Nexus between Agriculture and Unemployment in Nigeria

Abstract

This study examined the impact of agriculture sector growth on unemployment level as well as the direction of causality between agricultural sector output and unemployment level in Nigeria. Secondary annual time series data between 1981 and 2016 were used for the study. Data on unemployment rate, agriculture sector output, public expenditure and industrial output were obtained from the Central Bank of Nigeria's statistical Bulletin while data on FDI and population growth were obtained from the World Bank World Development Indicators. The data were analyzed using ADF (Augmented Dickey Fuller Test) unit root test, Autoregressive distributed lag Bounds test of cointegration, Autoregressive distributed lag error correction model estimation and Granger causality. The results of ADF unit root test revealed variables were at different orders of integration, the ARDL bounds test revealed cointegration between variables, and the Autoregressive distributed lag error correction model estimation revealed that change in agriculture output in the current period is negative and significant for current unemployment level in Nigeria, while the change in one period lagged agriculture output was positive and significant for current unemployment level in Nigeria. Also the error correction term indicated that about 74.10 percent of the disequilibrium in the system in the previous year would be corrected in the current year. Granger causality test results revealed bi-directional causality between agriculture output and unemployment level in Nigeria. The study recommends that the Nigeria government should using strategic policies targeted at boosting agriculture output such as increasing access to land for peasant rural farmers, investments in agricultural research, and so on, seek to boost agriculture output in order to reduce unemployment in Nigeria. Further, the Nigeria government should ensure that agriculture sector development policies are consistent with the objective of reducing unemployment in Nigeria.

Keywords: *Agriculture output, unemployment, Nigeria*

1.0 Introduction

The Nigeria agriculture sector is seen as a necessary sector in creating a framework for the nation's economic growth. This was the view in the 1960s and in line with that agriculture was the dominant contributor to the Nigerian economy at the time. However since the 1970s onwards, agriculture sector's contribution to the Nigerian economy has declined on account of the oil boom of the 1970s which resulted in the neglect of the sector. Such Neglect of the Agriculture sector is further illustrated by the fact that over the past 20 years, statistics on Nigeria has shown that value added per capita in agriculture in the country was less than one percent per annum. This highlights concern for the Nigeria economy as the Nigeria government seeks to use agriculture at present to bring about improvements in the fortunes of the economy.

Further, unemployment constitutes a major challenge for the Nigerian economy as unemployment continues to rise with significant number of graduates completing tertiary education in Nigeria every year with little prospect of finding employment. The National Bureau of Statistics shows that Nigerian's unemployment rate increased to 25.64 percent in 2015 compared with 24.58 percent in 2014 and 23.52 percent in 2013. Also, NBS report (2016) showed that unemployment rate at 25.09 percent. However, the agriculture sector, given its labour intensive nature may act as a means through which the unemployed youths in Nigeria may be absorbed towards contributing productively to the Nigeria economy. Thus the Nigeria

agriculture sector may affect unemployment in Nigeria. Despite this though, a paradox may exist whereby unemployment may affect agriculture in Nigeria. This is so as Agriculture is culturally seen as an unskilled job and thus has little demand by university graduates compared with formal occupations. Higher unemployment may work to the benefit of Nigeria's agriculture sector as the unemployed living under poor living standards are encouraged to seek employment in Agriculture in other to earn a livelihood and get out of their deplorable state of poverty on account of their previous state of unemployment. The large population of youth in Nigeria is a great advantage and asset only if they are empowered and encouraged to participate in agriculture which has many advantages attached to it. Also the agriculture sector may experience a boost as its output increases, which will benefit the Nigeria economy as increased output may address Nigeria's food sufficiency challenge, provide input for manufacturing sector, and enable Nigeria diversify its present narrow line of exports.

The fact that unemployment rate in Nigeria remains unacceptably on the increase despite agriculture's high potential to promote diversified, inclusive and sustained growth, necessitates the need to look at the relationship between agriculture and unemployment in Nigeria in order to examine how linkages between unemployment and agriculture may be used to benefit the Nigeria economy.

Further while Agriculture sector can affect unemployment, there equally exists the potential for unemployment to affect agriculture resulting in a two-way causality, otherwise referred to as a Nexus between Agriculture sector and Unemployment in Nigeria. This Nexus between agriculture sector growth and unemployment has generated considerable debate in the agriculture and unemployment literature over the years. As a result of unemployment in Nigeria, availability of labour for employment in the agriculture sector results. Further the Nigeria agriculture sector has ample opportunities for absorbing the teeming unemployed graduates and ultimately enabling their positive contribution to the Nigeria economy. But then again the effect of unemployment on agriculture sector growth is yet unconfirmed and hence the persistence of the Agriculture sector-Unemployment Nexus debate. The questions from the foregoing thus: Does Agriculture sector output have any impact on unemployment level in Nigeria? What is the nature of causality between agriculture sector output and unemployment level in Nigeria?

2.0 Literature Review

Over the years in view of tackling unemployment, the federal government has since independence organized and formulated different versions of development plans, policies, processes, programs and practices to tackle unemployment and ensure jobs creation. Some of these programs have been experiencing implementation, monitoring and sustainability crises. Some of these programs include OFN(Operation Feed the Nation) by Obasanjo's regime, (1975-1978), Green Revolution (GB) by Shehu Shagari's administration (1979-1980), DFRRI (Directorate of Food, roads and Rural Infrastructure) by Ibrahim Babangida (1986-1992), SAP (Structural Adjustment Programme,1988-1992), NEEDS(National Economic Empowerment and Development Strategies,1999-2007).

While the adoption of SAP in 1986 led to a drastic reduction in unemployment in Nigeria, with unemployment rates as low as 1.9 percent recorded by Nigeria in 1995, Nigeria's unemployment subsequently rose thereafter hovering between 2.8% and 13.1 percent between 1996 and 2000. Also the policy initiatives and development plans by Governments providing a blue print to tackling Nigeria's challenges were either prematurely abandoned or the administrations with the initiatives short-lived such as that of Shehu Shagari. Some of the national development plans from independence include NDP (Civil hostility era, 1962-1969),

NDP (oil boom era, Murtala/Obasanjo (1975-1980), NDP (Obasanjo's public service reform era, 1999-2007), NDP(7 point agenda of Umaru Yar'Adua era and Jonathan Goodluck's 10 point agenda, NDP (drive to vision 20:20). Most of these intervention programmes were implemented as ad-hoc, poorly coordinated and marred by corruption and inefficiency. Instead of reducing unemployment, the reverse seems to be the case. (Salami, 2011 and Mustapha, et al., 2013).

Olanrewaju (2014) employed the chi-square statistical method of data analysis to establish if a relationship exists between youth participation in agriculture and unemployment, using primary data. The findings shows that youth are ready to practice agriculture in the absence of the scarce white collar jobs if government can provide enabling environment by funding and developing the agriculture sector. The results gave the same outcome validating that agricultural development/funding has positive effect on youth participation and thereby reducing unemployment.

Ayinde (2011) examined the effect of agricultural growth on unemployment and poverty in Nigeria over the period of 1980 to 2011. Data for the study was obtained from NBS, Central Bank of Nigeria, IMF publications and United Nations publications. ARIMA model, Granger Causality approach and Co-integration techniques of data analysis were used to analyse the data. The results from the Granger Causality test showed there is a unidirectional causation from poverty to agricultural growth change, unidirectional causation from poverty to change in unemployment and unidirectional causation from change in agricultural growth to unemployment rate meaning that agricultural growth and unemployment in Nigeria is dependent on poverty. Unemployment rate depend on agricultural growth during the time frame.

Bernard and Adenuga (2017) employed the Error Correction and the Granger Causality test to analyze the contribution of agricultural sector alongside other explanatory variables such as GDP, foreign private capital, federal government expenditure on employment generation in Nigeria. The study revealed that there is a positive relationship between agricultural output and employment generation in Nigeria. Thus, Bernard and Adenuga (2017) supported the Keynesian view that increase in aggregate supply will increase employment generation of a country. Ayinde (2008) examined agricultural growth and unemployment in Nigeria The study employed t-test, Duncan Multiple Range test, Granger Causality test and regression analysis. The t-test was used to establish whether there exists significant difference in the unemployment rates of rural and urban areas. The Granger Causality test was used to examine the dimension and the linkage between agriculture and unemployment. The results revealed that unemployment rate is generally higher in the urban areas which may be as a result of rural-urban migration and various organizations laying off their members of staff for them to become more computerized and mechanized. The Granger Causality test showed that there is unidirectional causation between agricultural growth and national unemployment and between urban unemployment and agricultural growth. This is a decade ago. What is the situation today? Ayinde (2008) recommended that for unemployment rate in Nigeria to be curbed, there must be a huge intervention in agricultural production and its sustainability in order to not let the macroeconomic problem persist and recommending policies to alleviate poverty should focus on increasing agricultural growth.

Agbonlahor and Enilolobo (2013) investigated the factors that influence immigrants' decision to settle in rural areas as a way of ensuring sustainable food production and rural development using multi-stage stratified sampling method to select 218 immigrants from 72 rural communities in southwest Nigeria. A sample survey was used to collect data on household, migrants' social characteristics and community characteristics. The data gotten was analyzed using descriptive statistics and logit regression model. The study found that rural immigrants play significant roles in sustaining and developing rural non-farm economy and the agricultural

sector through direct production, and as source of farm labour. Availability of farm land, proximity to high labour demand sources and presence of relatives in the rural community were found to be significant pull factors to rural communities. Household structure as well community related factors were found to influence propensity to settle in rural areas.

Enilolobo and Ohalete (2017) examined the impact of inclusive growth determinants on agricultural output in Nigeria over the period of 1981 to 2015 employing four macroeconomic variables: Agric GDP, Per Capita Income, Unemployment and Poverty Rates while Government Expenditure on Education, Labour Force and Government Expenditure on Health were used as control variables. Data were sourced from CBN statistical bulletin and World Bank and Augmented Dickey fuller (ADF) unit root test, Johansen co-integration test and Error correction model (ECM) techniques of analysis were applied on the model. The ECM result revealed that Agricultural output increases as unemployment and poverty rates fall and when per-capita income rises meaning that agriculture serves as a viable means of achieving the much desired inclusive growth. It was suggested that serious attention be paid at growing the agricultural sector by all stakeholders (government, private initiatives, research institutions and individuals).

Ogbalubi and Wokocha (2013) examined agricultural development and employment generation in Nigeria over the period of 1973 to 2002. The study revealed that Nigeria's Agriculture sector is still at a very low level of development and the agriculture sector is yet to take advantage of the potentials of the country in terms of climate, land and human resources.

Exploring the contributions of unemployed youths to agriculture in Sarduna local government area of Taraba state, Nigeria, Musa, Istifanus, and Vosanka (2012) employed chi-square to test the hypothesis and examine the significant impact of agriculture to unemployment and also used multiple regression analysis to analyze the data obtained from the study. Data was gotten from primary sources using structured questionnaires which were administered to the target respondents which were the unemployed youths with a sampling frame of 660 youths and the use of multistage random sampling technique. The study revealed that unemployed youths' contribution had played a greater role in the uplifting of agriculture which can significantly help them to be self-employed and can have great impact on them by providing income towards improving their wellbeing and standard of living.

Evidence from Roehlano (2013) discussion paper suggested that the agricultural and rural economy should be at the forefront rather than periphery, of the country's strategy for quality, employment generation. Such a strategy completing an unfinished reform agenda for sustained development of the rural economy which involves swift completion of the land reform program post-2014. Suggestions were that liberalization initiatives be pursued in the area of market policy and logistic, government should rationalize its role as a market regulator, support for agricultural production should be oriented towards enhancing agricultural productivity and comparative advantage based largely on the effective delivery of public goods and associated services such as R&D irrigation and other infrastructure.

Guido (2005) estimated the impacts of world agricultural trade liberalization on wages, employment and unemployment in Argentina, a country with positive net agricultural exports and high unemployment rates. Two sources of information were used which were labour force surveys and price indexes. Data on individual characteristics and labour markets were taken from the Argentine Encuesta Permanente deHogares, EPH (permanent household survey. Data from 1992 to 1999 on prices of agricultural goods were taken from the Statistical Institute in Argentina (INDEC). The major claim of the study is that the bulk of the impacts of trade reforms on the welfare of the population will take place through quantity adjustments in labour markets. The study tried to fill a gap in which the impacts of trade may be blurred by the existence of imperfections in labour markets, rigidities and adjustment costs. He found that a 10 percent

increase in the price of Argentine agricultural exports would bring about an increase of 1.36 percentage points in the probability of being employed. This change would be accounted for by an increase of 0.61 percentage points in the probability of labor market participation, and a decline in the probability of unemployment of 0.75 percentage points. The unemployment rate would decline by almost ten percent or by 1.23 percentage points. Expected market wages would increase almost one to one with export prices. More than 70 percent of this change would be brought about by a higher probability of getting a job. This result confirms that the gains from trade are not only revealed by higher market wages, but also by lower unemployment and highlights the importance of employment and labor supply responses to trade policies in empirical trade work. I suggest that first order approximations will fail to capture an important fraction of the total impacts and that the estimation of labor market responses is a critical component of any serious welfare evaluation of trade reforms.

3.0 Methodology

The theoretical framework adopted in this study is the Neo-Malthusian theory of population and unemployment which states that 'population tend to increase in geo-metric progression (1, 3, 5...9) whereas, the output in food production increase only in time lagged quantum of arithmetic progression (1, 2, 3…8)'. With a disproportionate growth in population in relation to food production, there would be food insecurity, hunger, disease and mass-unemployment. The theory is applicable to Nigeria given Nigeria's unemployment challenge which is attributed to neglect of the Nigeria agriculture sector by the Nigeria government and Nigeria's large population size. According to the Neo-Malthusian theory of population, mass unemployment amongst other challenges including food insecurity, hunger, and disease results from disproportionate growth in population relative to food production.

3.1 Model Specification

The model employed is a modification of the model of Bernard and Adenuga (2017). The model of Bernard and Adenuga (2017) is as in Equation (1) below:

Total Employment=*f(*Total Agriculture output, Real GDP, Foreign private capital, Public expenditure, Industrial output) (1)

The above model is modified for the purpose of this study as:

Unemployment = *f*(Share of agriculture in GDP, Foreign domestic investment, Public expenditure, Industrial output, and Population growth rate) (2)

The above Equation (2) transformed into an econometric model for the purpose of econometric analysis of data is as in Equation (3) below with all independent variables expressed in log transformations in line with standard econometric practice so as to standardize the coefficients of the model:

$$UNEMP_t = \beta_0 + \beta_1 Log\ SAGD_t + \beta_2 Log\ FDI_t + \beta_3 Log\ PEXP_t + \beta_4 Log\ INDQ_t + \beta_5 POPG_t + \varepsilon_t \quad (3)$$

Where,
UNEMP= Unemployment Rate
SAGD= Share of agriculture in total GDP
FDI = Foreign Direct Investment
PEXP= Public expenditure
INDQ=Industrial output

POPG= Population growth rate
ε =Error term

The above model features a constant, β_0 providing the value of unemployment, the dependent variable in the model while all independent variables remain unchanged. The remaining coefficients, β_1, β_2, β_3, β_4, β_5, are the effects of a one percent change in the value of respective independent variables on the dependent variables with other independent variables held constant. The subscripts t, refer to the time period of observations which in the case of this study is 1981 - 2016.

3.2 Justification of the variables inclusion

***Share of agriculture in GDP*:** The higher the output of the agriculture sector, the higher its contribution to the economy. This contribution can be in form of employment opportunities for youths especially in rural areas.

***Foreign direct investment*:** This is known as the acquisition by residents of a country of real assets abroad. This can be done by remitting money abroad to be spent on acquiring land, constructing buildings. This can have a positive impact of the country in terms of employment only if the foreign company employs indigenes of that country where it established the business.

***Public expenditure*:** This is the spending by government at any level. This includes spending on real goods and services purchased from outside suppliers, spending on employment in state services such as administration, defense and education, spending on transfer payments to the unemployed and pensioners, spending on subsidies and grants to industry etc.so the higher the public, expenditure, the lower the unemployment rate.

***Industrial output*:** The greater the output of the industrial sector, the greater its contribution to not only GDP but unemployment as more employment opportunities are created for youths.

***Population growth rate*:** The higher the rate of population growth, the higher the rate of unemployment as the job spaces is not enough to accommodate the rising population.

Therefore, based on economic theory, the following are the a-priori expectations of the independent variables specified in Equation (3): $\beta_0 > 0$, $\beta_1 < 0$, $\beta_2 < 0$, $\beta_3 < 0$, $\beta_4 < 0$, $\beta_5 > 0$

To investigate the direction of causality between agriculture sector output and unemployment in Nigeria, the study specified Granger-causality test model as specified in equations (4) and (5):

$$UNEMP_t = \sum_{i=1}^{n} \alpha_i \, LOG\ SAGD_{t-1} + \sum_{i=1}^{n} \beta_i \, UNEMP_{t-i} + \mu_{1t} \quad (4)$$

$$LOG\ SAGD_t = \sum_{i=1}^{m} \lambda_i \, UNEMP_{t-1} + \sum_{i=1}^{m} \delta_i \, LOG\ SAGD_{t-i} + \mu_{2t} \quad (5)$$

Where
UNEMP = Unemployment Rate
SAGD = Share of agriculture in GDP

The subscripts t refer to time periods and the disturbances μ_{1t} and μ_{2t} are assumed uncorrelated. The above equation (4) states that current values of Unemployment Rate are related to past values of Share of agriculture in GDP (proxy for Agriculture Output) and unemployment and equation (5) states that current values of Share of agriculture in GDP (proxy for Agriculture Output) are related to past values of Unemployment Rate and Share of agriculture in GDP (proxy for Agriculture Output) The reason for employing this model is to examine the direction of causality between Agriculture sector output and unemployment.

3.3 Measurement of Variables

The following are the definition of the variables employed in the respective models in this study.

Unemployment Rate (UNEMP): This is the percentage of the Nigeria Labour force that is not actively employed in productive occupation.

Share of Agriculture in GDP (SAGD): This is measured by the contribution to Nigeria GDP of the Nigeria agriculture sector in Billions of Naira.. This is the proxy for Agriculture sector output adopted for this study.

Foreign Direct Investment (FDI): This is measured by Net foreign direct investment inflow to Nigeria i.e. foreign direct investment inflow- foreign direct investment outflow. It is measured in Billions of Naira.

Public Expenditure (PEXP): This is the sum of capital and recurrent expenditures by the Nigeria government. It is measured in Billions of Naira.

Industrial Output (INDQ): This is measured by the contribution to Nigeria GDP of the Nigeria industrial sector in Billions of Naira.

Population Growth (POPGR): This is the growth rate of the population size in percentage.

3.4 Estimation Techniques

Augmented Dickey Fuller Unit root test, Autoregressive distributed lag (ARDL) Bounds test of cointegration and Autoregressive distributed lag (ARDL) Error correction model Granger causality test were used to estimate the models.

3.5 The Data

Data employed in this study is secondary data sourced from the Central Bank of Nigeria (2016) statistical bulletin and World Bank World Development Indicators (2016). In particular, time series data on Unemployment rate, Share of agriculture in GDP, Public expenditure and Industrial output was obtained from the Central Bank of Nigeria statistical Bulletin 2016. On the other hand, data on FDI and population growth were obtained from the World Bank World Development Indicators.

Table 1. Summary Statistics

Descriptive Statistics	Unemployment rate (%)	Share of Agric in GDP (Billions of Naira)	FDI (Billions of Naira)	Public expenditure (Billions of Naira)	Industrial output (Billions of Naira)	Population growth rate (%)
Mean	11.24	5205.18	2.70	1525.34	4567.76	2.59
Median	9.45	1384.01	1.57	594.082	1242.82	2.59
Maximum	25.70	21523.51	8.84	5185.32	18402.19	2.72
Minimum	1.90	17.05	0.189	9.637	37.02	2.50
Std. Dev.	8.01	6716.33	2.64	1850.78	6058.16	0.069
Skewness	0.584	1.104	1.047	0.955	1.207	0.201
Kurtosis	1.94	2.824	2.783	2.323	2.952	1.764
Observations	**36**	**36**	**36**	**36**	**36**	**36**

Source: Author's computation (2018)

From Table 1 above, unemployment rate has a mean of 11.24%, a Median of 9.45%, a Maximum of 25.70%, a minimum of 1.90%, and a standard deviation of 8.01%. The maximum unemployment of 25.70% reveals that Nigeria has experienced of very high unemployment while the mean unemployment reveals that on the average unemployment has been high and

needs to be reduced Further the distribution of unemployment rate is positively skewed with a long right tail given skewness of 0.584, while the kurtosis of 1.94 is indicative that unemployment has a flat distribution as the kurtosis is less than 3. With respect to Agriculture output, it has a mean of N5205.18 Billion, a Median of N1384.01 Billion, a Maximum of N21523.51 Billion, a minimum of N17.05 Billion, and a standard deviation of N6716.33 Billion. The maximum agriculture output of N21523.51 Billion reveals that agriculture output in Nigeria has been low despite the wealth of resources in Nigeria, and on average agriculture output has been substantially low at N5205.18 Billion suggesting concerns for the state of agriculture in Nigeria and the need for a boost in agriculture output. Further the distribution of agriculture output is positively skewed with a long right tail given skewness of 1.104, while the kurtosis of 2.824 is indicative that agriculture output has a flat distribution relative to the normal as the kurtosis is less than 3.

Foreign direct investment (FDI), it has a mean of N2.70 Billion, a Median of N1.57 Billion, a Maximum of N8.84 Billion, a minimum of N0.189 Billion, and a standard deviation of N2.64 Billion. The maximum FDI of N8.84 Billion is still rather low for a developing country as Nigeria to benefit from the dividends of FDI inflow to an emerging economy as Nigeria, while the mean FDI of N2.70 Billion is also very low indicating rather minimal FDI inflow on average to Nigeria Further the distribution of FDI is positively skewed with a long right tail given skewness of 1.047, while the kurtosis of 2.783 is indicative that FDI has a flat distribution relative to the normal as the kurtosis is less than 3.

Public Expenditure (PUBEX) has a mean of N1524.34 Billion, a Median of N594.082 Billion, a Maximum of N5185.32 Billion, a minimum of N9.637 Billion, and a standard deviation of N1850.78 Billion. The maximum public expenditure of N5185.32 Billion is quite low for the Nigeria government to spend on the Nigeria economy in view of the significant economic and social challenges facing the nation, and this is further illustrated by the low average public expenditure of N1524.34 Billion. Further the distribution of public expenditure is positively skewed with a long right tail given skewness of 0.955, while the kurtosis of 2.373 is indicative that public expenditure has a flat distribution relative to the normal as the kurtosis is less than 3.

Industrial output (INDQ) has a mean of N4567.76 Billion, a Median of N1242.82 Billion, a Maximum of N18402.19 Billion, a minimum of N37.02 Billion, and a standard deviation of N6058.16 Billion. The distribution of industrial output is positively skewed with a long right tail given skewness of 1.207, while the kurtosis of 2.852 is indicative that industrial output has a flat distribution relative to the normal as the kurtosis is less than 3.

Population growth (POPGR) has a mean of 2.59%, a Median of 2.59%, a Maximum of 2.72%, a minimum of 2.50%, and a standard deviation of 0.069%. This further makes the average population growth rate of 2.59% high for Nigeria which will result in adverse implications for the Nigeria economy especially as regards unemployment and poverty. The distribution of population growth is further positively skewed with a long right tail given skewness of 0.201, while the kurtosis of 1.764 is indicative that population growth has a flat distribution relative to the normal as the kurtosis is less than 3.

The Trend This provides an overview of the patterns of agriculture output and unemployment in Nigeria.

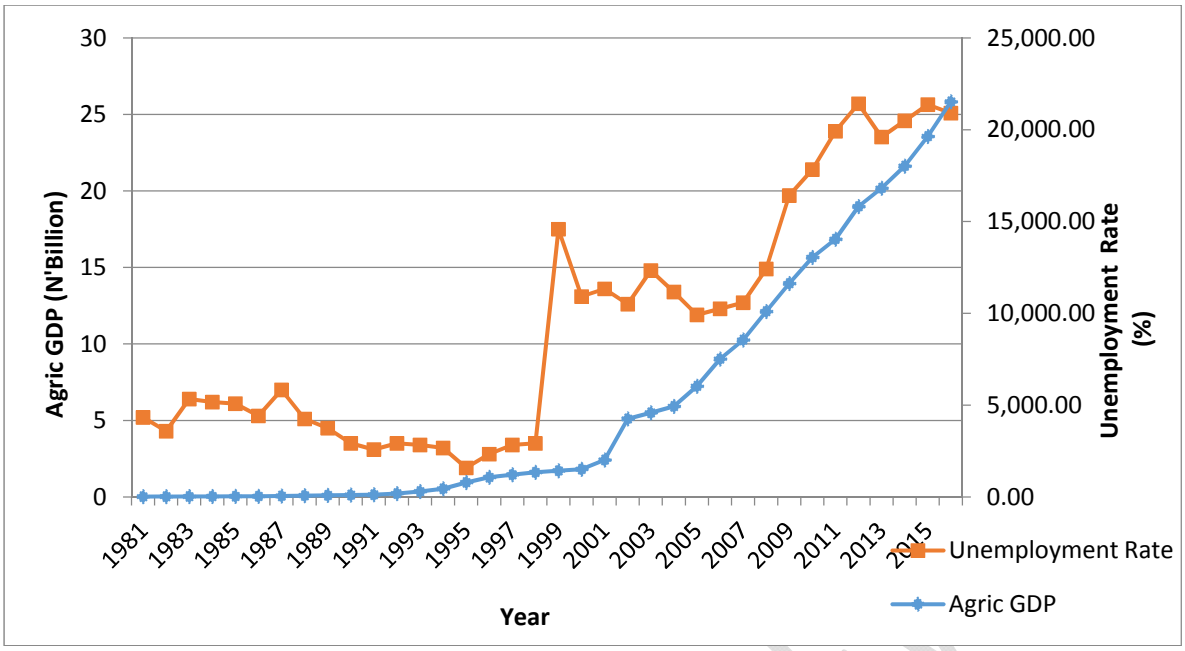

Figure 1. Agricultural GDP and Unemployment rate in Nigeria (1981-2016)

The graph (Figure 1) shows both the trend of agricultural output (proxied by agricultural GDP) and unemployment rate from 1981 to 2013 together. From the graph, it can be observed that there is no consistency in the flow of the two trends, although they move in the same direction. Both AGDP and unemployment increases over time, although there was instability in unemployment.

4.0 The Results

The results of econometric analysis of the data in line with the research objectives of this study are presented and discussed in this section. The econometric analysis techniques applied are unit root test, cointegration test, error correction regression and Granger causality test.

4.1 Unit Root Test of Variables

The results of Augmented Dickey Fuller unit root test of variables applied to the data employed in data analysis are presented in table 2.

Table 2: Augmented Dickey Fuller Unit Root Test Results With Intercept

VARIABLE	ADF TEST STATISTIC	ADF TEST CRITICAL VALUES			SIGNIFICANCE OF ADF TEST STATISTIC	INTEGRATION
		1%	5%	10%		
UNEMP	-7.135746	-4.252879	-3.548490	-3.207094	Yes***	I (1)
Log SAGD	-4.099713	-4.252879	-3.548490	-3.207094	Yes***	I (1)
Log FDI	-5.661702	-4.356068	-3.595026	-3.233456	Yes***	I (0)
Log PUBEXP	-4.603589	-4.262735	-3.552973	-3.209642	Yes***	I (1)
Log INDQ	-3.885711	-4.262735	-3.552973	-3.209642	Yes**	I (1)
POPGR	-3.817087	-4.339330	-3.587527	-3.229230	Yes**	I(0)

*****,**, indicate significance of ADF test statistic at 5% and 1% levels of statistical significance.**
Source: Author's computation (2018)

Table 2 reveals that the variables, UNEMP, Log SAGD, Log FDI, Log PUBEX, Log INDQ and POPGR are integrated of various orders ranging from I(0) to I(1). While Log FDI and POPGR are integrated of order zero, UNEMP, Log SAGD, Log PUBEX and Log INDQ are integrated of

order 1. In other words Log FDI, and POPGR are on their own stationary and do not need to be differenced, while UNEMP, Log AGQ, Log PUBEX and Log INDQ are non-stationary on their own and need to be differenced once to be stationary. The variables in the above table 2 based on their levels of integration may be employed in estimating the model as specified in equation (4), only after performing a cointegration test.

4.2 Cointegration Test

On the basis of evidence from table 2 above, the variables employed in the model to be estimated (equation (4) are a mix of I(1) and I(0) variables and therefore warrants the use of ARDL bounds test to test for cointegration between the variables as listed in Table 2 above and which also constitute the model specified (Equation (4)) The results of ARDL bounds test performed are presented in Table 3.

Table 3. ARDL Bounds Test Result

Sample 1981: 2016				
Included Observations: 32				
F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	7.783079	10%	2.26	3.35
K	5	5%	2.62	3.79
		2.5%	2.96	4.18
		1%	3.41	4.68

Source: Author's computation (2018)

The results of ARDL bounds test indicates the presence of cointegration between the variables in the model as the F-statistic of the bounds test of 7.78 is higher than the upper bound of the 5% Pesaran critical value bound for the test of 3.79. Therefore the null hypothesis of no cointegration is rejected and the alternative hypothesis of cointegation between all the variables as specified in Equation (4) of this study is accepted.

4.3 ARDL Error Correction Regression Model Results

The existence of cointegration between the variables as specified in equation (4) informs the estimation of the equation using ARDL Error Correction Regression Model and the result of the estimation of the model is presented in Table 4. Note that the chosen ARDL model of the form ARDL (2, 2, 3, 1, 4, 0) was determined based on Akaike information criterion and provides short run dynamic model estimates.

The results (Table 4) reveal that the estimated model is a parsimonious model on account of the R-squared of 0.856130, adjusted R-squared of 0.737080, Durbin-Watson statistics of 2.048445 and the statistically significant F-statistic of 9.421992 (Prob =0.000012<0.01). The R-squared of 0.856130 indicates that 85.61% of changes in unemployment in Nigeria are explained by changes in the respective independent variables constituting the model. The Durbin-Watson statistics reveals absence of autocorrelation, while the significant F-statistic indicates that all parameters of the model are jointly statistically significant.

Table 4. Autoregressive Distributed Lag Error Correction Model regression Results

ARDL Error Correction Regression
Dependent Variable: D(UNEMPLOYMENT_RATE)

Selected Model: ARDL(2, 2, 3, 1, 4, 0)
Sample: 1981 2016
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.077807	1.030478	7.838894	0.0000
D(UNEMP(-1))	-0.273414	0.120318	-2.272435	0.0394
D(LOG SAGD)	-5.786711	1.980943	-2.921190	0.0112
D(LOG SAGD(-1))	9.109295	2.312484	3.939181	0.0015
D(Log FDI)	-2.697070	0.795131	-3.391982	0.0044
D(Log FDI(-1))	-2.184372	0.780740	-2.797822	0.0142
D(Log FDI(-2))	-2.028611	0.646771	-3.136522	0.0073
D(Log PUBEX)	7.643613	1.495796	5.110063	0.0002
D(Log INDQ)	-0.274264	1.800090	-0.152361	0.8811
D(Log INDQ(-1))	-9.011830	1.694738	-5.317537	0.0001
D(Log INDQ(-2))	-3.526164	1.966446	-1.793166	0.0946
D(Log INDQ(-3))	-8.199127	2.193701	-3.737577	0.0022
CointEq(-1)*	-0.741010	0.093081	-7.960936	0.0000

R-squared	0.856130	Mean dependent var	0.590158
Adjusted R-squared	0.765265	S.D. dependent var	2.973747
S.E. of regression	1.440764	Akaike info criterion	3.859427
Sum squared resid	39.44021	Schwarz criterion	4.454882
Log likelihood	-48.75083	Hannan-Quinn criter.	4.056804
F-statistic	9.421992	Durbin-Watson stat	2.048445
Prob(F-statistic)	0.000012		

Source: Author's computation (2018)

Interpreting the coefficients of the estimated model, the constant, C of 8.077807 is statistically significant. Secondly, change in one period lagged unemployment, is negative and statistically significant for current unemployment in Nigeria at the 5% level with a coefficient of -0.273414 implying that a unit change in one period lagged unemployment level reduces current unemployment by 0.273414 units.

The coefficient of change in current period agriculture output (D(Log SAGD)) of -5.786711 is statistically significant at the 5% level. This implies that a unit change in current agriculture output reduces current period unemployment level in Nigeria by 5.786711%. The finding of negative relationship of agriculture with unemployment in Nigeria is consistent with findings by Bernard and Adenuga (2017) and highlights that benefits to the Nigeria economy in terms of reduced unemployment if the huge potential of Nigeria's agriculture sector can be achieved. Further the coefficient of change in one period lagged agriculture output (D(Log SAGD(-1)) of 9.109295 is statistically significant at the 1% level implying that a unit change in one period lagged agriculture output increases current period unemployment level in Nigeria by 9.109295%. reflecting the glut in the agriculture sector on account of excess production which may contribute to current period unemployment as labourers are laid off as a result.

Change in Foreign direct investment (D(Log FDI)), is statistically significant at the 1% level with a coefficient of -2.697070. A unit change in current foreign direct investment results in a 2.69% decrease in unemployment level in Nigeria. Further one period lagged Foreign direct investment (D(Log FDI(-1)), with a coefficient of -2.184372 and two period lagged Foreign direct investment (D(Log FDI(-2))with a coefficient of -2.028611 are statistically significant in reducing current period unemployment level in Nigeria

Change in Public expenditure (D(Log PUBEX)), is statistically significant at the 1% level with a coefficient of 7.643613. A unit change in current public expenditure results in a 7.64% increase in current unemployment level in Nigeria.

Change in industrial output (D(Log INDQ)) with a coefficient of -0.274264 is insignificant for current unemployment level in Nigeria. However one period lagged industrial output (D(Log INDQ(-1)) with a coefficient of -9.011830 and three period lagged industrial output (D(Log INDQ(-3))with a coefficient of -8.199127 are statistically significant in affecting current unemployment level in Nigeria. This may be because there is excessive demand for manufactured goods in Nigeria in one year lagged and three year lagged periods and therefore there is capacity for the sector to absorb the unemployed in Nigeria, which results in reduction of unemployment in Nigeria in the current period. Two period lagged industrial output (D(Log INDQ(-2)) with a coefficient of -3.526164 is statistically insignificant for current unemployment in Nigeria.

Finally, the error correction model term (cointeq(-1)) captures the long-run equilibrium of the estimates. Evidence from Table 4 above, indicates that there exists a long run relationship between unemployment and the independent variables of the model. The coefficient of the error correction model term (cointeq(-1)) is -0.741010 and is statistically significant at the 1% level. The coefficient of the error correction model term indicates that about 74.10 percent of the disequilibrium in the previous year would be corrected in the current year.

4.4. Causality between Unemployment and Agriculture Output

Unemployment and agriculture output may have a causal relationship. However causality may occur either in one direction or both directions and this must be established for informed policy decision regarding unemployment and agriculture output. Testing the causality between variables is performed in econometrics with the aid of Granger causality. Granger causality requires choosing an optimal lag length to be applied for the test on the basis of selection criterion of Akaike information criterion, Schwarz criterion, and so on amongst a number of lag selection criterion. To that effect Granger causality was applied to test the causality between unemployment and agriculture output as measured by agriculture GDP and the lag selection criteria of 4 was chosen on the basis of the lag selection criterion determined by most of the lag selection criteria. The null hypothesis of Granger causality test is "no causality" between unemployment and agriculture output, while the alternative hypothesis is "causality" between unemployment and agriculture output. The results of Granger causality test between unemployment and agriculture output are presented in Table 5.

Table 5. Pairwise Granger Causality test between Unemployment rate and Agriculture Output

Pairwise Granger Causality Tests
Sample: 1981 2016
Lags: 4

Null Hypothesis:	Obs	F-Statistic	Prob.
UNEMP does not Granger Cause Log SAGD	32	3.95909	0.0138
Log SAGD does not Granger Cause UNEMP		2.88612	0.0450

Source: Author's computation (2018)

The result of the test shows that there is two-way or bi-directional causality between unemployment (UNEMP) and agriculture output (Log SAGD) as the null hypothesis of "No

causality" between unemployment and agriculture output are rejected in favour of the alternative hypothesis. In particular the F-statistic of the Granger causality test testing whether unemployment rate Granger causes Agriculture output (Log SAGD) of 3.959 is statistically significant at the 5% level indicating that unemployment granger causes agriculture output in Nigeria. Similarly, the F-statistic (2.586) of the Granger causality test is statistically significant at 5% level indicating that agriculture output granger causes unemployment in Nigeria.

This finding may be explained by unemployment giving rise to agriculture output as the agriculture sector grows in response to rampant unemployment in Nigeria. For the unemployed due to their poor living standards, their unemployment acts as a catalyst for them to seek employment in Agriculture so as to earn a livelihood and get out of their deplorable state of poverty and as they do so they will contribute to agriculture output in Nigeria. On the other hand, agriculture output may cause unemployment in Nigeria as highlighted by Ayinde (2008) in the sense that increase in production of agricultural production in excess of demand creates a glut. Consequently in the subsequent production year it results into laying off of workers. Therefore bi-directional causality between unemployment and agriculture output indicates that both unemployment and agriculture output cause each other. This finding and result however goes against findings of unidirectional causality between agriculture sector output or growth and unemployment going from agriculture sector output or growth to unemployment by Ayinde (2008), Ayinde (2011) and Michael (2017).

5.0 Conclusion

Unemployment is a persistent challenge in Nigeria which has over the years not been effectively addressed. However the Nigeria agriculture sector on the basis of the research findings of this present study may be argued as a strategy to bring an end to Nigeria's high and rising unemployment challenges. Further there exists the potential for a two –way causal relationship between agriculture output and unemployment in Nigeria thus suggesting a nexus between agriculture output and unemployment. This present study using data from 1981 to 2016 explores the nexus between agriculture output and unemployment in Nigeria using Pearson's correlation, ADF unit root test, ARDL bounds test of cointegration, ARDL error correction model regression and Granger causality. The study reveals that agriculture sector output has a bi-directional causal relationship with unemployment, and agriculture sector output in the current period and one period lagged are significant for reducing unemployment in Nigeria. Specifically current period agriculture output is significant in reducing unemployment in Nigeria. The findings indicate the possibility for the Nigeria government to address Nigeria's long standing unemployment challenge by boosting agriculture output. Further Nigeria's unemployment level causes agriculture sector output in Nigeria indicating that Nigeria's agriculture sector may benefit from the unemployment situation in Nigeria. Thus the Nigeria agriculture sector has a central role to play in effectively bringing an end to high and persistent unemployment in Nigeria to the benefit of the Nigeria economy.

6.0 Policy Recommendations

The following are the policy recommendations arising from the findings of this study:

1. The Nigeria government should engage in strategic policies targeted at boosting agriculture output such as increasing access to land for peasant rural farmers, investments in agricultural research, and so on, seek to boost agriculture output in order to reduce unemployment in Nigeria.
2. The Nigeria government should ensure that agriculture sector development policies are consistent with the objective of reducing unemployment in Nigeria

3. The Nigeria government should use the prevailing unemployment situation in Nigeria to the benefit of Nigeria by strategically and optimally deploying unemployed individuals into the agriculture sector to the benefit of the agriculture sector and consequently the Nigeria economy.

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