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A Dynamic Analysis of Oil Revenue and the Performance of the Agricultural Sector in Nigeria

Lawrence, U. Egbadju[1*] & Victor, E. Oriavwote[2]

[1] Department of Accounting & Finance, Federal University Otuoke, Yenagoa, Bayelsa State, Nigeria

[2] Department of Economics & Developmental Studies, Federal University Otuoke, Yenagoa, Bayelsa State, Nigeria

[*] Lawrence, U. Egbadju, E-mail: lawuvie@gmail.com

Abstract

The main objective of the research is to empirically investigate the relevance of oil revenue to agricultural development in Nigeria. This is important because despite the numerous efforts by successive governments to diversify the economy, the level of agricultural output still remains abysmally low. The fallen oil price in the international market also makes this research to be timely. The research covered the period between 1981 and 2014. The cointegration technique and the granger causality tests were used for the study. The result indicates that oil revenue is not statistically significant in explaining the level of economic growth. The result of the granger causality test indicates that oil revenue does not granger cause agricultural output. The result is symptomatic since it casts some doubts on the diversification policies of successive governments in Nigeria. The result recommends, amongst others concerted efforts to revamp the agricultural sector through judicious use of the dwindling oil revenue and foreign investors should be encouraged to go into the agricultural sector in Nigeria.

Keywords

oil revenue, agricultural output, Foreign Direct Investment, cointegration, granger causality

1. Introduction

Prior to the discovering of crude oil, the driver of the Nigerian economy was revenue from agriculture. Nigeria was one of the leading producers of certain agricultural products as revealed in Appendix 1 showing Nigeria's position in 20 products produced globally. Oil was eventually discovered in 1956, in Otuabagi Land, Bayelsa State. By 1965, oil was already making tremendous contribution to government revenue and had taken over from agricultural products as the major foreign exchange earner for the country as at the end of the 1973/1974 financial year (Adeyemi & Abiodun, 2013) as Table 1 below indicated.

Table 1. Daily Average Crude Oil Production from 1961 to 1975

Year	Quantity	Year	Quantity	Year	Quantity
1961	46,032.6	1968	141,823.2	1975	1,784,956.3
1962	67,462.2	1969	540,286.3	2009	2,137,939.6
1963	76,475.3	1970	1,084,481.7	2010	2,454,913.4
1964	120,210.1	1971	1,531,175.0	2011	2,373,274.6
1965	272,202.2	1972	1,817,713.4	2012	2,329,990.9
1966	417,611.4	1973	2,056,033.7	2013	2,193,118.1
1967	319,324.1	1974	2,255,673.2	2014	2,187,785.2

Source: Nigerian National Petroleum Corporation 2005 & 2014 Annual Statistical Bulletin.

Revenue derived from the Nigerian economy between 1960 and early 1970s was mainly from agriculture while revenue from other sources was considered as residual. But from 1973/1974 financial year, Nigeria's revenue structure changed and oil share in federally collected revenue rose from 26.3% in 1970 to 81.8% in 1979, 72.6% in 1989 and 76.3% in 1999 (Odusola, 2006), Ihendinihu and Nwaiwu (2015) also reported that available data from Central Bank of Nigeria indicated that the oil and gas sector contributed 77.5% of federally collected revenue from 1986 to 2012 while non-oil sector generated only 22.5% for the same period. From 2005 to 2013, revenue from oil was 77% while that of non-oil revenue was 33% as pointed out in Table 2 below.

Table 2. Oil and Non-Oil Revenues from 2005 to 2013 Financial Years (Naira Billion)

Item \ Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
Oil Revenue	4,762.4	5,287.6	4,462.9	6,530.6	3,191.9	5,396.1	8,879	8,026	6,809	53,345.5
Non-Oil Revenue	857	773.4	1,252.5	1,336.0	1,652.9	1,907.6	2,237.9	2,628.8	2,950.6	15,596.7
Total Rev	5,619.40	6,061	5,715.4	7,866.6	4,844.8	7,303.7	11,116.9	10,654.8	9,759.6	68,942.2
Oil Rev(%)	0.85	0.87	0.78	0.83	0.66	0.74	0.80	0.75	0.70	0.77

Source: Central Bank of Nigeria (CBN) 2009 and 2013 Annual Reports.

The huge wealth from oil revenue was made possible by circumstances outside the control of any nation, known as the "oil price shock" especially from the 1973/1974 financial year. Nigeria became a member of Organization of Petroleum Exporting Countries (OPEC) in 1971 when the price of crude oil was about $3.00. Between October 1973 and March 1974, oil price has risen up to $12 following the Yom Kippur War between Israel and Arab countries as Arab oil exporting nations imposed an embargo on the nations supporting Israel with a cut in production by 5million barrel per day when Israel was attacked by Syria and Egypt on October 5, 1973 (Williams, 1998). He went on to note that the cumulative effect of the

Iranian revolution and the Iraq-Iran crisis drove up oil price from a stable price of $14.00 in 1978 to as high as $35.00 in 1981. The invasion of Kuwait by Iraq in 1990 and the ensuing Gulf War in 1991 made the price of crude oil to increase once again after years of steady fall. Thus, the increases in prices disappear after the events, only to emerge with another event, thereby creating shocks and disequilibria (Alley, Asekomeh, Mobolaji, & Adeniran, 2014). The oil boom from 1973 to early 1980s brought a positive terms of trade, drove up per capita income, led to rural urban drift for white collar jobs, and this negatively affected revenue from agriculture. The pitiable state of agriculture in Nigeria is as illustrated in cocoa and palm oil production in Table 3 and Table 4 below.

Table 3. Cocoa Beans Production for the Selected Years and Countries (Metric Tonnes/MT)

Year	Ghana	Nigeria	Ivory Coast	Indonesia	Year	Ghana	Nigeria	Ivory Coast	Indonesia
1961	415,200	197,000	85,000	N/A	1990	293,355	244,000	807,501	142,347
1970	406,000	304,800	179,156	N/A	2000	436,600	338,000	1,401,101	421,142
1980	277,200	153,000	417,222	10,284	2010	632,031	399,200	1,301,347	844,626

Source: Food and Agricultural Organization. Retrieved from http://www.faostat.fao.org/site/339/default.aspx

Ivory Coast overtook Nigeria in 1975 and Ghana in 1977 as the World biggest producer of cocoa. The country production in 2012 was 1,650,000 metric tonnes, Indonesia (936,300), Ghana (879,348) and Nigeria (383,000). Indonesia occupied the 20th position with 3909 in 1976 when Ghana's production was 326,700 and Nigeria's 231,796. The country overtook Nigeria in 1995 and Ghana in 2001.

Table 4. Palm Oil Production for the Selected Years and Countries (Metric Tonnes)

Year	Nigeria	Malaysia	Indonesia	Year	Nigeria	Malaysia	Indonesia
1961	437,000	24,600	34,331	1990	730,000	6,094,622	2,412,612
1970	488,000	431,069	216,827	2000	899,000	10,842,095	7,000,507
1980	650,000	2,573,173	721,172	2010	970,820	16,958,120	21,958,120

Source: Food and Agricultural Organization. Retrieved from http://www.faostat.fao.org/site/339/default.aspx

Nigeria maintained her first position in palm oil production until Malaysia took over from her in 1971 while Indonesia overtook Nigeria in 1980. Indonesia took over from Malaysia in 2009 and produced 26,900,000 metric tonnes in 2012, Malaysia (18,785,030) and Nigeria (940,000). Federal Ministry of Agriculture and Rural Development (2011) reported that in 1961, Nigeria was the leading exporter of groundnut with a world's share of 42%, 27% of the world's palm oil export, 18% of cocoa and 1.4% of cotton. This glory, however, has declined over the years ceding her dominance in export to China

(groundnuts and cotton), palm oil to Malaysia and Indonesia, and cocoa to Ivory Coast. Strong marketing organizations that linked the farmers to markets, improved planting material, improved seed utilization, fertilizer, adequate government expenditure and rural infrastructure were some of the reasons adduced to the competitors dominance. The report went on to indicate that fertilizer use in Nigeria is 13Kg/hectare compared to World average of 100Kg/hectare and 150Kg/hectare for Asia. Only 5% of the farmers could access the improved seeds and operates with only 10 tractors per 100 hectares compared to 241 tractors per 100hectares in Indonesia. Thus, Nigeria is unable to compete with others and consequently, it is estimated that Nigeria losses $10 billion agricultural exports annually. According to the World Bank (1988), progress toward achieving economic diversification was far less impressive as only Indonesia and Ecuador, among OPEC countries, managed to strengthen and diversify the non-oil sectors during the windfall decade. The other producers began and ended the period with uncompetitive manufacturing and agricultural sectors which contributed minimally to non-mining Gross Domestic Products (GDP). Agriculture started prior to or simultaneously with the industrialization of most nations and formed the backbone of those economies. Today, they have achieved food sufficiency with a lesser and lesser percentage of agriculture value added to total GDP while most African countries, Nigeria included, with larger percentage of agriculture value added to total GDP are net food importers. See Table 5 below.

Table 5. Agriculture, Value Added (% of GDP)

Year	Angola	Burkina Faso	Ecuador	Ghana	Indonesia	Senegal	Nigeria	South Africa	Zimbabwe	SSA	OECD	World
1981	N/A	30.7	16.3	55.3	23.4	22.3	28.5	4.6	17.7	20.6	N/A	N/A
1985	N/A	35.2	19.6	48.4	23.2	23.2	39.2	5.0	22.7	20.5	N/A	N/A
1990	33.3	29.1	21.4	45.1	19.4	19.9	31.5	6.5	16.5	21.0	N/A	N/A
1995	7.3	35.8	22.6	42.7	17.1	21.0	32.1	3.9	15.2	19.7	N/A	6.4
2000	5.7	19.2	16.3	39.4	15.6	19.1	26.0	3.3	18.3	17.1	2.0	4.0
2005	8.5	28.2	10.0	40.9	13.1	16.8	32.8	2.7	18.6	17.1	1.6	3.3
2010	9.8	23.3	10.2	30.8	14.3	17.7	23.9	2.6	14.5	15.1	1.5	3.0
2014	9.4	22.4	9.4	20.7	13.7	17.2	20.2	2.5	13.6	14.0	N/A	N/A

Source: World Development Indicator/The World Bank. Retrieved from http://www.data.un.org/Data.aspx?d=WDI&f=Indicator_Code%3ANV.AGR.TOTL.ZS

Although the African Heads of State in Maputo, Mozambique in 2003 pledged to increase their investment in food production and agriculture to the tune of at least 10% of their national budget, the 2007 survey conducted by African Union (AU) and New Partnership for Africa's Development (NEPAD) found that 50% of the countries spent less than 5% of their national expenditure on

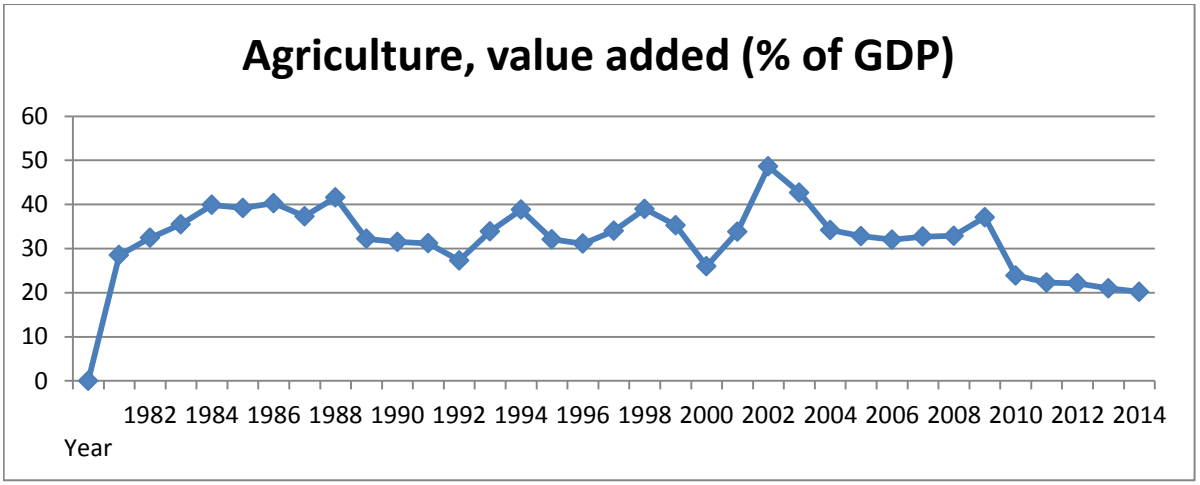
agricultural development (NEPAD, 2009). A decade after, only seven (Burkina Faso, Niger, Guinea, Senegal, Mali, Ethiopia and Malawi) of the 54 AU member states have consistently met the Maputo target of spending 10% of budgetary resources on agricultural and rural development (ONE, 2013), while Burundi, the Democratic Republic of Congo, Ghana, Madagascar, Zambia, and Zimbabwe have met or surpassed the 10 percent target in one or more years since 2003 (IFPRI, 2013). Nigeria is one of the countries that has made the least progress with only 2% of its national budget dedicated to agriculture, achieving about 7% target in 2006. In 2006, AU leaders made another pledge to allocate 1% of agricultural GDP to agricultural research and development (R&D). After seven years, only eight countries have exceeded the 1% target for agricultural R&D spending. On average, Africa has just 70 agricultural researchers for every one million people, Latin America 550 and 2,640 in North America (ONE, 2013).

It is instructive to note that most African countries, including Nigeria, do not have adequate records of percentage of total population engaged in agriculture unlike other continents where data on employment in agriculture (% of total employment) from 1981 to 2015 are readily available in the World Bank's web site. Thus, the objective of this study is to empirically evaluate the contribution of oil revenue to the development of the agricultural sector in Nigeria. This is timely and important for the Nigerian economy given the dwindling price of crude oil in the international market due to oil glut and the loss of United States as our major oil buyer. This has been made worst by the neglect of the non-oil sector, particularly the agricultural and manufacturing sectors by successive administrations. It is worth recalling that prior to the discovering of crude oil and even at the early stages of crude oil exploration, agriculture was the mainstay of the Nigerian economy. The question being asked is what contribution has the oil sector made to the agricultural sector in promoting overall economic growth? The answer to this question is necessary because most Nigerians live in the rural areas and engage in farming. A well harnessed agricultural policy could both create jobs and earns the needed foreign exchange for the nation. We, therefore, hypothesized that oil revenue has not influenced agricultural productivity in Nigeria. Other than this introductory section, the rest of the paper is divided into five sections, the second section borders on the problem statement while the third section is on the literature review. The fourth section is on the methodology while the fifth section is on the results and findings. The sixth section concludes this paper.

2. Problem Statement

1958-1981 could be regarded as the golden years for Nigeria. Although agricultural output has been declining fast since about 1975, the effect was unnoticed due to unexpected crude oil price increase, strong exchange rate and low population. What could have been an enduring blessings turned out to be a resource curse as agricultural labour force migrated from the rural areas to the cities in search of white-collar jobs for greener pasture. The nation has not been able to fully recover till today from the 1982 crude oil price crash. The graph below shows the trend in agricultural value added to GDP in

percent.



Source: Retrieved from http://www.data.un.org/Data.aspx?d=WDI&f=Indicator_Code%3ANV.AGR.TOTL.ZS

The ever dependence on oil revenue led to a rapid decline in foodstuff production to the extent that Nigeria became a net importer of food in the last one decade as shown in table below.

Table 6. Non-Oil Import and Non-Oil Export (Naira Billion)

Year	Non-Oil Import (A)	Non-Oil Export (B)	Net Import (A-B)	Year	Non-Oil Import (A)	Non-Oil Export (B)	Net Import (A-B)
2005	2,977,832.07	105,955.88	2,871,876.19	2010	5,857,515.83	404,828,.62	5,452,687.21
2006	3,315,351.81	133,594.99	3,181,756.82	2011	7,191,577.50	499,544.11	6,692,033.39
2007	3,536,439.47	169,709.78	3,366,729.56	2012	6,020,198.81	476,188.02	5,544,010.79
2008	4,071,296.26	94,316.70	3,976,979.56	2013	6,378,726.51	708,912.05	5,669,814.46
2009	3,590,909.17	286,325.54	3,304,583.63				

Source: CBN 2009 & 2013 Annual Reports.

Thus, the Governor of Central Bank of Nigeria (CBN), Mr. Godwin Emefiele, has decried the neglect of the agricultural sector by successive governments, saying Nigeria is now a net importer of agricultural produce with annual import bill of over N630 billion that covers large import of food products which include wheat, rice, flour, fish, tomato paste, textile and sugar (Udunze, 2015). In the midst of a continuous fall in oil revenue, the Central Bank of Nigeria (CBN) announced that revenues from non-oil products equally declined by $6.14 billion for the 12 months in 2015 (Anumihe, 2016).

3. Literature Review

3.1 Theoretical Literature

3.1.1 The Staples Theory of Economic Growth

The theory is closely related to an export-driven theories of economic growth and used to explain the growth and economic development of resource-rich economies. It was developed by members of what was then known as departments of political economy in Canadian universities. The two prominent among them were Harold Innis and Mackintosh, William whose works were rooted firmly in the historical examination of the development of the Canadian economic, social and political history between 1920 and 1940. A staple is a commodity which dominates an economy's exports like cotton, fish, yam, cassava, wheat, timber, cocoa beans, palm oil, rubber, etc. used to drive their development process. According to this theory, the availability of resources or staples in any region determines the type of economic activity in that region given a strong export demand and this has a pervasive impact on the entire economy. It attempts to show how regional natural resource endowments led to the linkages or spreading effect to the rest of the economy and to technological innovations. A well harnessed backward and forward linkages are expected to result in agricultural-industry interdependence leading to diversification around the staples production to the extent that the nation ceases to be a staples producer. If this is not the case, "staples trap" occurs where the economy becomes tied to the boom and bust cycles of primary commodity markets and therefore unable to achieve diversification, industrialization and long term prosperity.

3.2 Empirical Literature

Akwe (2014) researched on the impact of non-oil tax revenue on economic growth in Nigeria. To achieve this research objective, relevant secondary data from 1993 to 2012 were used. These data were analyzed using the Ordinary Least Square (OLS) regression methods. The result from the test showed that there exists a positive impact of non-oil tax revenue on economic growth in Nigeria. Baghebo and Atima (2013) studied the impact of petroleum on economic growth in Nigeria using data covering the period 1980-2011. The regressand is Real Gross Domestic Product (RGDP) while Foreign Direct Investment (FDI), OIL revenue (OIL), Corruption Index (CI), External Debt (EXDEBT) were the regressors. The results of the Johansen co-integration test revealed that the variables: oil revenue and corruption index impacts negatively on Real GDP, while FDI and EXDEBT have positive impact on the growth of the economy. Adesoji and Sotubo (2013) evaluated the effectiveness of the Nigerian export promotion strategies in diversifying the productive base of the Nigerian economy from crude oil as the major source of foreign exchange. The OLS was used to run the data from 1981 through 2010. The results showed that non-oil exports have performed below expectations. Alley, Asekomeh, Mobolaji and Adeniran (2014) examined the impact of oil price shocks on the Nigerian economy. The researchers used the General Methods of Moment (GMM) to test the data from 1981 to 2012. The study found that oil price shocks insignificantly retards economic growth while oil price itself significantly improves it. Oladele and Aderemi (2013) examined the impact of the Nigerian Extractive

Industries Transparency Initiative (NEITI) in promoting revenue transparency in the oil and gas industry. The study employed the OLS regression technique to analyze both the primary and secondary data collected. Results indicated that the establishment of NEITI has helped in reducing corruption and also encouraged tighter scrutiny of oil revenue flows. Bakare and Fawehinmi (2011) examined the econometric analysis of the extent to which oil revenue has affected standard of living in Nigeria. The OLS regression technique was used to analyze the secondary data from 1975 to 2008. The results showed a significant and negative relationship between oil revenue and standard of living in Nigeria. Mohsen, Maysam and Abbas (2012) examined the relationship between the government expenditure and non-oil revenues of 11 selected oil exporting countries over the period 1980-2009. The panel integration and co-integration techniques were applied to investigate the relationship between the three economic series: spending, non-oil revenues and GDP. The results show a strong causality from GDP and non-oil revenues to government spending in the oil exporting countries. Hodo, Emmanuel, Amenawo and Cornelius (2013) explored the relationship between oil revenue shock, non-oil export and industrial output in Nigeria using data spanning the period 1970-2010. Vector Autoregressive (VAR) model and co-integration technique were used to examine the long run relationship, while the Vector Error Correction Model (VECM) was used to analyze the short-run behaviour of the variables. The short-run result showed that it would take a very slow process for industrial output to recover from shock arising from variation in oil revenue while the long run result shows that oil revenue shock and policy/regime shift had negative impact on industrial output and non-oil export. Kareem, Bakare, Ademoyewa, Ologunla and Arije (2015) studied the nexus between the Nigerian government's expenditure on agricultural sector, agricultural output and economic growth. Secondary data from 1979 to 2013 were used, analysed by the OLS regression technique. The results indicated that government spending on agricultural sector has significant impact on economic growth. Ehigiamusoe (2012) investigated the performance of the agricultural sector under the military and the civilian regimes in Nigeria comparing the proportion of public expenditures on agriculture with the allocations to other sectors of the economy. Descriptive statistics was used to analyse the secondary data from 1984-1998 (military) and 1999-2012 (civilian). The results showed that there is a positive relationship between public expenditure on agriculture and agricultural performance under either regime. Oladipo and Fabayo (2012) investigated the effect of the global recession and the oil sector on economic growth in Nigeria. Data covering the period1990-2006 were used while the OLS was used to analyze the effect of oil activities on gross domestic product. The result revealed that there was a negative relationship between GDP and oil produced. Aroriode and Ogunbadejo (2014) examined the impact of macroeconomic policy on agricultural growth in Nigeria. Time series data from 1970 to 2010 were analysed using the OLS regression technique. The result showed that there is a positive relationship between agricultural output and GDP. Ugwuanyi and Matthew (2015) researched on the contribution of agriculture, petroleum, human capital to the economic growth in Nigeria. Time series data for the period 1970-2012 were used for this study. The results of the OLS regression technique showed that

while agriculture and petroleum contribute positively and significantly to economic growth, human capital contributes negatively and insignificantly to output growth.

Onwe (2012) took an overview of the economic implication of petroleum policies in Nigeria. Descriptive statistics was used to analyse the time series data obtained on the variables of interest. The results showed some increase in gross domestic product, foreign direct investment and employment generation but could not identify its direct economic benefits on the average Nigerian. Ihugba, Nwosu and Njoku (2013) studied the relationship between Nigeria's government expenditure on the agricultural sector and its contribution to economic growth. Time series data from 1980 to 2011 were tested using the OLS regression technique. The results showed a weak positive relationship between agricultural contribution to GDP and government expenditure on agriculture. Ijirshar (2015) empirically analysed the impact of oil revenue and industrial growth in Nigeria. The OLS regression technique was used to analyse the time series data from 1970 to 2013. Results revealed that oil revenue had a positive and significant influence on industrial growth in Nigeria on the long run but insignificant influence on the short run. Olajide, Akinlabi and Tijani (2014) examined the relationship between agricultural resource and economic growth in Nigeria. The OLS regression technique was used to analyse the time series data from CBN statistical bulletin, 1970-2010. Results showed a positive relationship between agricultural output and GDP. Akinlo (2012) investigated the importance of oil in the development of the Nigerian economy. Secondary data from 1960 to 2009 were used in this study and analysed with the OLS regression technique. Results showed that oil had an adverse effect on manufacturing, but had no relationship with agriculture, trade and service, building and construction. Nwanchukwu (2014) studied the relationship between non-oil export and economic growth in Nigeria. Data from CBN statistical bulletin for the period 1970-2013 were analysed using the OLS regression technique. Results revealed that all dependent variables (tariffs, bank credits and infrastructure) had positive relationship with GDP. Udofia and Essang (2015) examined the impact of agricultural expenditure on poverty alleviation in Nigeria. Time series data from 1980-2012 were analysed with the OLS regression technique. The results revealed a weak negative relationship between agricultural growth and poverty reduction in Nigeria.

4. Methodology

The cointegration technique and the granger causality methodologies were used to analyze the data. The Augmented Dickey Fuller (ADF) unit root test was used to test whether the data are stationary or not and their order of integration. This will serve as a pre-test to the cointegration test which is used to test for the existence of a long run equilibrium relationship among the variables. The Johansen methodology will be employed in this regard. This is because the Johansen methodology has the advantages amongst others for allowing for more than one cointegrating equation. The overparameterize Error Correction Model (ECM) and the Parsimonious ECM will enable us assess the various magnitudes and elasticities. This will enable us assess the hypothesis. The Granger Causality

test will be used to assess the causal relationship among the variables.

The model to be estimated is therefore specified below:

$LAGRQ = b_1OREV + b_2GFCF + b_3CPS + b_4FDI + U_t$, $b_1, b_2, b_3, b_4 > 0$.

Where:

AGRQ = Agricultural output

OREV = Oil Revenue

CPS = Credit to the private sector

FDI = Foreign Direct Investment

GFCF = Gross Fixed Capital Formation

L = Natural Logarithm

U_t = Error term.

The data used for the study covered the period between 1981 and 2014. the Data were collected from various issues of the Central Bank of Nigeria Statistical Bulletin and annual reports.

5. Results and Findings

The unit root test result shown in Table 7 below indicates that all the variables were stationary after the first difference was taken:

Table 7. Summary of ADF Unit Root Test Result

Variables	Level data	First Difference	Order of Integration
AGRQ	-0.11	-4.14*	I(1)
OREV	-2.13	-5.78*	I(1)
FDI	-0.83	-4.95*	I(1)
GFCF	2.33	-7.32*	I(1)
CPS	-2.14	-5.78*	I(1)

Note. 1) *Indicates statistical significance at the 1 percent level.

2) Critical values = 1% = -3.86, 5% = -2.96, 10% = -2.62.

This indicates that all the variables are integrated of order 1. That is, they are I(1) series. This allows for the estimation of the long run relationship. The result of the Johansen cointegration test is shown in Table 8 below:

Table 8. Johansen Cointegration Test Result

Hypothesized		Trace	5 Percent	1 Percent
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Critical Value
None**	0.960557	173.3449	68.52	76.07

At most 1**	0.786449	76.35823	47.21	54.46
At most 2*	0.417054	30.04185	29.68	35.65
At most 3	0.335642	13.85202	15.41	20.04
At most 4	0.051430	1.584002	3.76	6.65
Hypothesized		Max-Eigen	5 Percent	1 Percent
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Critical Value
None**	0.960557	96.98666	33.46	38.77
At most 1**	0.786449	46.31639	27.07	32.24
At most 2	0.417054	16.18983	20.97	25.52
At most 3	0.335642	12.26802	14.07	18.63
At most 4	0.051430	1.584002	3.76	6.65

The result of the trace statistic indicates a long run relationship among the variables since the trace statistic indicates 3 cointegrating equations, while the Max-Eigen statistic indicates 2 cointegrating equations. This result allows the estimation of the overparameterize ECM and parsimonious ECM which are shown below:

Table 9. Summary of Overparameterize ECM Result, Modeling: LAGRQ

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCPS	0.022343	0.115789	0.192966	0.8493
LCPS(-1)	0.259386	0.048410	5.358066	0.0001
LCPS(-2)	0.156025	0.068593	2.274668	0.0362
LFDI	0.100135	0.207724	0.482056	0.6359
LFDI(-1)	0.041964	0.170219	0.246528	0.8082
LFDI(-2)	0.306165	0.202827	1.509486	0.1495
LGFCF	0.342634	0.120008	2.855082	0.0110
LGFCF(-1)	0.251464	0.113712	2.211413	0.0410
LGFCF(-2)	0.316285	0.100056	3.161086	0.0057
LOREV	0.012342	0.072530	0.170165	0.8669
LOREV(-1)	0.043837	0.107174	0.409029	0.6876
LOREV(-2)	0.037649	0.104233	0.361196	0.7224
ECM(-1)	-0.662257	0.114133	-5.802524	0.0000
C	5.034630	2.891695	1.741065	0.0997

R^2 = 0.90, AIC = 0.86, SC = 1.51, DW = 2.02.

Table 10. Summary of Parsimonious ECM Result, Modeling: LAGRQ

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCPS(-1)	0.289132	0.043037	6.718232	0.0000
LCPS(-2)	0.184593	0.052585	3.510383	0.0018
LGFCF	0.294793	0.100685	2.927883	0.0074
LGFCF(-1)	0.226477	0.090085	2.514038	0.0190
LGFCF(-2)	0.331241	0.093662	3.536542	0.0017
ECM(-1)	-0.605096	0.093663	-6.460374	0.0000
C	7.908783	0.567406	13.93850	0.0000

R^2 = 0.93, AIC = -0.76, SC = -1.07, DW = 2.11.

Two lags each of oil revenue, FDI, Gross Fixed Capital Formation and credit to the private sector forms the overparameterize ECM. The result of the parsimonious ECM derived from the overparameterize ECM indicates that 93 percent of the total variation in agricultural output has been explained by the independent variables taken together. This is good enough since only 7 percent of the total variation was explained outside the model. The oil revenue as shown in the overparameterize ECM was not statistically significant, hence it was not shown in the parsimonious ECM. This may not be unconnected with the fact that in Nigeria, the revenue from the oil sector has not been used to expand the agricultural sector in Nigeria. This neglect has been partly responsible for the sluggish growth of the Nigerian economy. Foreign Direct Investment was not also significant. This is however not surprising since most of the foreign capital inflows into Nigeria have been on the oil sector since the agricultural sector has been left out in this respect. The result indicates further that the credit to the private sector and the Gross Fixed Capital Formation; have positive and significant impact on the level of agricultural output in Nigeria. The statistical significance of the ECM indicates a satisfactory speed of adjustment. It showed that about 61 percent of the errors are corrected in each period.

The result of the granger causality test is shown below:

Table 11. Granger Causality Test at Lag2

Null Hypothesis:	Obs	F-Statistic	Probability
LOREV does not Granger Cause LAGRQ	32	0.40838	0.66876
LAGRQ does not Granger Cause LOREV		0.61183	0.54970
LGFCF does not Granger Cause LAGRQ	31	7.48265	0.00271
LAGRQ does not Granger Cause LGFCF		1.34344	0.27846
LFDI does not Granger Cause LAGRQ	31	1.28182	0.29449
LAGRQ does not Granger Cause LFDI		1.30144	0.28929
LCPS does not Granger Cause LAGRQ	31	1.26250	0.29972

LAGRQ does not Granger Cause LCPS		0.06296	0.93913
LGFCF does not Granger Cause LOREV	31	0.38980	0.68109
LOREV does not Granger Cause LGFCF		0.36402	0.69836
LFDI does not Granger Cause LOREV	31	1.49748	0.24236
LOREV does not Granger Cause LFDI		4.82523	0.01651
LCPS does not Granger Cause LOREV	31	0.42555	0.65788
LOREV does not Granger Cause LCPS		11.0210	0.00034
LFDI does not Granger Cause LGFCF	31	3.63423	0.04057
LGFCF does not Granger Cause LFDI		1.16279	0.32834
LCPS does not Granger Cause LGFCF	31	4.26825	0.02495
LGFCF does not Granger Cause LCPS		1.58763	0.22359
LCPS does not Granger Cause LFDI	31	4.49965	0.02098
LFDI does not Granger Cause LCPS		4.29743	0.02441

The result of the granger causality test seems to go in line with the short run dynamic specification since it indicates no causality between oil revenue and agricultural output. Agricultural output didn't also granger cause oil revenue. Causality however ran from Gross Fixed Capital Formation to agricultural output. The causality that ran from oil revenue to Foreign Direct Investment insinuates the huge concentration of foreign investment on the oil sector in Nigeria. The same is not true for the agricultural sector. The result indicates that Foreign Direct Investment granger cause Gross Fixed Capital Formation and unidirectional causality also runs from credit to private sector to Gross Fixed Capital Formation. The result indicates bi-causal relationship between credit to private sector and foreign direct investment. An indication that foreign investors who are mainly in the oil industry even benefits more from the credit facilities than the agricultural sector in Nigeria.

The diagnostic checks results shown in the appendix indicates residual normality and residual stability.

6. Conclusion

This paper analyzed the impact of oil revenue on agricultural output in Nigeria. The cointegration technique and the granger causality methodology were applied for this study. The ADF unit root test result indicates that all the variables are I(1), while the Johansen cointegration test showed a long run relationship among the variables. The oil revenue was not statistically significant in explaining the level of agricultural output and was thus not included in the parsimonious ECM. This has some implications for the Nigerian economy because it indicates that the so called diversification by successive governments have not reflected in the output of the agricultural sector. This is indeed a sad situation since most Nigerians live in rural areas with agriculture as their main occupation. This problem has increased the level of unemployment and rural urban migration as well as loss of valuable foreign exchange earnings from supposed increased agricultural exports and huge money will be saved from

huge import bills for food and inputs for agro-allied industries. The result indicates that most of the Foreign Direct Investments coming into the country have not been on the agricultural sector. The result of the granger causality test at lag 2 indicates that in Nigeria, changes in oil revenue have not influenced the level of agricultural output in Nigeria. The study recommends judicious use of the dwindling oil revenue to expand the agricultural sector. This will increase the level of employment and will be a stable source of foreign exchange earnings into the country. This could be through increased agricultural exports and a reduction of importation of agricultural produce and their bye-products. Foreign investors should also be encouraged to go into the agricultural sector.

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Appendix

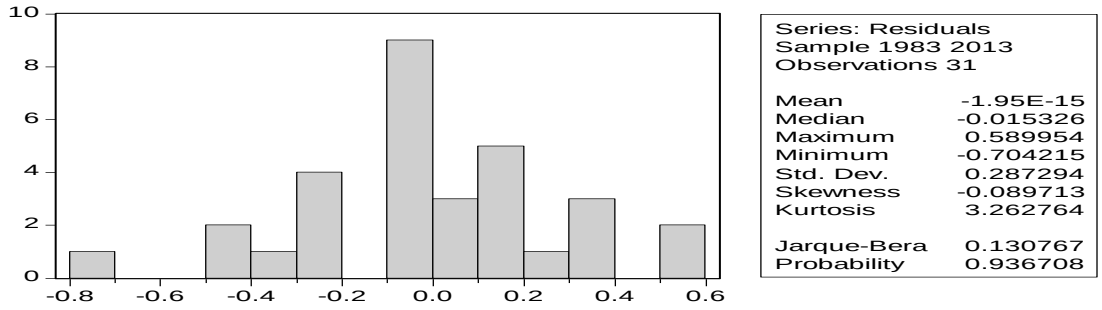
Table 1. Agricultural Products Produced by the First 20 Countries in the World

Products	1961	1970	1980	1990	2000	2010	2012
Cassava	4th(Indian)	4th(Brazil)	4th(Thailand)	4th(Thailand)	1st	1st	1st
Yams	1st	1st	1st	1st	1st	1st	1st
Groundnut with shell	2nd(India)	3rd(India)	7th(Indian)	5th(India)	3rd(China)	3rd(China)	4th(China)
Sorghum	3rd(India)	3rd(India)	4th(Indian)	4th(Indian)	2nd(India)	2nd(India)	1st
Fruit, citrus	1st	1st	1st	1st	1st	2nd(China)	2nd(China)
Millet	2nd(India)	3rd(India)	3rd(India)	2nd(India)	2nd(India)	2nd(India)	2nd(India)
Pineapples	2nd(USA)	2nd(USA)	4th(Thailand)	5th(Thailand)	5th(Thailand)	5th(Brazil)	7th(Thailand)
Palm oil	1st	1st	3rd(Malaysia)	3rd(Malaysia)	3rd(Malaysia)	4th(Indonesia)	5th(Indonesia)
Palm kernels	1st	1st	2nd(Malaysia)	3rd(Malaysia)	3rd(Malaysia)	3rd(Indonesia)	3rd(Indonesia)
Cocoyam	1st	1st	5th(China)	3rd(China)	1st	1st	1st
Fruit fresh	4th(India)	3rd(India)	3rd(India)	2nd(India)	3rd(India)	6th(India)	8th(India)
Cocoa beans	2nd(Ghana)	2nd(Ghana)	4th(Ivory Coast)	5th(Ivory Coast)	4th(Ivory Coast)	4th(Ivory Coast)	4th(Ivory Coast)
Chillies and Pepper	2nd(China)	2nd(China)	2nd(China)	4th(China)	6th(China)	8th(China)	8th(China)
Meat, game	3rd(USA)	3rd(USA)	3rd(USA)	4th(PupuaNew Guinea)	3rd(PNG)	3rd(PNG)	3rd(PNG)
Plantains	5th(Uganda)	5th(Uganda)	6th(Uganda)	5th(Uganda)	4th(Uganda)	6th(Uganda)	6th(Uganda)
Vegetables	13th(China)	12th(India)	15th(India)	12th(China)	5th(China)	4th(China)	4th(China)
Okra	2nd(India)	2nd(India)	2nd(India)	2nd(India)	2nd(India)	2nd(India)	2nd(India)
Maize, green	4th(USA)	3rd(USA)	8th(USA)	2nd(USA)	2nd(USA)	2nd(USA)	3rd(USA)
Mangoes	7th(India)	8th(India)	8th (India)	8th (India)	8th (India)	7th(India)	7th(India)
Rubber	6th(Malaysia)	7th(Malaysia)	8th(Malaysia)	6th(Thailand)	8th(Thailand)	9th(Thailand)	12th(Thailand)

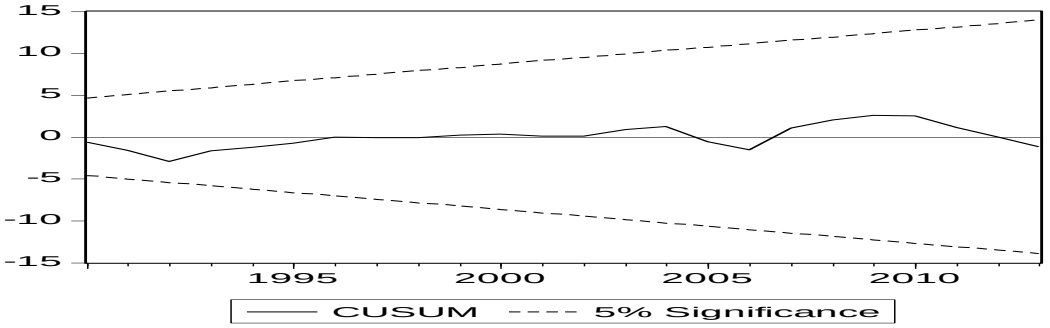
Source: Food and Agricultural Organization. Retrieved from http://www.faostat.fao.org/site/339/default.aspx

The countries in brackets are those that occupy the first position accordingly.

Normality test



CUSUM Stability test



CUSUMQ Stability test