculture or are otherwise dependent on natural resources in generating their livelihoods. Hanson (2009) corroborating this asserts that vast areas of land that may seem to be waiting for development are often providing important economic and social benefits for local communities. Thus, it is not just about bringing land into production but also the disruption of the livelihood and social structure of traditional communities who have for decades relied on their land for sustenance.

Despite the problems associated with it, FDI seems to be a blessing to the host nations. Since 1999 when Nigeria returned to civil rule, various governments have deployed strategies and policies aimed at attracting foreign direct investment into the country. Policies aimed at facilitating easier movement of capital into and out of the country have been used as incentives to bring in foreign investors. Shiro (2009) advances that with the enthronement of democracy in 1999, the government of Nigeria has taken a number of measures necessary to woo foreign investors into Nigeria. These measures includes the repeal of laws that are inimical to foreign investment growth, promulgation of investment law, various overseas trips for image laundering by the president, among others. FDIs are seen as a healthy way for less-developed and developing nations to overcome their saving-investment gap. FDIs fill such gaps by bringing foreign investment into the country, as well as bridging gaps in management, technology, entrepreneurship and skills.

Investment in the agricultural sector which was hitherto driven by domestic investors has witnessed a steady rise in the amount of foreign investment being ploughed in. According to Hallam (2011), benefits arising from agricultural FDI should include capital inflows, technology transfers, leading to domestic productivity and production, quality improvement, employment creation, and forward and backward linkages. Most of these foreign investments in agriculture are used for the acquisition of land and farm machinery and equipment used for production and processing of produce from the farms.

Djokoto (2012) observed that agricultural FDI in Sub-Saharan Africa is mainly land based. Standing Committee for Economic and Commercial Cooperation of the Organization of Islamic Cooperation (COMCEC) (2013) gives an example of massive land deals to include that carried out by Biopalm Energy an Indian company which has invested about $1,907.24 million to acquire a 200,000 hectare palm oil plantation in the south of Cameroon, as part of a joint venture with the National Investment Corporation of Cameroon. According Graham *et al* (2011) media reports in Nigeria indicate that in December 2008 Nigeria's Niger Delta Development Commission and UK based TRANS4 mation Agritech (T4M) signed a 305 million United States Dollars ($305m) agreement for the establishment of 30,000 hectares of land for mechanized farming for rice and other agricultural products in the Niger delta. The case of the Zimbabwean farmers in Kwara State, Israeli Vegetable farmers in the Federal Capital territory and American rice and vegetables farmers in Anambra State are all cases in point in Nigeria, where FDI has shown massive improvement in investment portfolio of the nation.

The upsurge in large-scale land acquisitions in developing countries including Nigeria has raised concern, and given rise to the expression "land grabbing" which has now become an issue in most policy debate. Land grabbing according to Kachika (2010) is the contentious issue of large-scale land acquisitions; the buying or leasing of large pieces of land in developing countries, by domestic and transnational corporations (TNCs), governments, and individuals. It refers to large scale land acquisition – be it purchase or lease –for agricultural production by foreign investors (GRAIN 2008; Cotula*et al*. 2009). Global land grabbing according to Zoomers (2010) generally refers to large-scale, cross-border land deals or transactions

that are carried out by transnational corporations or initiated by foreign governments. Graham *et al*. (2011) defined land grabbing as taking possession of and/or controlling a scale of land for commercial/industrial or agricultural production which is disproportionate in size in comparison to the average land holding in the region. Although the practice is widespread and seem to have a global effect, there seem to be some intensity in South Sahara Africa, South east Asia and Latin America. Kachika (2010) reported that seventy percent (70 percent) of land grabs is concentrated in Sub-Saharan Africa. Other estimates of the scope of land acquisition, published in September 2010 by the World Bank, showed that over 46 million hectares in large-scale farmland acquisitions or negotiations were announced between October 2008 and August 2009 alone, with two-thirds of demanded land concentrated in Sub-Saharan Africa.

It appears that huge amount of FDI is being used to acquire large swathes of arable land for the purpose of agricultural production to meet the growing needs of the developed and a few newly emerging economies. The International Land Coalition (2012) cited in Lafrancesca (2013) reported that 134 million hectares of land has already been grabbed in Sub-Saharan Africa. Liverage (2010) cited reports from bodies like the International Land Coalition, Grain, Food Policy Research Institute (IFPRI) indicating that the targeted countries in Africa where land grabbing is prevalent include: Angola, Benin, the Congo, Ethiopia, Liberia, Madagascar, Mali, Mozambique, Nigeria, The Sudan, The United Republic of Tanzania and Zambia. This report brings the issue of land grabbing and its consequences nearer home. According to Costantino (2014), the land grabbing phenomenon is not distributed homogeneously across all countries, and the unevenness in its occurrence cannot apparently be explained adequately by the relative abundance of land in any of the target countries. So, even though Nigeria may seem to have abundant land for agriculture, the Country may not have escaped the land grabbing phenomenon. Furthermore, Kachika (2010) posited that land grabbing undermines the contribution of agriculture to the GDP in countries where the practice is prevalent. Thus, the import of this practice on the growth and development of these countries, especially Nigeria is dire. The practice undermines the policy of government that focuses on agriculture as a key sector for economy recovery and growth.

This study estimates the per capita agriculture gross domestic product; it also shows the trend in Per capita agricultural gross domestic product as well as the determinants of per capita agriculture gross domestic product.

II. Methodology

The study was conducted in Nigeria. The country is situated in tropical Sub-Saharan Africa along the Gulf of Guinea and is one of the largest countries on the continent. Nigeria lies between latitudes 4° and 14° north of the Equator and between longitudes 3° and 15° east of the Greenwich Meridian (Akpan, 2010). The country is bounded on the west by the Republic of Benin, on the east by the Republic of Cameroon, on the north east by the republic of Chad and on the North-west by the Niger Republic. The Atlantic Ocean forms the southern boundary of the country. Nigeria has a total land area of 923,768.622km^2 or about 92.4 million hectares, made up of land: 910,768 sq km and water: 13,000 sq km. The country's population is currently put at 167 million with an annual growth rate of 3.2 percent (National Population Commission NPC, 2015). The NPC had earlier put the country's population at 140,431,790 persons (NPC, 2006).

The climate of the country varies from equatorial in the south to tropical in the central and arid in the northern part of the country. Nigeria has only two seasons; the rainy season, which begins in April and ends in October; and the dry season, which lasts between October and March. Relative humidity is below 40 percent in the north to above 80 percent in the mangrove forest zone. Temperature varies between 27^{0}C in the south to above 40^{0}C in the North. The variations in climate also affect the vegetation. The vegetation of the country varies between savannah in the north and north central to swamp and rain forest in the south.

Agriculture is a major occupation in Nigeria. About 60 percent of the population is involved in agricultural production. The major food crops produced in Nigeria are: cassava, maize, rice, yams, various beans and legumes, soya, sorghum, ginger, onions, tomatoes, melons and vegetable. Cash crops produced in the country include: cocoa, cotton, groundnuts, palm oil and rubber. Nigeria has 19 million head of cattle, the largest in Africa. The sector contributed about 17.8 percent of the GDP of the country in 2015.

a) Data Sources

Data used for the study were secondary data and were generated from the Central Bank of Nigeria (CBN) publications, National Bureau of Statistics, FAOSTAT, Federal Ministry of Agriculture and Natural Resources. Data were collected on macroeconomic variables including: Gross Domestic Product (GDP), Agricultural Foreign Direct Investment (AFDI), Aggregate Agricultural Domestic Investment (ADAI), Total area of agricultural land, Capital accumulation in agriculture, National Output of Food, National Population, and Government capital expenditure on agriculture. The data generated for the study spanned from 1980 to 2015.

b) Specification of model

The per capita Agric. Gross Domestic Product

$$(PCAGDP) = \frac{AGDP_t}{N_t} \quad (1)$$

$$Y_{it} = b_0 e^{b1^T} \quad (2)$$

Linearizing equation 3.4 by taking the log of both sides we have

$$LnY_{it} = b_0 + b_1 T + u_t \quad (3)$$

Where,
LnY_{it} = natural log of Y $\{Y_i = PAGDP_t\}$
b_0 = intercept
b_1 = slope coefficient
T = Time trend variable (years)

$$\ln PCGDP_t = b_0 + b_1 T + \mu_i \quad (4)$$

Where,
$PCGDP_t$ = Per capita agricultural GDP (Agricultural Gross Domestic product/population in agriculture)
T = Trend variable (1980-2015)
b_0 and b_1 = parameters to be estimated.
Ln = Natural logarithm
U_t = error term

Using time series data in econometric analysis of this nature it is necessary that we first test for the stationarity properties of the variables. The Augmented Dickey-Fuller ADF was used to test for stationarity in the data series. The ADF model as specified by Ayinde *et al* (2011) is given thus:

$$e_t = \Delta Y_{t-1} = (y_{t-1} - Y_{t-2}), \Delta Y_{t-2} = (Y_{t-2} - Y_{t-3}). \quad (5)$$

The vector error correction model was used to establish the determinants of per capita agriculture gross domestic product short run and the long run relationships between the variables. The test for co-integration was first carried out using the Johansen Jesselis test before proceeding to vector error correction model.

Co-integration Test

According toUremadu, Umezurike and Odili (2016) the Johansen Jesselis tests the null hypothesis that the number of distinct co-integrating vector is less than or equal to q against a general unrestricted alternatives q= r, this test is shown in the equation below:

$$\gamma\, trace\,(r) = -T \sum_{i}^{n} r + 1 \ln(1 - \gamma t) \quad (6)$$

Where: T is the number of usable observations, and γt is the estimated eigenvalue from the matrix. The second statistical test is the maximum eigenvalue test (γ max) that is calculated according to the following formula:

$$\gamma \max\,(r, r+1) = -T \ln(1 - \gamma r + 1) \quad (7)$$

The test concerns a test of the null hypothesis that there is r co-integrating vector against the alternative of r+1 co-integrating vectors.

The VECM as specified by Atanda *et al* (2013) is as follow:

$$\Delta \ln PCAGDP_t = \log\beta_0 + \beta_1 \Delta \log AALUFI_t + \beta_2 \Delta \log GEA_t + \beta_3 \Delta \log DIA_t + \beta_4 \Delta \log AFDI_t + \beta_5 ECTt\text{-}1 + vt \quad (8)$$

The variables $AALUFI_t$, GEA_t, DIA_t, $AFDI_t$ are as earlier defined. ECTt-1 is the error correction component and is the lagged estimated error series; vt are the random error terms.

III. Results and Discussion

a) Per Capita Agriculture Gross Domestic Product (PCAGDP)

The PCAGDP of the Country was computed for the period under review, the result is presented in Table 4.2.

Table 4.2: PCAGDP for Nigeria 1980 -2015.

PCAGDP (Million Naira)	Frequency (No. of years)	Percentage
0.27 - 21.90	22	61.11
21.91 - 43.54	5	13.89
43.55 - 65.18	3	8.33
65.19 - 86.82	2	5.56
86.83 - 108.46	4	11.11
Total	36	100
Mean	28.1814	

The result in the table shows that the Country had an average PCAGDP of above ₦28 million Naira for the period under review. This represent the average agriculture output in Naira value per head of the Country and is an indication of the volume of activities in the agricultural sector within the period. The result also shows that the PCAGDP for most years within the period under review was less than ₦22 million. The PCAGDP of Nigeria compares favourably with countries like Ghana and Kenya which had average PCAGDP of ₦24.52 million and ₦20.20 Million respectively but is much lower than the PCAGDP of Malaysia and the United States of America which were ₦58 million Naira and ₦32 billion respectively for the period under review (FAOSTAT, 2017).

The low PCAGDP may be as a result of low capital investment in the sector. Low agricultural output in the Country has also been attributed to other factors including the use of low yielding crops and animal species, use of primitive implements, minimal usage of improved inputs like fertilizer and agrochemicals, fragmentation of agricultural land, inconsistencies in government policies and lack of competitiveness (Anyanwu *et al*., 2010; Odetola and Etumnu, 2013). According to COMCEC (2013), suitability of ecological

conditions, sophisticated infrastructure, availability of natural resources, use of equipment and human capacity to carry out agricultural activity are key drivers of growth in the agricultural sector. The mismanagement of any of these factors or a combination of them may lead to underdevelopment and low output in the sector. Odetola and Etumnu (2013) identified low productivity as a major contributor to the slow or declining growth in Nigeria's agricultural sector. According to Iyoha and Oriakhi (2002) in Odetola and Etumnu (2013), slow growth in the agricultural sector of the country may also be attributed to slow growth in capital per worker. The relatively low PCAGDP of the Country may also be an indictment of the poor implementation of numerous government policies, projects and programmes aimed at improving productivity and enhancing output and growth in the sector. According to Noko (2017), the poor performance of the agricultural sector in Nigeria may be attributed to the disincentive created by an unstable macroeconomic environment. The low value of output in agricultural sector may also be an indication of low living standard especially among the rural population who are mostly engaged in farming. It may also be an indication of food security challenges the country may be facing (Anyanwu*et al*., 2010).

b) *Trend in Per Capita Agriculture Gross Domestic Product within the period also depicts slight fluctuations in the variable with time*

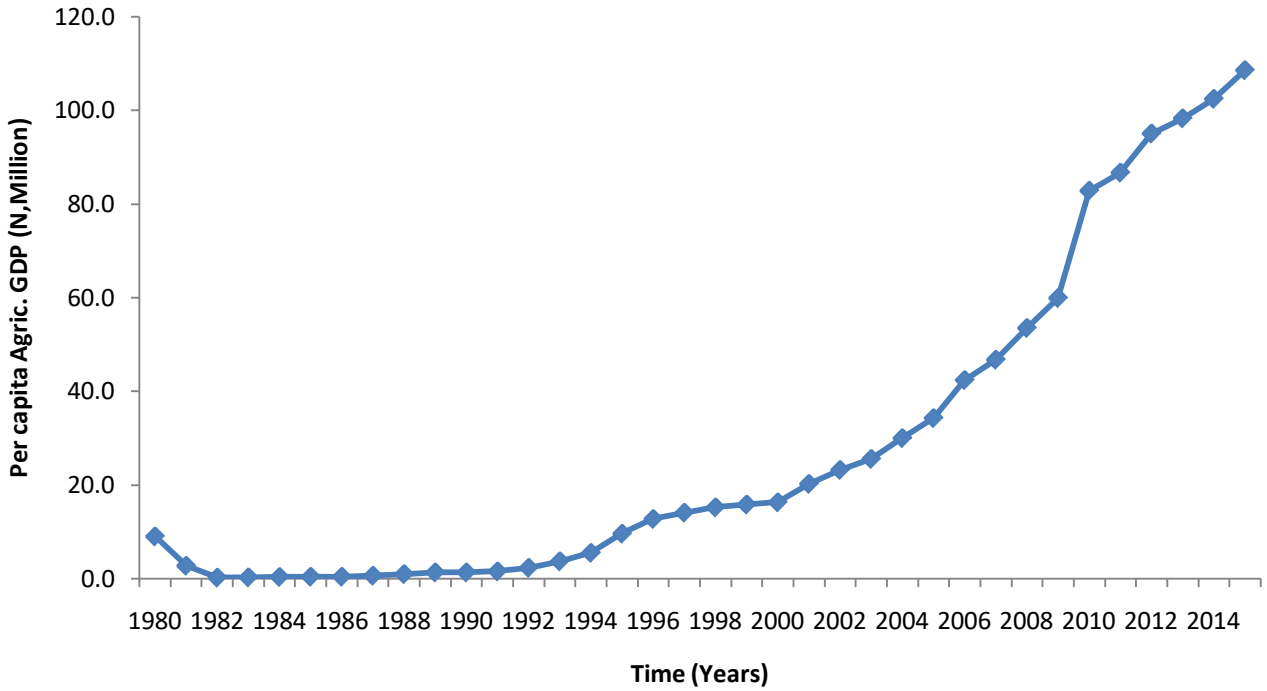

Figure 2: Trend in Per Capita Agriculture Gross Domestic Product in Nigeria 1980 to 2015

The trend shows that Per capita agriculture gross domestic product was low and remained stagnant throughout the 1980s to the early 1990s. This period coincides with the period of oil boom and the "Udorji award" which led to an unprecedented increase in earnings both to the Country and individuals, especially government workers. These led to a complete neglect of agriculture in the Country. Domestic investment in agriculture dropped drastically and foreign investment in the sector declined due to political instability. Despite these limitations, population was on the increase.

The introduction of the Structural Adjustment Programme (SAP) in the mid-1980s did little in shoring up domestic investment in the agricultural sector but this was not enough to encourage a massive rise in GDP. Population dynamics saw a mass movement of labour out of agriculture. Domestic investment orchestrated by SAP encouraged PCAGDP to rise despite the mass movement of agricultural labour force. Growth in the sector therefore picks up Growth in PCAGDP however picks up in the mid1990s and continues albeit gradually into the next decade and this is reflected in the gradual increase in PCAGDP within the period as shown in the trend. The return to democracy and the pursuance of developmental programmes by government may be responsible for growth in the PCAGDP. Also, the influx of grants and developmental aid from foreign developmental partners may have contributed to this growth.

Due to the significance of the unit root in determining the co-integration, the series in the study were tested for unit root using the standard Augmented Dickey-Fuller (ADF) unit root tests. The tests were performed using E views 9.0 statistical package which

automatically selects the number of lagged dependent variables in order to correct for the presence of serial correlation (Asteriou and Hall, 2007). The standard ADF test was conducted for unit roots in the levels (for both constant without trend and constant with trend) and first difference (for both constant without trend and constant with trend), given the automatically selected schwarz information criterion, and the maximum lags, in order to determine the number of unit roots in the series of the variables. The result of the Augmented Dickey-Fuller unit root testis presented in Table 1.

Table 1: Result of Augmented Dickey-Fuller unit root test

Variables	With intercept			With intercept and trend		
	I(0)	I(1)	Order of Integration	I(0)	I(1)	Order of Integration
Agric. FDI	-0.03468	-10.0805***	I(1)	-1.264309	-10.05152***	I(1)
Domestic Investment in Agriculture	-0.82258	-5.48998***	I(1)	-1.288451	-5.492540***	I(1)
Govt. Capital Expenditure on Agric.	-1.92985	-5.45957***	I(1)	-0.922883	-5.322730***	I(1)
Area of Agricultural Land Used by Foreign Investors	-2.69333*	-6.62543***	I(1)	-2.376590	-6.795569	I(1)
Per capita Agric. GDP	-0.41524	-2.63980*	I(1)	-3.262063*	-5.093259***	I(1)

Source: Generated data from various issues of CBN, NBS and FAOSTAT (1980 -2015)

Note: With constant at level, critical value at 1% =- 3.633, and at 5% = -2.948; at first difference, critical value at 1% = - 3.639, and at 5% = -2.951. With constant and trend at level, critical values at 1% = -4.244 and at 5% = -3.544; at first difference, critical value at 1% = -4.253 and at 5% = -3.548. Asterisks * and ** represent 5% and 1% significance levels.

The result for the unit root test with constant for the logged variables shows that only Agriculture Partial Productivity of Capital was stationary at level, I(0), other variables were stationary at order one, I(1). PCAGDP was weakly stationary at first difference. On the other hand, the result for the unit root test with constant and trend determination in Table 3.2 shows that only API was stationary at level I(0), all other variables were stationary at order one, I(1). Therefore all the logged variables used for the study were integrated of order one, I(1) except for the API which was used at level, I(0). The difference- stationary values for the variables found to be stationary at order one, I(1) were generated and used for analysis. The analyses in the study were therefore based on the unit root test of the logged variables with constant and trend.

To further show the long run and short run relationships between the independent variables in the model and the dependent variable, the vector error correction model was estimated. First Johansen co-integration test was conducted. The result is presented in Table 2.

Table 2: Johanson Cointegration Test

Trend assumption: Linear deterministic trend
Series: LOG(PCAGDP) LOG(AALUFI) LOG(AFDI) LOG(DIA) LOG(GCEA)
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.663	86.574	69.819	0.001
At most 1 *	0.473	50.634	47.856	0.027
At most 2	0.400	29.509	29.797	0.054
At most 3	0.284	12.665	15.495	0.128
At most 4	0.048	1.623	3.841	0.203

Trace test indicates 2 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 3: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.663	35.940	33.877	0.028
At most 1	0.473	21.125	27.584	0.269
At most 2	0.400	16.844	21.132	0.180
At most 3	0.284	11.042	14.265	0.152
At most 4	0.048	1.623	3.842	0.203

Max-eigenvalue test indicates 1 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

To consider the Null hypothesis that the variables are not co-integrated (r=0) against the alternative hypothesis of one or more co-integrating vectors (r>0). The result of the trace statistic indicates the value of TRACE equal to each number of the co-integrating vector: TRACE (0) = 86.754, TRACE (1) = 50.634, TRACE (2) = 29.509, TRACE (3) = 12.665 and TRACE (4) = 1.623. The trace test indicates 2 co-integrating equation at the 0.05 level as denoted by the significant sign (*) on the hypothesized number of co-integration equations at none and at most 1.

This implies that the null hypothesis that the variables are not co-integrated (r=0) was rejected at 0.05 level and the alternative hypothesis that there are one or more co-integrating vectors (r>0) was accepted judging from the MacKinnon (1999) p-values for none and at most 1 equations.

Similarly, the result of the Maximum Eigen statistic indicates that the value of Maximum Eigen value equal to each number of the co-integrating vector: Maximum Eigen value (0) = 35.394, Maximum Eigen value (1) = 21.125, Maximum Eigen value (2) = 16.844, and Maximum Eigen value (3) = 4.699852, Maximum Eigen value (4) = 11.042 and Maximum Eigen value (5) = 1.623. The Maximum Eigen value test indicates 1 co-integrating equation at the 0.05 level as denoted by the significant sign (*) on the hypothesized number of co-integration equations for none. This implies that the null hypothesis that the variables are not co-integrated (r=0) was rejected at 0.05 level and the alternative hypothesis that there are one or more co-integrating vectors (r>0) was accepted judging from the MacKinnon (1999) p-values for none equations which were less than 0.05%.

The results of the co-integration tests showed that there was co-integration in the foreign direct investment model with the trace test showing 2 co-integrating variables and the Maximum Eigen value test showing a co-integrating variable. Thus, the trace test and the Maximum Eigen value test showed slightly no disparity in their ability to account for all the outliers on the regression line. Once there is co-integrating vector, a long run relationship is concluded (Gujarati, 2004). According to Engle and Granger (1987), when a set of variables are I(1) and are co-integrated then short-run analysis of the system should incorporate error correction term (ECT) in order to model the adjustment for the deviation from its long-run equilibrium. The error correction model (ECM) is therefore characterized by both differenced and long-run equilibrium models, thereby allowing for the estimates of short-run dynamics as well as long-run equilibrium adjustments process. This indicates that if the variables are co-integrated then they share a long-run relationship, which error correction model corrects. Therefore, the result of the co-integration test established that there exist a long run relationship among the variables that were co-integrated at order I(1). The models were normalized on the variables in order to obtain the long-run parameter estimates. Since there is a long-run and short-run relationship, we will then proceed to estimate the parsimonious error correction model (ECM).

c) Parsimonious Error Correction Model

The Parsimonious Error Correction Model correction was used to establish the short run and long run relationships between the variables in the model. The result is resented in Table 5.

Table 4: Result of the Parsimonious Error Correction Model

Variable	Coefficient	Std. Error	t-statistics
Ln(AALUFI(-1)	-0.380	0.071	-5.362***
Ln(AFDI(-1)	0.0005	0.027	0.017
Ln(DIA(-1)	-0.702	0.051	-13.864***
Ln(GCEA(-1)	-0.150	0.0353	-4.276***
ECM (-1)	-0.834	0.097	-8.624***
D(Ln(AALUFI(1)	-0.213	0.058	-3.673***
D(Ln(AFDI(-1)	-0.007	0.041)	-0.159
D(Ln(DIA(-1)	0.066	(0.172	0.382
D(Ln(GCEA(-1)	-0.063	0.046	-1.369
R-squared	0.804		
Adj. R-squared	0.760		
F-statistic	18.416***		

Source: Generated data from various issues of CBN, NBS and FAOSTAT (1980 -2015)

***= Significant at 1%; ** = significant at 5%. (-1) = 1 year lagged.

The result in Table 4.7 shows that the coefficient of multiple determinations (R^2) value was 0.804 which indicates that the explanatory variables jointly accounted for about 80.4 percent of the variations in the dependent variable D(Ln(PCAGDP(-1)). The value of the F-statistics also indicates the robustness of the model.

The result shows that in the long run, $LnAALUFI_{t-1}$, $LnDIA_{t-1}$ and $LnGCEA_{t-1}$ were significant at one percent and negatively influenced $LnPCAGDP_{t-1}$. This implies that there is inverse relationship between each of these variables and $PCAGDP_t$. The result also shows that the value of $PCAGDP_t$ falls by 0.38 percent for every one percent increase in $AALUFI_t$. This is indicative of the profound adverse effect of $AALUFI_t$ on output and growth in the agricultural sector even in the long run. This relationship may be considered from the ability of foreign large scale land acquisition in displacing local small holder farmers from their land and thereby reducing their output even in the long run. According to Onyebinama (2004) in Nnamerenwa (2012) limited access to land limits the size and scale of the farm business. Land is one of the most important factors of production and has a direct relationship with output. A reduction in agricultural land area available to smallholder farmers who form the majority of producers in the agricultural sector therefore impinges negatively on their output and hence reduces overall output of the agricultural sector.

The negative relationship between $LnDIA_t$ and $LnPCAGDP_t$ in the long run is not in consonance with *a priori* expectation. This may however be ascribed to low returns on investment made in the sector by local investors. Nigeria's agriculture is still rain-fed and therefore very vulnerable to the vagaries of weather as well as attacks by diseases and pests, all of which could increase investment risks and drastically reduce output. According to Nnamerenwa (2012) and Ayinde, Ajewole, Ogunlade and Adewumi (2010), Nigeria's agriculture is rain dependent and adequate and timely rainfall is necessary for better agricultural output. Processors and other actors in the sector are also exposed to the risks of wide fluctuations in prices of inputs, unavailability of constant power supply, instability and inconsistencies in policies, and low capacity utilization all of which affect output adversely and reduces growth in the sector.

$LnGCEA_t$ was negatively related to $LnPCAGDP_t$. This implies that increase in $GCEA_t$ will lead to a decrease in $PCAGDP_t$. This again is not in agreement with a priori expectation. A likely reason for this relationship may be massive diversion of funds and corruption which is rife in the public sector of the Country and which usually leads underperformance of Government's funding in almost all sectors of the economy. Also, the effect of the top-down syndrome in planning and implementation of capital projects in the agricultural sector tends to reduce the performance of these projects and hence the output of beneficiaries of such projects.

The model also showed that the parameter estimate of the co-integrating error correction term (ECM (-1) which measures the speed of adjustment of the dependent variables to equilibrium after a deviation has occurred due to a change due to the explanatory variables in the model is 0.833. This is negative and lies between 0 and 1. Ehirim*et al*. (2017), indicated that an ECM that is negative and significantly different from zero actually justifies long-run adjustment with a speed of less than 100%. The result therefore indicates that the stochastic error (residuals) processes generated and their movements with time in the model can be corrected and the speed of adjustment back to equilibrium in the long run was given as 83.3 percent.

Also in the short run, the area of land used by foreign investors D (Ln(AALUFI(-1) was significant at one percent and negatively related to $LnPCAGDP_t$. The result shows that there is a 0.21 percent fall in $PCAGDP_t$ for every 1 percent increase in $AALUFI_t$ in the short run. This indicates the acuteness of the problem of large scale land acquisition as it relates to output and growth in the agricultural sector. The coefficients of DIA_t, $AFDI_t$ and $GCEA_t$ were not found to be significant in the short run.

IV. Conclusion and Recommendation

The study analyzed the per capita agriculture gross domestic product (PCAGDP) for Nigeria from 1980 to 2015. It also described the trend in PCAGDP for the Country within the period and estimated the determinants of PCAGDP. The Augmented Dickey-Fuller Test was used to test the data series for stationarity. Johansen co-integration test was used to test co-integrating relationships among the variables in the model. Also, the vector error correction model was used to estimate the determinants of PCAGDP of the Country. study tested the time series data The results show that the Country had an average PCAGDP of 25 Million Naira for the period. In the long run, area of land used by foreign investors, domestic investment in agriculture and government capital expenditure on agriculture negatively influenced PCAGDP; in the short run only area of land used by foreign investors was significant and negatively related to PCAGDP.

The study recommends policies that would regulate foreign investors' access to land for agricultural production so as to ensure that small holder farmers access to land is not jeopardized. Also, it recommends stricter monitoring of government's spending in agriculture to ensure that funds are used for the purpose for which they were allocated.

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