The role of agriculture in the economic diversification of the Nigerian economy: (1980 – 2016)

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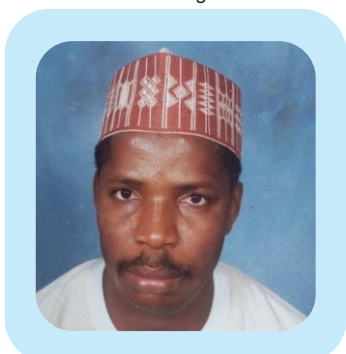
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Abstract

This study empirically examines the role of agriculture in the diversification of the Nigerian economy, using time series data from 1980–2016. Estimation results using Cointegration and Vector Error Correction Technique indicate that agricultural output has a positive relationship and significant impact with non-oil exports (NOE) and that non-oil revenue has a positive relationship with non-oil exports (NOE). It was recommended that, government should endeavor to increase agricultural productivity by improving its expenditure on the sector so as to enhance the growth of the economy. Government should also increase its non-oil revenue and revive the sector through sufficient budgetary allocation and efficient utilization of allocated resources in order to guarantee poverty reduction, sustainable livelihood and enhanced food security.

Keywords: Agriculture, economic diversification, cointegration, error correction term, sustainable development.

1.0   Introduction

Nigeria is the largest oil exporting country in Africa and has a rapidly growing economy. The country follows a resource based growth strategy driven by the production and exporting of oil. With the volatility of global oil prices and often volatile growth of its economy, the country has wasted much of its opportunities to break away from underdevelopment despite its massive natural and human resource endowments. It has dwelt only on its huge crude oil resources as the major source of revenue, driving a monolithic economy for years in spite of the enormous developmental challenges it faces (Ojo,1994).

Agriculture has been an important sector in the Nigerian economy in the past decades, and is still a major sector despite the oil boom. Basically, it provides employment opportunities for the teeming population,

eradicates poverty and contributes to the growth of the economy. The study of economic history provides us with ample evidence that an agricultural revolution is a fundamental pre-condition for economic development (Eicher and Witt, 1964; Oluwasami 1966).

The agricultural sector has the potential to be the industrial and economic springboard from which a country's development can take off. Indeed, more often than not, agricultural activities are usually concentrated in the less developed rural areas where there is a critical need for rural transformation, income redistribution, poverty alleviation and socio-economic development (Stewart, 2000). Nigeria's economic aspirations have remained that of altering the structure of production and consumption patterns, diversifying the economic base and reducing dependence on oil, with the aim of putting the economy on a path of sustenance, all inclusive and non-inflationary growth. Despite Nigeria's vast agricultural resources both human and natural, it is still faced with acute food crisis, the intensification of poverty and massive suffering of the overwhelming majority of Nigerians. This situation is however typical of all third world countries operating within the neo-colonial capitalist system (Akor, 2009).

Diversification implies "movement into new fields and stimulation and expansion of existing traditional products." Diversification does not discourage specialization, but requires that resources be channeled into the best alternative uses (Iniodu, 1995). It presents the most competitive and strategic option for Nigeria in the light of her developmental challenges and given her background. Diversification has a lot of benefits for Nigeria to maximally utilize her abundant resource base to rebuild the economy and enjoy the benefits of all the linkages, synergy, economies of scale, grow national technology and foreign investment profile, build human capital, exploit new opportunities, lessen averagely operational costs, increase national competitiveness and grow the standard of living and confidence of the citizens for national renaissance.

Economic diversification is generally taken as the process in which a growing range of economic output is produced. It can also refer to the diversification of markets for exports or the diversification of income sources away from domestic economic activities (i.e. income from overseas investment).The last is particularly relevant to capital-surplus oil exporting countries.

In spite of Nigeria's rich agricultural resource endowment, there has been a gradual decline in agriculture's contributions to the nation's economy (Manyong et al., 2005). In the 1960s, agriculture accounted for 65-70% of total exports; it fell to about 40% in the 1970s, and crashed to less than 2% in the late 1990s. The decline in the agricultural sector was largely due to rise in crude oil revenue in the early 1970s. Less than 50% of the Nigeria's cultivable agricultural land is under cultivation, even though, smallholder and traditional farmers who use rudimentary production techniques, with resultant low yields, cultivate most of this land. But, smallholder farmers are constrained by many problems including those of poor access to modern inputs and credit, poor infrastructure, inadequate access to markets, land and environmental degradation, and inadequate research and extension services. (Lawal, 2011).

Options for diversifying an economy abound, such as agriculture, entertainment, financial services, industrialization, information and communication technology, tourism, mining, etc. However, it is worthy to note that country-specific circumstances ought to as a matter of necessity, be considered. This is cogent, since due to structural differences, a model that fits an economy perfectly well may prove irrelevant in another.

Given its major objective of examining the role of agriculture in diversifying the productive base of the Nigerian economy with a view to reducing dependence on the oil sector; and following Eko, et.al, (2013), this study zeroed in on agriculture as imperative. The choice of this approach is informed by developmental policy in Nigeria and the huge successes recorded by 'Asian Tigers' (some Asian countries) in applying these imperative, as well as the fact that these countries were basically at the same level of national development with Nigeria, at the time of their respective take-off and still share certain similarities with Nigeria. (Eko, et al. 2008).

In view of the gradual decline in agricultural contribution to the nation's economy which has negative effect on the Nigerian economy as a whole, this research work is aimed at examining the agricultural sector as the key to the diversification of the Nigerian economy for sustainable development as its main objective. The specific objectives are:

I.   To examine the impact of agricultural output on economic diversification in Nigerian.

ii.   To determine the role of agriculture in the diversification of Nigerian economy for sustainable development.

2.0   LITERATURE REVIEW
2.1   Conceptual Framework
2.1.1   The concept of Agriculture

Agriculture is a way of life that involves production of animals, fishes, crops, forest resources for the consumption of man and supply of agro-allied product required by various sectors. It is seen as the inherited and dominant occupation employing about 70% of Nigerians. Though, subsistence agriculture is practiced in this part of the world, it will not be an overstatement to say that it is the life-wire of the economies of developing countries.

Components of agricultural production include Crop production: this involves the cultivation of different crops which may be food crops or cash crops, Livestock which involves rearing of domestic animals for consumption. Such animals include goat, ram sheep etc, Forestry concerns the preservation and maintenance of economic trees or plants and Fishing involves breeding and catching of fish from the river for domestic consumption and commercial purpose.

Broadly speaking, agricultural activities are undertaken as peasant farming and or plantation farming. Peasant farming involves cultivation of small scale acres of land. This is also called subsistence agriculture because it is undertaken to meet domestic needs and survival or to eke out living from the farm produce. The size of the of the land used by peasant farmers is determined by the size of their family, land and the number of the size of the family interested in agriculture. Rudimentary agriculture equipment such as hoes, cutlasses, and axes etc. which are crude in nature are usually used.

Plantation farming: is the system that involves the use of a large estate of land permanently planted with economic or commercial crops which include cocoa, tea, cotton, sugar, tobacco, rubber, sugarcane, palm tree, coffee and other commercial crops. In plantation farming land could be owned by government, private, individuals or corporate bodies. Mechanized equipment and modern inputs are mainly used in plantation farming.

2.1.2   Concept of Development

The term development may mean different things to different people. The concept has been misconceived by many to mean economic growth. This view is myopic because the concept does not consider if the increase in per capital income trickle-down. The concept is more than a sustained increase in per capita income. If

the sustained in per capita income brings about the desirable social changes, and improve the functioning, capability of individual, we will say there is economic development although, increase in income per capita must have occurred before there can be development. .

2.2   Theoretical Framework
2.2.1 Agricultural based economic development theory:

Wiggins (2009) propounded the Agricultural based economic development theory which stressed that Agriculture requires technical, institutional and financial incentive change that will raise the productivity of small   farmers. The theory further explains that in strive for economic development; agricultural financial scheme can play a dual role of increased purchasing power and provision of input to sustain the industrial revolution.

2.2.2.   Structural change theory:

The theory which was formulated by Nobel laureate W. Arthur Lewis in the mid-1950s emphasized on the mechanism by which developing economies can transform their domestic structure from a heavy dependence on traditional subsistence agricultural to a more modern and advanced agricultural practices through sufficient financial support. An extended version of this theory adds that increased agricultural development cannot be realized unless government builds a supporting system which creates and provides the necessary incentives, opportunities and most importantly productivity in the agricultural sector.

2.2.3   Sustainable Livestock Theory:

Chamber and Conway (1991) extended the sustainable livestock theory for capabilities, including capital and other social resources as well as other farming practices required for a means of living. The theory holds that increase output can only be achieving by ensuring secured ownership of, or access to capital resources and income earning activities which includes; reserves and assets to offset risk, ease stocks and meet contingencies as well as enhancement and maintenance of productive resources on a long term basis. Therefore, increase agricultural output (food security) is not just food affordability but the ability to produce food and earn income on a long term basis by farmers.

2.3   Empirical Literature

Ligon and Sadoulet (2008) in their analysis, using panel data, investigated the contribution and impact of the agricultural sector and non-agricultural sector on GDP. The findings agree with other researchers that the agricultural sector is significantly a stimulant for the growth and development of an economy about other sectors.

Simeon (2009) using the global trade analysis project (GTAP) approach found out the growth capacity of Nigerian agricultural sector. The study concluded that the bias against the agricultural sector should be discarded and meaningful contribution in terms of funding and the entire well-being should be made available because, the agricultural sector holds the capacity for job creation, food sufficiency and foreign exchange earnings from exportation.

Okoro (2011) investigated the contribution of agricultural sector on the Nigerian economy, using panel data for a period of 1986 - 2007. The study discovered a positive relationship between agricultural sector and economic growth. From the finding, FDI and domestic savings were able to explain 81 percent of the variation in the economic growth. He recommended, better improvement of the Nigerian agricultural sector, and that the government and Central Bank of Nigeria (CBN) should have accessible and low-interest rate loan plan for farmers and also

strengthen the research institutions for noble findings.

Ebere et al. (2012) investigated on the impact of government spending on agriculture and economic growth, using the Ordinary Least Squares (OLS) econometrics technique on a time series data from 1980 - 2012. The study revealed that there exist a positive and significant association between GDP and agricultural output. The study also figured out a couple of constraints among which are paucity of capital available to the rural farmers, poor infrastructure and emphasis was laid on timely and adequate agricultural extension services among all key agents in the agricultural sector.

Oyetade and Oluwatoyese (2014) examined the effect of the agricultural sector as the determinant of economic growth, using a time series econometric model from 1980 to 2011. The study revealed a positive relationship between the agricultural sector and economic growth. It was discovered that the agricultural sector could be the determinant for exportation, if given due attention in all ramification in terms of funding and enabling the environment to key actors in the sector. The study also concluded that there are constraints to the full attainment of agricultural sector progress.

Ahungwa et al., (2014) examined trend of the impact of agriculture to GDP 1960 - 2012 using time series data. The regression results show that there exists positive and significant relationship between the agricultural sector and GDP, with GDP accounting for 66.4 percent of the variation in the economy, and also displays the dominance of the agricultural sector relative to other sectors of the economy. The study recommended that there should be a conducive and enabling environment provided by the government and decision makers so that the full gains can be derived from the sector.

Mussema (2015) examines the drivers of agricultural diversification in Oromia region. Hackman's two-step method was employed on survey data from a regionally representative household survey. The study discovered that asset ownership, soil quality, agricultural extension, and level of infrastructural development are the significant drivers of crop diversification in Oromia. The study recommends that public investment and policy reform geared toward risk mitigation, soil health improvement, extension information, and reduction in transactions will have the greatest pay off in promoting agricultural diversification.

Inusa et al., (2018) investigates the impact of agriculture on economic growth of Nigeria using Ordinary Least Squares (OLS) regression technique on a time series data from 2016 to the second quarter of 2017. The study discovered that exchange rate has positively and significantly impacted agricultural output. Loans and advances, and total savings were also discovered to have significantly impacted agricultural output as a component of GDP. The study recommends that agricultural inputs be largely sourced locally and foreign exchange be made favorable, government allocation to the sector be increased and monitored to ensure prudency in its usage.

Adesoye (2018) examined how enhancing the agricultural value chain can contribute to rapid economic diversification in Nigeria. Autoregressive distributed lag (ARDL) model was employed as the econometric method of estimation from (1981-2015). Findings showed that agricultural raw material, machinery and land have direct impact on agricultural productivity in Nigeria while agriculture productivity had positive impact on economic growth in Nigeria. The study recommended that government should make deliberate efforts to create institutions that will make policy programmes on agricultural development not only to enhance its growth and the

overall output growth but also make it all inclusive.

3.0   Materials and Methods
3.1   Data and Data Source

Secondary data was   used in this study. The data was obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin and World Bank's Development Indicators. The models used in this study were estimated using data on non-oil exports (NOE) and some macroeconomic indicators which includes: government expenditure on agriculture (GEA), agricultural value added (AGV) and agricultural GDP (AGDP) for the period 1980-2016.

3.2   Model Specification

The model specifies that non-oil export (NOE) is significantly influenced by non-oil revenue (NOR), government expenditure on agriculture (GEA), agricultural value added (AGV) and agricultural GDP (AGDP). The research model adopts the Cobb -Douglas production function which takes the form:-

$$Q = f(AL^{\alpha}K^{\beta}) \dots\dots\dots\dots\dots\dots\dots\dots i$$

Where Q is the output; A is the level of technology; L is labor; K stand for capital; while α and β stand for the coefficients of labor and capital respectively.

The equation can be transformed by incorporating government expenditure on agriculture (GEA) as a proxy to labor (L) and non-oil revenue(NOR) as a proxy to capital(K), while agricultural GDP and agricultural value added as factor a inputs that determine non-oil export(NOE).The functional relationship can be expressed as follows;

$$NOE = f(AGDP, GEA, AGV, NOR) \dots\dots\dots ii$$

Where:
NOE = Non-oil exports
AGDP = Agricultural GDP
GEA = Government expenditure on Agriculture
AGV = Agricultural value added

NOR = Non-oil revenue

From equation (2) above, an econometric model can be generated by incorporating intercept (β_0) and disturbance variable (μ) as follows:-

$$NOE = \beta_0 + \beta_1 AGDP + \beta_2 GEA + \beta_3 AGV + \beta_4 NOR + \mu \dots\dots\dots iii$$

Finally, a time series model can be generated by adding (t) subscribe to equation 3 above with the exception of intercept of the model (β_0) as:-

$$NOE_t = \beta_0 + \beta_1 AGDP_t + \beta_2 GEA_t + \beta_3 AGV_t + \beta_4 NOR_t + \mu_t \dots\dots\dots iv$$

Equation four (4) is our final model for estimating the role of agriculture in the diversification of the Nigerian economy for a period of 37 years.

3.3   Method of Data Analysis

A time series data covering (1980-2016) a period of 37 years was estimated using Augmented Dickey Fuller (ADF) unit root test, Vector Autoregressive (VAR) method, Lag Length Selection Criteria, Johansen co-integration technique, Vector error correction model (VECM) and Ordinary least square estimator

3.3.1   Unit Root Test (ADF)

ADF test is used to determine the order of integration of a variable, i.e. how many times it has to be differenced or not to become stationary. The null hypothesis is that there is no unit root. The rule is that if the (ADF) test statistic is greater in absolute terms than the five percent critical value we accept the null hypothesis i.e. the variable is stationary, but if the (ADF) test statistic is less than the five percent critical value i.e. the variable is non-stationary we reject the null hypothesis and go ahead to difference once.

If the variable does not become stationary at first difference we difference twice. However it is expected that the variable becomes stationary at first difference.

The Fundamentals of Augmented Dickey Fuller (ADF) test

(1) $\Box yt = Yyt + \sum {}^{k}t = 1\beta1 \Box yt - 1 + tt$

(2) $\Box yt = a0 + Yyt + \sum {}^{k}t = 1\beta1 \Box yt - 1 + tt$

(3) $\Box yt = a0 + \partial2t + Yyt + \sum {}^{k}t = 1\beta1 \Box yt - 1 + tt$ v

Ho: $\delta = 0$, $\rho = 1$ (presence of unit root, the data is non-stationary)

H_1: $\delta < 0$, $\rho \neq 1$ (the data is stationary and does not need to be differenced)

Unit Root Equation

This test is conducted by "augmenting" the preceding three equations by adding the lagged values of the dependent variable Yt. The Augmented Dickey Fuller (ADF) test here consists of estimating the following regression:

$y_t = \alpha_0 + \alpha_{1t} + \delta y_{t-1} + \sum\limits^{m} j = 1 + ai\Delta y_{t-1} + \varepsilon_t$

$NOE_t = \alpha_0 + \alpha_{1t} + \delta NOE_{t-1} + \sum\limits^{m} j = 1 + ai\Delta NOE_{t-1} + \varepsilon_t$ vi

Where ε_t is a pure white noise error term, t is the time or trend variable and where $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$, $\Delta Y_{t-2} = (Y_{t-3} - Y_{t-3})$, etc. The number of lagged difference terms to include is often determined empirically, the idea being to include enough terms so that the error term is serially uncorrelated, so that we can obtain an unbiased estimate of δ, the coefficient of lagged Y_{t-1}

So the rest regressors equation is as follows:

$NOE_t = \alpha_0 + \alpha_{1t} + \delta NOE_{t-1} + \sum j = 1 + ai\Delta NOE_{t-1} + \varepsilon_t$

$NOR_t = \alpha_0 + \alpha_{1t} + \delta NOR_{t-1} + \sum j = 1 + ai\Delta NOR_{t-1} + \varepsilon_t$

$AGDP_t = \alpha_0 + \alpha_{1t} + \delta AGDP_{t-1} + \sum j = 1 + ai\Delta AGDP_{t-1} + \varepsilon_t$

$AGV_t = \alpha_0 + \alpha_{1t} + \delta AGV_{t-1} + \sum j = 1 + ai\Delta AGV_{t-1} + \varepsilon_t$

$GEA_t = \alpha_0 + \alpha_{1t} + \delta GEA_{t-1} + \sum j = 1 + ai\Delta GEA_{t-1} + \varepsilon_t$ vii

3.3.2 VAR-Lag Length Selection Criterion

Determination of the VAR lag length will be preceded by the estimation of differenced data through the unrestricted VAR. In order to avoid reporting unauthentic casual relations; it is important to determine the optimal lag length to be used for the estimation in the Johansen co-integration and the Vector error correction models. A combination of Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SC), Likelihood Ratio (LR), Hannan- Quinn (HQ), Final prediction error (FPE) were adopted and ran for the optimal lag length.

3.3.3 Johansen Co-integration Test

Co-integration is a statistical property possessed by some time series data that is defined by the concept of stationarity and the order of integration of the series. A stationary series is one with a mean value which will not only vary with the sampling period. The series will constantly return to its mean value as fluctuations occur. In contrast, a non-stationary series will exhibit a time varying mean.

$Xt = A1Xt - 1 + ... + ApXt - p + \beta xt + \mu t$ .... $viii$

Consider a VAR model of order p:

Assume the vector: $x = f$ (AGDP, GEA, AGV, NOR)

Where:
NOE = Non-oil exports
AGDP = Agricultural GDP
GEA = Government expenditure on Agriculture
AGV = Agricultural value added
NOR = Non-oil revenue

Assume that the vector has a VAR representation of the form:

$X_t = z + \sum \Pi_1 X_{t-1} + \mu_t$ ix

Decision Rule

Ho: = 0 (there is no co-integration among the variables)

H_1: $\neq 0$ (there is co-integration among the variables)

If the trace or Max-Eigen test statistics value is greater than its critical value in absolute terms at 5% level of significance, we reject Ho and accept H_1. This means that there is co-integration among the variables of study and otherwise there is no cointegration.

Co-Integration Test Equation.

Johansen's methodology takes its starting point in the vector auto-regression (VAR) of order p given by

$$\Delta Y_t = \mu + A1 y_t - 1 + \dots + A P y_t - P + e_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots x$$

Where Y_t is an nx1 vector of variables that are integrated of order one commonly denoted I(1) and ε_t is an nx1 vector of innovations. This VAR can be re-written as:

$$\Delta y_t = \mu_t + \Pi y_t - 1 + \sum j = 1 \Gamma_j = 1 \Delta y_t - j + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots xi$$

Now the equation of the study will be written as

$$\Delta NOE_t = \mu_t + \Pi NOE_t - 1 + \sum j = 1 \Gamma_j = 1 \Delta NOE_t - j + \varepsilon_t$$

$$\Delta NOR_t = \mu_t + \Pi NOR_t - 1 + \sum j = 1 \Gamma_j = 1 \Delta NOR_t - j + \varepsilon_t$$

$$\Delta AGV_t = \mu_t + \Pi AGV_t - 1 + \sum j = 1 \Gamma_j = 1 \Delta AGV_t - j + \varepsilon_t$$

$$\Delta GEA_t = \mu_t + \Pi GEA_t - 1 + \sum j = 1 \Gamma_j = 1 \Delta GEA_t - j + \varepsilon_t$$

$$\Delta AGDP_t = \mu_t + \Pi AGDP_t - 1 + \sum j = 1 \Gamma_j = 1 \Delta AGDP_t - j + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots xii$$

3.3.4   Vector Error Correction Model

Yule (1936) and Granger and New bold (1974) were the first to draw attention to the problem of spurious correlation and found solutions on how to address it in time series analysis. A vector error correction model (VECM) is a restricted VAR designed for use with non-stationary series that are known to be co-integrated. The VEC has a co-integration relation built into the specification so that it restricts the long-run behavior of the endogenous variables to converge to their co-integrating relationships while allowing for short-run adjustment dynamics. The co-integration term is known as the error correction term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments.

The purpose of the error correction model is to indicate the speed of adjustment from the short-run equilibrium to the long-run equilibrium state. However, the greater the coefficient of the vector error term (ECM), the higher the speed of adjustment of the model from the short-run to the long-run equilibrium.

The VECM express the relationship between Y_t and X_t. The model specification can then be express as:

$$\Delta Y_t = a_0 + \beta_1 \Delta X_t - \pi \mu_{t-1} + e \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots xiii$$

Only if then, Y_t and X_t are co-integrated, by definition $\mu t \sim I(0)$. Which will now have the advantage of including both long-run and short-run information. In this model,

$$\Delta LNOE_t = \alpha_0 + \alpha_1 \Delta NOR_t + \alpha_2 \Delta LGEA_t + \alpha_3 \Delta LAGV_t + \alpha_4 \Delta LAGDP_t + VECT_{t-1} + \mu_t \dots\dots\dots xiv$$

3.4   Diagnostic Checks

Diagnostic checks were further applied and appropriate lags levels determined to ensure a better model. These tests include

3.4.1   Serial Correlation

In order to find out where the error terms are correlated in the regression, we will use the Breusch-Godfrey Statistics. The Breusch-Godfrey serial correlation LM test is a test for autocorrelation in the errors in a regression model. It makes use of the residuals from the model being considered in a regression analysis, and a test statistic is derived from these. The null hypothesis is that there is no autocorrelation of any order up to p.

3.4.2   Heteroscedasticity Test

Breaking this assumption means that the Gauss–Markov theorem does not apply, meaning that OLS estimators are not the Best Linear Unbiased Estimators (BLUE) and their variance is not the lowest of all other unbiased estimators.

3.4.3   Normality Test

To find out if the error term is normally distributed with zero mean and constant variance. The Jarque-Bera test was used to test for the normality in the time series variable used.

4.0 Data Presentation and Analysis
4.1 Unit Root Test

The variables were verified for stationarity by subjecting them to unit root test using Augmented Dickey-Fuller test. The results of the unit root test are presented on table 4.1 below

Table 4.1
Unit Root Test

Variables	Order of integration	Augmented Dickey Fuller Test				
		Critical Values			ADF Statistic	Prob.
		1%	5%	10%		
NOE	I (0)	2.6639210	1.951687	1.610579	4.309301	0.0001
	I (1)	2.634731	1.951000	1.610907	7.057164	0.0000
ΔAGDP	I (1)	3.632900	2.948404	2.612874	4.621661	0.0007
ΔAGV	I (1)	3.639407	2.951125	2.614300	6.314073	0.0000
Δ2NOR	I (2)	3.653730	2.957110	2.617434	7.633912	0.0000

Source: (Computed by author using E-views 9)

1. Δ= Difference Operator
2. I(d) = No. of times of integration
3. Level = 10%, 5% and 1% level of significance

The results on table 4.1 above shows that the variables have been found to be stationary at level, first and second differencing at 1%, 5% and 10% level of significance respectively, i.e. one of the variable is integrated of order I (0), three (3) of the variables are integrated of order I(1) while the remaining one (1) is integrated of order I(2).

4.2 Vector Autoregressive Estimate.

VAR estimation enabled the determination of the optimal lag length selection while serial correlation test was conducted to determine the stability of the VAR equations where it was found that residuals were not auto correlated.

The result of the serial correlation LM test is presented on table 4.2.1 below.

Table 4.2.1 *Serial correlation LM test*

Lags	LM-Stat	Prob.
1	34.02548	0.1074
2	31.19919	0.1825

Prob from chi square with 25 df

From the table 4.2.1 above it can be observed that there is absence of serial correlation. In other words the residual are not autocorrolated.

Result of the VAR lag length selection criteria is presented on table 4.2.2 below

Table 4.2.2

VAR Lag Order Selection Criteria

Lag	Logl	LR	FPE	AIC	SC	HQ
0	-1045.991	NA	8.32e+19	60.05662	60.27881	60.13332
1	-908.8336	227.2893	1.39e+17	53.64763	54.98079	54.10784
2	-862.5201	63.51560*	4.52e+16*	52.42972*	54.87384*	53.27343*

*Indicates lag order selection by the criterion.

From the table 4.2.2 above, it is indicated that LR, FPE, AIC, SC, and HQ selected lag two (2) as the optimal lag   . L ag two (2) was selected for the estimation procedure as presented on the table.

Results of the Johansen Co -Integration Test are presented on tables 4.3.1 and 4.3.2

4.3 Johansen Co-Integration Test

Tables 4.3.1 and 4.3.2 compare unrestricted co-integration rank test obtained from the trace and maximum Eigen value test with the corresponding critical values due to Mackinnon. The results on tables 4.3.1 and 4.3.2 indicate that trace statistics show evidence of four (4) co-integrating equations and maximum Eigen statistics show evidence of two (2) co-integration equations at 5% critical value, which implies existence of unique long-run relationship between non-oil export and other variables of study in the model.

Table 4.3.1

Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5% Critical Value	Prob.**
None *	0.808984	123.6148	69.81889	0.0000
At most 1 *	0.610401	67.33119	47.85613	0.0003
At most 2 *	0.422540	35.28153	29.79707	0.0106
At most 3 *	0.379637	16.61158	15.49471	0.0338
At most 4	0.011064	0.378258	3.841466	0.5385

Source: (Computed by author using E -views 9)

Trace test indicates four(4)co-integrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**Mackinnon-Haug-Michelis (1999) p-values

From table 4.3.1 above, the trace statistic at (None * = 123.6148) exceeds its critical value of 69.81889, the null hypothesis of no co-integrating equations is rejected. Also the trace statistic at (At most 1* =67.33119) is greater than it critical value of 47.85613, the null hypothesis that there is one or fewer co-integrating equations is therefore rejected. Also the trace statistic at (At most 2* =35.28153) is greater than its critical value of 29.79707, the null hypothesis that there are two or fewer co-integrating equation can be rejected. While the trace statistic at (At most 3*=16.61158) is greater than its critical value of 15.49471, the null hypothesis that there are three or fewer co-integrating equation is also rejected. Finally the trace statistics at (At most 4 =0.378258) is less than its critical value of 3.841466, the null hypothesis that there are four or fewer co-integrating equation is therefore accepted.

Table 4.3.2

Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5% Critical Value	Prob.**
None *	0.808984	56.28359	33.87687	0.0000
At most 1 *	0.610401	32.04965	27.58434	0.0124
At most 2	0.422540	18.66995	21.13162	0.1068
At most 3 *	0.379637	16.23333	14.26460	0.0241
At most 4	0.011064	0.378258	3.841466	0.5385

Source: (Computed by author using E-views 9)

Trace test indicates 4 co-integrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level **Mackinnon-Haug-Michelis (1999) p-values

The Eigen value shown on table 4.3.2 also indicates the presence of co-integration. The max Eigen statistic at (None*=56.28358) exceeds its critical value of 33.87687, the null hypothesis of no co-integrating equations is rejected. Also the max Eigen statistic at (At most 1 *=32.04965) is greater than its critical value of 27.58434, the null hypothesis that there is one or fewer co-integrating equations is rejected. Also the max Eigen statistic at (At most 2 * = 18.66995) is less than its critical value of 21.13162, the null hypothesis that there are two or fewer co-integrating equations are accepted also the max Eigen statistic at (At most 3 * = 16.23333) is greater than its critical value of 14.26460, the null hypothesis that there

are three or fewer co-integrating equations can also be rejected. Finally, the max Eigen statistics at (At most 4 =0.378258) is less than its critical value of 3.841466, the null hypothesis that there are four or fewer co-integrating equations can be accepted. Therefore, since we found four co-integrating vectors, the economic interpretation of the long-run on Non-oil Export (NOE) in Nigeria can only be obtained by normalizing the estimates of the unrestricted co-integrating vector on the Non-oil Export.

Results of the VECM OLS estimates of NOE and the corresponding diagnostic tests are presented on tables 4.4.1 and 4.4.1.1 respectively.

4.4 Error Correction Model (ECM)
Table 4.4.1

VECM OLS Estimates of NOE

	Coefficient	Std. Error	t-Statistics	Prob.
C(1)	0.800572	0.471360	1.698429	0.1035
C(2)	-0.515845	0.435494	-1.184507	0.2489
C(3)	-0.739223	0.397155	-1.861298	0.0761
C(4)	0.442821	0.160371	2.761229	0.0114
C(5)	-0.371632	0.139189	-2.669992	0.0140
C(6)	3.038479	4.694494	0.647243	0.5242
C(7)	1.148653	4.029051	0.285093	0.7782
C(8)	0.157052	0.054252	2.894843	0.0084
C(9)	-0.059816	0.044050	-1.357908	0.1883
C(10)	-2.906915	1.718697	-1.691348	0.1049
C(11)	-0.874184	1.535580	-0.569285	0.5749
C(12)	11.01282	28.81686	0.382166	0.7060

R-squared = 0.422946   Adjusted R-squared = 0.134419
Durbin Watson D* = 1.670846 F statistics = 1.465880
Prob. (F-statistic) = 0.213954.

From table 4.4.1, above it can be seen that there are two error correction terms i.e C(1) and C(2), but the rule is that the ECT must be either positive significant or negative significant at 0.05. Therefore ECT (1) is positive and insignificant while ECT(2) is negative and also insignificant. R-squared is 0.42, indicating that 42% variation in the dependent variable is explained by the independent variables.

Diagnostic Test
Table 4.4.1.1
Diagnostic test result

	Test statistics	LM version	F version
1	Serial correlation	CHSQ(2)=0.0839	F(2,20)=0.02069
2	Heteroscedasticity	CHS(15)=0.0567	F(15,18)=0.0121
3	Normality	JB=11.73497	0.002830

From table 4.4.1.1 the result shows that the model is generally free from serial correlation. In other words the residuals are not auto correlated. Additionally, no evidence of heteroscedasticity was found in the errors of the estimated system while confirming that the errors are normally distributed. Therefore, it can be concluded that the results are not affected by white noise distribution process, enhances efficiency and consistency.

Results of the VECM OLS estimates of NOR and the corresponding diagnostic tests are presented on table 4.4.2 and 4.4.2.1 respectively

Table 4.4.2
VECM OLS Estimates of NOR

	Coefficient	Std. Error	t-Statistics	Prob.
C(13)	1.973988	0.525092	3.759316	0.0011
C(14)	-0.757838	0.485138	-1.562110	0.1325
C(15)	-1.359427	0.442428	-3.072653	0.0056
C(16)	0.351958	0.178652	1.970076	0.0615
C(17)	0.023499	0.155055	0.151550	0.8809
C(18)	-1.196091	5.229639	-0.228714	0.8212
C(19)	-2.315914	4.488339	-0.515985	0.6110
C(20)	0.063956	0.060437	1.058223	0.3014
C(21)	0.016217	0.049071	0.330481	0.7442
C(22)	-6.865892	1.914619	-3.586036	0.0016
C(23)	2.520183	1.710628	1.473250	0.1548
C(24)	79.78675	32.10181	2.485428	0.0210

R-squared = 0.806141 Adjusted R-squared = 0.709211
Durbin Watson D* = 2.307741 F statistics = 8.316772
Prob. (F-statistic) = 0.000015.

From table 4.4.2, above it can be seen that there are two error correction terms i.e C(13) and C(14), (ECT13) is positive and significant at 0.05, which means that there is a long-run relation or causality running from NOR, AGV, GEA, AGDP to NOE while ECT14 is negative in sign but insignificant.

R-squared is 0.80, indicating that 80% variation in the dependent variable is explained by the independent variables.

Diagnostic Test

Table 4.4.2.1

Diagnostic test result

	Test statistics	LM version	F version
1	Serial correlation	CHSQ(2)=0.0666	F(2,20)=0.0210
2	Heteroscedasticity	CHS(15)=0.4991	F(15,18)=0.5976
3	Normality	JB=101.8926	0.000000

From the above table 4.4.2.1 the result shows that the model is generally free from serial correlation. In other words, the residuals are not auto correlated. Additionally, no evidence of heteroscedasticity was found in the errors of estimated system while it was confirmed that the errors are normally distributed. Results of the VECM OLS estimates of AGV and the corresponding diagnostics test are presented on tables 4.4.3 and 4.4.3.1 respectively.

Table 4.4.3

VECM OLS Estimates of AGV

	Coefficient	Std. Error	t-Statistics	Prob.
C(25)	-0.068198	0.017529	-3.890556	0.0008
C(26)	0.058138	0.016195	3.589829	0.0016
C(27)	0.017823	0.014769	1.206763	0.2403
C(28)	-0.007743	0.005964	-1.298228	0.2077
C(29)	0.015306	0.005176	2.957093	0.0073
C(30)	-0.311638	0.174580	-1.785069	0.0880
C(31)	-0.206202	0.149833	-1.376208	0.1826
C(32)	-0.005441	0.002018	-2.697057	0.0132
C(33)	0.000643	0.001638	0.392346	0.6986
C(34)	0.108797	0.063915	1.702210	0.1028
C(35)	0.069290	0.057106	1.213365	0.2379
C(36)	-1.008834	1.071649	-0.941385	0.3567

R-squared = 0.671712   Adjusted R-squared = 0.507569
Durbin Watson D* = 2.007610 F statistics = 4.092219 Prob. (F-statistic) = 0.002393
From table 4.4.3, above it can be seen that there are two error correction term i.e. C(25) and C(26), ECT(25) is negative and significant at 0.05, which means that there is a long-run relation from NOR, AGV, GEA, AGDP to NOE. ECT26 is positive in sign and significant at 0.05 which means that there is also a long-run relation from NOR, AGV, GEA, AGDP to NOE or causality running from AGV to NOE
R-squared is 0.67, thereby indicating that 67% variation in the dependent variable is explained by the independent variables.

Diagnostic Test
Table 4.4.3.1
Diagnostic test result

	Test statistics	LM version	F version
1	Serial correlation	CHSQ(2)=0.3144	F(2,20)=0.4942
2	Heteroscedasticity	CHS(15)=0.5308	F(15,18)=0.6360
3	Normality	JB=0.323150	0.855025

From the table 4.4.3.1 the result shows that the model is generally free from serial correlation. i.e. the residuals are not autocorrelated. Additionally, no evidence of heteroscedasticity was found in the errors of estimated system. While normality of the errors, it was confirmed that the errors are normally distributed.

Results of the VECM OLS estimates of AGDP and the corresponding diagnostic tests are presented on tables 4.4.4 and 4.4.4.1 respectively.

Table 4.4.4
VECM OLS Estimates of AGDP

	Coefficient	Std. Error	t-Statistic	Prob.
C(37)	-4.208074	1.430771	-2.941122	0.0076
C(38)	2.999520	1.321902	2.269094	0.0334
C(39)	1.808751	1.205527	1.500381	0.1477
C(40)	0.321297	0.486791	0.660031	0.5161
C(41)	0.916372	0.422495	2.168957	0.0412
C(42)	5.207874	14.24972	0.365472	0.7182
C(43)	-23.21551	12.22982	-1.898270	0.0709
C(44)	-0.021495	0.164678	-0.130527	0.8973
C(45)	0.422076	0.133709	3.156666	0.0046
C(46)	6.737067	5.216951	1.291380	0.2100
C(47)	-3.958377	4.661118	-0.849233	0.4049
C(48)	31.97180	87.47099	0.365513	0.7182

R-squared = 0.761187   Adjusted R-squared = 0.641781
Durbin Watson D* = 2.079657 F statistics == 6.374762 Prob. (F-statistic) = 0.000118

From table 4.4.4, above it can be seen that there are two error correction term i.e. C(37) and C(38), ECT(37) is negative and significant at 0.05, which means that there is a long-run relation from NOR, AGV, GEA, AGDP to NOE or Causality running from AGDP towards NOE.

ECT26 is positive in sign and significant at 0.05, which means that there is a long-run relation from NOR, AGV, GEA, AGDP to NOE.

R-squared is 0.76 which means that 76% variation in the dependent variable is explained by the independent variables.

Diagnostic Test
Table 4.4.4.1
Diagnostic test result

	Test statistics	LM version	F version
1	Serial correlation	CHSQ(2)=0.7112	F(2,20)=0.8167
2	Heteroscedasticity	CHS(15)=0.3180	F(15,18)=0.3510
3	Normality	JB=0.575322	0.750016

From the table 4.4.4.1 the result shows that the model is generally free from serial correlation. Residuals are not auto correlated. No evidence of heteroscedasticity was found in the errors of estimated system and residuals of the errors are normally distributed. Therefore, it can be concluded that the results are not affected by white noise distribution process, enhances efficiency and consistency.

Discussion of Findings

The discussion of findings is done in line with objectives of the study.

Objective 1: To examine the impact of agricultural output on economic diversification in Nigeria.
The result showed that agricultural output had a positive relationship with and significant impact on non-oil exports (NOE) which is in line with the work of Oyetade and Oluwatoyese (2014) who concluded that the agricultural sector could be the determinant for exportation, if given due attention in all ramification in terms of funding and enabling the environment to key actors in the sector.

An increase in agricultural output brings about an increase in non-oil exports (NOE). As agricultural output increases (i.e. the total productivity of the economy, it enhances raw materials for industries and export promotion thereby leading to more employment of labor from both the agricultural sector and the industrial sector, and eventually increase in NOE.

Objective 2: To investigate the role agriculture in the diversification of Nigerian economy.
It was found that non-oil revenue had a positive relationship with non-oil exports (NOE). This is in line with the result of most researches as seen in the works of A. A. Awe and S.O Ajayi (2009) where the authors found that non-oil revenue has a positive and significant impact on economic diversification in Nigeria and

Adesoye (2018)who concluded that agriculture productivity had positive impact on economic growth in Nigeria.

5.0 Conclusion and Recommendation

The research aimed at examining the role of agriculture in the diversification of the Nigerian economy during the period 1980-2016. In the empirical exercise, the Augmented Dickey-Fuller (ADF) unit root test for finding out the presence of unit root in all the variables, the Johansen's co-integration test to check for long-run relationship among the variables, as well as the vector error correction model and the ordinary least squares were employed .We found that there was the presence of long-run relationship between non-oil exports (NOE), government expenditure on agriculture (GEA), agricultural GDP (AGDP), and agricultural value added (AGV).

Estimation results indicate that non-oil revenue had a positive and significant relationship with non-oil exports while government expenditure on agriculture had a negative relationship but significant impact on economic diversification in Nigeria over the period of study.

The following recommendations were made from the findings thus:
Government should endeavor to increase agricultural productivity by improving its expenditure on the sector so as to enhance the growth of the economy. And given that agricultural output was found to have a positive relationship with non-oil exports (NOE) and given that agricultural sector is the major contributor to gross domestic products (GDP) in Nigeria, which is capable of changing social indicators of the economy, policies aimed at adequate financing of agricultural sector by government in order to boost its output should be vigorously pursued in order to create more job opportunities.
Government should intensify its efforts towards the diversification of the economy to increase its non-oil revenue given the

findings that non-oil revenue has a positive and significant impact on the economic diversification of Nigeria.

Moreover, the anticipated benefits from agricultural sector have been minimal in Nigeria. There is therefore an urgent need to revive the sector through sufficient budgetary allocation, consistent policies and efficient utilization of allocated resources in order to guarantee poverty reduction, sustainable livelihood and enhanced food security which will lead to comprehensive agricultural development as well as economic diversification.

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