International Journal of Operational Research in Management, Social Sciences & Education | IJORMSSE
p-ISSN: 2536-6521 | e-ISSN: 2536-653X
Volume 10 Number 1 May, 2024

Effect of Dutch Disease on the Agricultural Sector in Nigeria: An ARDL Approach

[1]Ogunoye, Aderounmu Adebayo, &[2]Adeyemi, P. A.
[1]*Department of Economics and Development Studies,*
Faculty of Arts and Social Sciences, Islamic University in Uganda, Mbale, Uganda
[2]*Department of Economics, Faculty of The Social Sciences,*
Ekiti State University, Ado Ekiti, Ekiti State, Nigeria

Article DOI: 10.48028/iiprds/ijormsse.v10.i1.21

Abstract

Nigeria's economy is seen as a mono-cultural economy as almost 80% of the government's revenue is coming from crude oil. This over-dependency on oil revenue hurts the economy due to the volatile nature of crude oil prices and it also causes a decline in agricultural sector output. This study, therefore examined the effect of Dutch Disease on agricultural sector output in Nigeria using annual data spanning from 1986 to 2021. The study employed Augmented Dickey-Fuller (ADF) to test for the stationarity of the time series properties of the research variables. The study also made use of the econometric tool of the Auto-Regressive Distributed Lag (ARDL) approach to estimate the short-run and long-run relationship between the agricultural output to the GDP and the determinants of the Dutch Disease in Nigeria. The overall result of the study exhibited the existence of a long-run relationship between a dependent variable and independent variables. The findings from the study revealed that there is a significant negative relationship between agricultural output and some explanatory variables such as oil revenue (OILRV), the real exchange rate (REXCH), and interest rate (INTR) with coefficients of -0.002184, -0.900190, and -0.000783 respectively. The result of the study also showed that there is a significant positive relationship between agricultural output and other regressors like government expenditure (GEXP) and trade openness (TOP) with coefficients of 0.006516 and 0.900129 respectively. Based on the findings of this study, it was recommended that the Agricultural sector should be regarded as a prerequisite and a core sector that could facilitate development as well contribute a greater percentage to the government's revenue through diversification of the economy. Also, the government should work out holistic policy measures to ensure a floating exchange rate and also make interest rates friendly for the farmers so as to boost agricultural output in Nigeria.

Keywords: *Dutch Disease, Agricultural sector output, ARDL model, and the Nigerian economy.*

Corresponding Author: **Ogunoye, Aderounmu Adebayo**

Background to the Study

Dutch disease is primarily associated with the discovery or exploitation of a valuable natural resource and the unexpected negative repercussions that such a discovery can have on other natural resources, sectors, and the overall economy of a nation (Marwan and James, 2021). Accordingly, (Bature, 2013) explained that the discovery of any tradable goods truly becomes a blessing by helping a nation to face its constitutional obligations to the people. The Dutch disease theory, therefore, refers to the situation in which a boom in an export sector leads to a shift of production factors toward the booming sector and an increase in the prices of non-tradable goods and services. Therefore, the Dutch disease is a paradoxical situation where good means for one resource or sector of the economy, such as the discovery of natural resources, resulting in a negative impact on the country's overall economy.

Agriculture is seen as the production of food and livestock and the purposeful tendering of plants and animals, (Ahmed *et.al*, 1993). He stated further that it is fundamental to the socio-economic development of a nation because it is a major element and factor in national development. In the same view, Okolo (2004) described the agricultural sector as the most important sector of Nigeria's economy which holds a lot of potential for the future economic development of the nation. Agriculture played a prominent role before and after the independence era in Nigeria's economy, as it was the leading sector before the oil sector was discovered. Nigeria was a net exporter of several agricultural products. Prominent among these commodities were groundnut, cocoa, cotton, palm oil, and palm kernel. Agriculture plays vital roles in the provision of employment opportunities for the teeming population, alleviates poverty and contributes to the growth of the economy. It is believed that a strong and efficient agricultural sector would enable a country to feed its fast-growing population, generate employment, earn foreign exchange, and provide raw materials for industries. On average in the Nigerian economy between 1960 and 1970, the agricultural sector output accounted for about 50 percent of the GDP and employed 72 percent of the labor force, Central Bank of Nigeria (CBN, 2005).

Globally, oil is seen as one of the most essential commodities. In Africa, Nigeria is considered the largest producers of oil and the fifth largest in the Organization of Petroleum Exporting Countries (OPEC). The discovery of oil in 1956 at Oloibiri Delta State brought about a shift from the agricultural sector of the economy to the emerging oil sector which resulted in a gradual decline over time in the agricultural sector output. For instance, Manyong, Ikpi, Olayemi, Yusuf, Omonona, Okaruwa and Idachaba (2005) stated that despite Nigeria's rich agricultural resource endowments, there has been an acute decline in agriculture's contributions to the nation's wealth. Oil for the past 3 decades has provided 90 percent of the foreign exchange earnings of Nigeria and is being used for financing about 80 percent of total government expenditure. The Nigerian economy is a suitable economy to test for the Dutch disease from the late 1950s, when its first oil deposit was discovered. The dependence on natural resources such as crude oil revenues makes the national economy vulnerable to market prices. The oil dependence and unpredictable oil prices in international markets can lead to problems in fiscal planning, reduce the

quality of public spending, and lead to financial disaster when oil prices drop unexpectedly.

Substantial economic growth is a result of the expiration of oil, and the boom of world oil prices during the past several years. Drilling, extraction, and exportation of crude oil have been increasing substantially and it has become the leading sector in the Nigerian economy while agricultural sector output has partially been neglected. Also, the evidence of what is called "Dutch disease" in Nigeria is due to the augments of crude oil exploration and exploitation as well as the geometric dwindles of the agricultural sector of the economy (Duruji and Dibia, 2017). Moreover, at the peak of the oil boom, NRGI, (2015) observed that the agricultural sectors of the economy were hurt as a result of the large increase in natural resource revenue. This harm was done by causing inflation or exchange rate appreciation and shifting labor and capital from the non-resource sector to the resource sector of the economy (Ross, 1999). Nigeria can no longer cultivate food for its fast-growing population nor could the agro-based industries operate at full capacity to serve the nation domestically as well as exporting to the international market (Aliyu, 2011). In addition to this, it is very perplexing that despite Nigeria's huge agricultural potential, the importation of many quantities and varieties of foods to feed its geometric population is on high increase (Onuka, 2017).

Furthermore, the enormous influx of cash from oil tends to foster wasteful, overzealous, extravagant spending and in fact, the high oil revenue raises the exchange rate and promotes an adverse balance of payment as the cost of imports rises (Otaha, 2012). According to Lewis (1984), the increase in natural gas prices associated with the balance of payment surpluses resulted in an increasing guilder during the 1970s. The appreciation in turn works against the Agricultural and manufacturing sector.

In literature, there have been several studies carried out regarding the effect of Dutch disease on the agricultural sector output. The findings from these studies are mixed up and inconclusive. Some researchers like Aliyu (2011) Ammani (2011) and Omgba (2011) discovered that Dutch disease has positive impact on agricultural sector output while researchers like Chukwuka et al. (2013), Adebisi (2012), Abdulaziz et al (2018), Pergis et al (2014) discovered that Dutch disease was negatively related with agricultural sector output. More so, there are missing variables such as interest rate and trade openness that are important which are not included in the previous studies. This study intends to incorporate them to get a robust result. It is against this backdrop that this study is set out to fill the gap, by examining the effect of Dutch disease on agricultural sector output in Nigeria.

Empirical Literature

Olusi and Olagunju (2005) examined the presence of Dutch Disease using Nigeria as a case study; in their study, quarterly data from 1980 to 2003 was used. A vector autoregressive (VAR) modeling was used as their method of estimation and the result reveals that the economy suffers from the Dutch disease. Aliyu (2011) had an empirical work where the

graphical descriptive statistics and the one-way analysis of variance technique were used, the investigation sought to know whether the neglect of the agricultural sector was due to a result of the discovery and exploitation of oil in Nigeria during the period of oil boom (1973-1983). The research found a significant increase in the quantity of capital expenditure allocated to the agricultural sector during the period of the oil boom and thus, more capital expenditure was allocated to the agricultural sector than was allocated to the health, education and defense sector in Nigeria during that period. After the findings of the study, he concludes by rejecting the hypothesis that the neglect of the agricultural sector was due to an oil boom.

Adebisi, (2012) examined the analysis of oil and exchange rate in Nigeria; a case of Dutch disease. He used annual time series data from 1960 to 2010. His study covers both fixed and post-fixed exchange rate systems in Nigeria. A Vector autoregressive (VAR) modeling, Impulse response functions (IRF), and Variance decomposition analyses were used. In his study, Dutch disease was diagnosed and the conclusion was made that the contraction of the agricultural sector in Nigeria was as a result of the sudden windfall from oil. Paulo, Jhean, and Guilherme (2017) carried out a study on the resource curse using a Dutch disease and economic complexity analysis for 122 countries from 1963 to 2013. From the study, it was established that oil shares were in excess of 50% of exports in oil-exporting countries. It was concluded that big data may offer significant contributions to the still-current debate surrounding the Dutch disease.

Onakoya and Adabanija (2013) examined the effect of oil discovery on sectoral performance in Nigeria, from the time period of 1975 - 2010. The study employed Vector Error Correction Mechanism (VECM). The VECM confirmed that oil discovery in Nigeria affects both the agricultural and industrial sectors. Is‟haq and Mansur (2016) Used the Autoregressive Distributed Lag (ARDL) approach, and time frame of 1981–2014. Is Nigeria affected by the Dutch disease? The findings revealed that Nigeria is more affected by corruption disease than Dutch Disease.

Chukwuka et al, (2013), examined the oil exploitation and agricultural commodity export in Nigeria, taking an empirical evaluation of the extent and impact of Dutch disease from 1970 to 2011 that is, annual time series data was used. Their study evaluates how the discovery and exportation of crude oil have impacted the production and exportation of agricultural output. The study was analyzed using co-integration and vector error correction models in other to explore the long-run relationship between agricultural commodity export and oil export. The results of this study show that in the long run, Dutch disease is present in Nigeria that is the more Nigeria produces and export oil, the lower the output and less competitive the traditional tradable sector becomes

Stijns (2003) employed a gravity trade model to empirically test the Dutch Disease syndrome in a number of countries. The study found strong evidence of the Dutch disease, with energy price-led booms systematically tending to hurt manufacturing exports of the energy exporters. Ogbonna, Innocent Chukwuka1, Uwajumogu et al (2013) examined the

impact of crude oil discovery, exploitation, and exportation on the agricultural commodity export (AGO) in Nigeria in the period 1970-2011. Specifically, the study sought to evaluate how the discovery and exportation of crude oil have impacted the production and export of agricultural output. Annual time series data were used. co-integration and vector error correction models were employed. The results show that in the long run, Dutch disease (DD) is present in Nigeria. Ibe, R. C and Ihejirika, U. (2017) empirically investigated the presence of Dutch disease (DD) in Nigeria covering the period from 1981-2015 by using the unit root test, Johansen cointegration technique, and Granger Causality test. The findings indicate the presence of Dutch Disease (DD) in Nigeria.

Ammani (2011) used a graphic descriptive statistic and one-way analysis of variance technique to answer the following question: "Was agriculture neglected as a result of the oil boom?" Secondary data on capital expenditure for the agriculture and health sectors, education, water resource, and defense sector were collected before and during the oil boom. The outcome showed that the capital expenditure and budgets allocated for the agricultural sector exceeded those of other sectors during the oil boom. However, the author confirmed that agricultural production in Nigeria cannot be attributed to the neglect of the agricultural sector that resulted from the oil boom. Omgba (2011) and Ammani (2011) claimed that the windfall of oil cannot be held responsible for the fall in the agricultural sector. The study utilized time series data for 1978–2009 and also applied VAR model and Granger causality test to explore the study. The results of the study did not reveal co-integration between the growth of the oil sector and non-oil sectors. However, Granger positively causes non-oil GDP growth in the short-run oil GDP growth.

Ijirshar (2015) looked into the empirical analysis of agricultural exports and economic growth in Nigeria. An annual time series data from 1970 to 2012 was employed in the analysis. The econometrics techniques used were: Augmented Dickey-fuller (ADF) unit root test, Johansen Co-integration test, and Error Correction Model (ECM). The results of the analysis showed that; the results of the co-integration test exhibited that a long-run equilibrium relationship exists among the variables. Also, the result of the Error Correction Model showed that agricultural export has contributed positively to the Nigerian economy. Fasanya, Onakoya, and Adabanija (2013) examined the effect of oil discovery on sectoral performance in Nigeria, from the time period of 1975 - 2010. The study employed Vector Error Correction Mechanism (VECM). The VECM results confirmed that oil discovery in Nigeria affects both the agricultural and industrial sectors. Moradi et al. (2010) applied the error correction model (ECM) to investigate the effect of price fluctuation on the amounts of industrial and agricultural value added to GDP and non-oil GDP for the Iranian economy. A symptom of Dutch disease was found. Sekumade (2009) also analyzed the effect of oil export and production on five agricultural export commodities. The result of ECM showed that the production of oil palm and groundnut is negatively affected by the amount of crude oil production. This finding means that increased production of crude oil in Nigeria causes less production of cocoa, cotton, and palm oil.

Laguda (2019) analysed the impact of Dutch disease on Nigerian economy using Ordinary Least square method, Two-Stage Least Square and Autoregressive Distributed Lag with a system of equation from 1981 to 2017. The study found a decline in the manufacturing sector over the years.

Obie (2022) assessed the prospects for reverse Dutch disease in the oil-rich economies of sub Saharan Africa. The study made use of household survey data to explore the study and it was revealed that there is a significant relationship between agricultural supply and international market. The study also showed that lowering the trade cost and boosting agricultural productivity can assist offset the lost income from oil.

Methodology

Theoretical Framework

This underpinning theory for this study is Dutch-Disease syndrome. The Dutch disease is associated with the adverse effect of the natural resource boom on the manufacturing sector/agricultural sector of a natural resource-rich country. The pioneering work on the Dutch disease was carried out by Corden and Neary (1982). Corden and Neary's (1982) theoretical analysis is based on the assumption that the naturally endowed country has three sectors known as the non-tradable sectors (NTS), manufacturing sector (MANP)/agricultural sector, and resource sector (RSEC). The boom of Natural resources will affect the naturally endowed country through the spending effect and the resource movement effect. The spending effect occurs when the government's expenditure increase occasion by a boom, which leads to an increase in domestic absorption and exchange rate appreciation. The resource movement effect also involves the movement of labor away from the non-tradable sector to the oil and gas sector thereby reducing output in that sector (Neary & Van1986). For the purpose of this study, the agricultural sector (AGRIC) is modeled and expressed mathematically below

$$AGRIC = f(NRS, EXCH, TEXP, LAB) \ldots\ldots (1)$$

Where; *AGRIC* = agricultural sector, *NRS* = natural resource, *EXCH* = Exchange rate, *TEXP* = Government expenditure and *LAB* = *LABOUR*

The schema for the equation 1 hold as follow

$$AGRIC\downarrow \rightarrow NRS\uparrow \rightarrow EXCH\uparrow \rightarrow TEXP\uparrow, LAB\downarrow \ldots\ldots\ldots\ldots (2)$$

Where the arrow indicates direction of each of the identified variables in the model.

The above equation is based on the certain assumption that holds that; labor is perfectly mobile among all three sectors and make sure that wage equalizes across them, all goods are for final consumption, trade is always balanced as national output always equals expenditure, and commodity and factor price are not distorted. In the above equation (ii), there is a decline in agricultural sector output caused by the negligence of the sector by the government due to an increase in natural resources. According to Michael (2003) increase

in oil sector output in Nigeria caused impediments to growth in other sectors as a result of easy money, lack of good policies from the government could have removed these obstacles and produced a more balanced pattern of growth. The continuous increase in this phenomenon leads to exchange rate appreciation and total expenditure of government (spending effect); therefore, leads to the movement of labor from the agricultural sector to the booming sector (natural resource). A situation is known as the resource movement effect.

Model Specification

The model for this study adopted the model of Corden and Neary (1982) with modifications which took its root from the theory of Dutch disease as stated above:

AGRIC = f(NRS, EXCH, TEXP, LAB) ……. (3)

The modified model for this study is given as follows;
AGRIC = f (OILRV, EXCH, INTR, TEXP, TOP) ……. (4)

Where;
AGRIC = Agricultural sector output,
OILRV = Oil Revenue used to proxy Dutch disease
EXCH = Exchange rate,
INTR = interest rate
TEXP = Total government expenditure
TOP= Trade openness

The autoregressive distributed lagged specification of equation (3.3) above is presented in equation (v) as:

$$\Delta AGRIC = \beta_0 + \sum_{i=1} \beta_1 \Delta AGRIC_{t-i} + \sum_{i=0} \beta_2 \Delta OILRV_{t-i} + \sum_{i=0} \beta_3 \Delta EXCH_{t-i}$$
$$+ \sum \beta_4 \Delta INTRt-i + \sum_{i=0} \beta_5 \Delta TEXPt-i + \sum_{i=0} \beta_6 \Delta TOPt-i + \omega_1 AGRICt-1$$
$$+ \omega_2 OILRVt-1 + \omega_3 EXCHt-1 + \omega_4 INTRt-1 + \omega_5 TEXPt-1 + \omega_6 TOPt-1 + vt \text{ ----------(v)}$$

Where: ω_1 -ω_6 are the long run multipliers and v_t is the white noise error.

Data Analysis and Interpretation of Result
Covariance Analysis
Table 1: Correlation Matrix

Variable	AGRIC	OILRV	EXCH	INTR	TEXP	TOP
AGRIC	1.000000					
OILRV	-0.275916	1.000000				
	0.0000					
EXCH	0.047101	-45.05772	1.000000			
	0.0486	0.2911				
INTR	0.342507	14.51562	56.88648	1.000000		
	0.0078	0.0625	0.5359			
TEXP	-0.081869	-5.334155	24.34722	-2.453527	1.000000	
	0.0005	0.0001	0.1586	0.4492		
TOP	12.37547	655.3543	-431.8772	693.7457	-227.7015	1.000000
	0.0000	0.0000	0.7887	0.0156	0.0000	

Source: Researcher's Compilation from E-view-9 (2023)

In Table 1 above, it was revealed that the agricultural sector output (AGRIC) coefficient was in line with Pearson's correlation assumption that states that there must be a perfect and strong relationship between a variable and against itself (i.e. X1 against X1). The economic implication of this is that continuous increase in agricultural output in the agricultural sector within the years reviewed is perfectly proportional to the factors inputs employed in the sector. For oil revenue (OILRV), it had a negative and strong relationship with agricultural sector output (AGRIC), with a coefficient value of approximately 27.6% and *p*-value of 0.000. Statistically, this implies that an increase in oil revenue brought about a decrease in agricultural products with a moderate degree of impact. This finding implies that declining in output in the agricultural sector is due to an increase in revenue generated from oil and gas industries which resulted in the government not providing enable infrastructural development for the sector.

In terms of the degree of association between exchange rate and agricultural sector output (AGRIC), the finding confirmed a moderate relationship between them with a coefficient value of 4.7% and *a p*-value less than 5%. This, therefore, confirmed a direct relationship between the duo with the exchange rate having a greater effect on it. In economic terms, the finding implies that exchange rate appreciation in terms of naira relative to the US dollar (N/$) encourages output in the agricultural sector in Nigeria.

The coefficient of interest rate proved to be positive and significant with a value of 34.3%. This shows that access to lower lending rate by farmers promote productivity in the agricultural sector by 34.3%. Also, the government expenditure (TEXP) *p*-value was less than 0.05 with a coefficient value of approximately 8.1%, implying a moderate degree of association. In economic terms, this shows that the contribution from the agricultural sector to the country's GDP is infinitesimal compared to other sources of revenue; hence, lower government expenditure. Furthermore, a direct relationship was confirmed

between trade openness and agricultural sector output (AGRIC) with a strong degree of association with a *p*-value of less than 5%. This established a positive relationship between them. From the correlation matrix above it was confirmed that the relationship between the variables identified was strong.

Pre-test Result

Augmented Dickey Fuller (ADF) Unit Root Test

Table 2: Results of Unit Root Test

Test at Level				**Test at first level difference**			**Level of**
Variable	ADF	1% C. V	5% C V	Test Statistic	1% C.V	5% C V	**Integration**
AGRIC	-0.395731	-3.646342	-2.954021	-3.901995	-3.646342	-2.954021	I(1)
OILRV	-1.698157	-3.632900	-2.948404	-6.425103	-3.639407	-2.951125	I(1)
EXCH	-4.172070	-3.632900	-2.948404	-7.089318	-3.639407	-2.951125	I(0)
TEXP	-1.175122	-3.639407	-2.951125	-9.108602	-3.639407	-2.951125	I(1)
INTR	-2.151251	-3.653730	-2.957110	-4.955468	-3.653730	-2.957110	I(1)
TOP	- 0.043661	-3.632900	-2.948404	-5.780109	-3.639407	-2.951125	I(1)

Source: Researcher's Compilation from E-view-9 (2023)

Table 2 shows the Augmented Dickey-Fuller (ADF) result of the test at level and test at first differences. The findings inferred that the exchange rate (EXCH) was the only variable that was stationary at level, i.e., I (0). Also, it was confirmed that all the variables include, agricultural sector output (AGRIC), oil revenue (OILRV), government expenditure (TEXP), and trade openness (TOP) stationary at the first level difference, i.e. I(1). The economic implication of this finding is that at the integration of order I(1), other economic variables do not cause change among the variables identified in the model; therefore, become independent of themselves.

Lag Order Selection

Since unit root tests have been applied, the next step is selection of the lag order to be used for the ARDL approach as developed by Pesaran *et al.* (2001).

Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	-595.2133	NA	92094894	35.36549	35.63485	35.45735
1	-441.5872	243.9945	94359.26	28.44630	30.33181*	29.08932
2	-394.6974	57.92270*	61327.32*	27.80573*	31.30738	28.99989*

* indicates lag order selected by the criterion

Table 2 shows the optimal lag length of the selected variables in the model; since the calculation of ARDL bounds is sensitive in the selection of the lag length. The finding

revealed that many of the criterion indicators selected an optimal lag length of two. Therefore, this study selected an optimal lag length of two because the majority of the criterion indicators selected it.

ARDL Result

Table 3: Short-Run Result

R^2=0.989432; Adjusted R^2 =0.984838; Prob.(F -statistic) = 0.000012*; Durbin -Watson stat*=1.998901				
Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.**
AGRIC(-1)	1.163196	0.066514	17.48808	0.0000**
OILRV	-0.002184	0.000652	-3.347436	0.0028**
EXCH	7.500005	4.780005	-2.195560	0.1305
EXCH(-1)	-0.900190	0.410005	-2.561208	0.0175**
TEXP	0.006516	0.002324	2.804245	0.0101**
TEXP(-1)	-0.002037	0.001503	-1.355061	0.1886
INTR	-0.000783	0.000212	-3.699408	0.0012**
TOP	-1.930005	4.000005	-0.482500	0.6362
TOP(-1)	0.900129	0.390005	2.307993	0.0112**
TOP(-2)	-0.230005	0.990005	-0.232330	0.1324
Constant	-0.009223	0.008168	-1.129147	0.2705
** *indicate statistically significant at the 0.05*				

Source: Researcher's Compilation from E-view-9 (2023)

Table 3 shows the short-run ARDL result. The results for agricultural sector output (AGRIC) for the immediate past year were significant with a direct effect. In economic terms, this implies that an increase in yearly output in the agricultural sector within an economy in the previous year, to a large extent influenced its increase in the current year. The direct and significant nature of agricultural sector output (AGRIC) could be attributed to the fact that agricultural sector output (AGRIC) is the highest employer of labor in Nigeria; hence, its production in terms of subsistence or large-scale contributes hugely to the economy. For the oil revenue (OILRV), the finding confirmed an indirect and statistically significant effect on agricultural sector output (AGRIC). The indirect and significant nature of the finding was not surprising when looking at the fact that there was a drastic decline in agricultural sector output (AGRIC) from years 1986-1995 when compared with the geometric increase in oil revenue during the same years.

The exchange rate (EXCH) had an inversely co-efficient (90.0%) and was statistically significant at the 5% level. In the immediate past year, the negative sign of the exchange rate was contrary to *the a priori* expectation formulated for this study. This finding implies that exchange rate appreciation reduces productivity in the agricultural sector and; therefore, reduces its share of yearly GDP. The contrary nature of the real exchange rate to manufacturing sector output could be attributed to the fact that Nigeria's government

adopts a floating exchange rate system in which the determination of the exchange rate is allowed by market forces.

Government expenditure (TEXP) was positive and significant at a 5% significance level. The economic implication of this finding is that a steady increase in agricultural productivity coupled with the high increase in oil revenue increases government spending on health, welfare, defense, education, and pension. The positive and significant nature of government expenditure is attributed to two reasons. First, revenue from crude oil over the past years has been the major source of revenue for the Nigerian government which increases government expenditure on both the recurrent and capital expenditure.

Secondly, agricultural sector output also contributes to the government's coffer through its sectoral contribution to real gross domestic product. The coefficient of interest rate (INTR) was significant and negative. The negative sign of the interest rate was in consonance with *a priori* expectation. In the case of interest rates, its economic implication is that reduction in lending rates would increase the demand for funds by farmers and investors in the agricultural sector; therefore, increasing productivity in the sector. Furthermore, trade openness (TOP) was directly related to the agricultural sector and had significance at 0.05. Thus, implying that the aggregate value of both the import and export coupled with gross domestic product influences agricultural sector output. However, the establishment of the positive influence of trade openness on agricultural sector output conformed to economic theory.

Bound Test Result

Table 4: ARDL Bounds Test

Test Statistics	**Value**	**K**
F-statistic	4.961379	5
Critical Value Bounds		
Significance	**I0 Bound**	**I1 Bound**
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

Source: Researcher's Compilation (2023) from E-view-9

The table above shows that the F-statistic value was greater than the critical upper bound value at 1%, 2.5%, 5%, and 10% significance levels; therefore, indicates a long-run relationship between agricultural sector output (AGRIC), oil revenue (OILRV), exchange rate (EXCH) government expenditure (TEXP) interest rate (INTR) and trade openness (TOP).

Table 5: Long-Run Estimates

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
OILRV	-0.013382	0.005611	-2.385130	0.0257**
EXCH	0.000703	0.000359	1.958372	0.0624*
TEXP	-0.027444	0.016045	-1.710467	0.1006
INTR	0.004796	0.001971	2.432890	0.0232**
TOP	-0.000293	0.000275	-1.064573	0.2981
Constant	0.056512	0.050735	1.113853	0.2768
** *indicates statistically significant at the 0.05 and 0.1 level*				

Source: Researcher's Compilation from E-view-9

The long-run result showed that oil revenue (OILRV) was significant at 5% with a direct effect on agricultural sector output (AGRIC), judging from the *p*-value (0.0257) which was less than 0.05. Statistically, this implies that a 1% increase in oil revenue brought about a 1.3% increase in agricultural sector output (AGRIC). Oil revenue had a strong effect on agricultural sector output judging from the obtained estimated coefficient. This implies that there is a high tendency in the future for the agricultural sector to be ignored at the expense of oil exploration.

Furthermore, it was confirmed that the exchange rate (EXCH) was significant and directly related to agricultural sector output (AGRIC), judging from the *p*-value (0.0624) that was greater than 0.1.

Statistically, this implies that the exchange rate had a positive effect on AGRIC. This implies that exchange rate appreciation was responsible for the increase in agricultural exported goods. The long-run result for government expenditure (TEXP) was not statistically significant at a 5% conventional level judging from the *p*-value of the estimated result that was greater than 0.05. The long-run coefficient of interest rate (INTR) had a positive sign and was significant at a 5% significance level. Statistically, this implies that a 1% increase in interest rate (INTR) brought about a 0.4% increase in agricultural sector output. The implication of this is that increase in the lending rate to the agricultural sector would increase in the long run. Hence, worsens productivity in the sector.

The coefficient of trade openness (TOP) was negative and not significant. This implies that trade openness had zero effect on agricultural sector output (AGRIC). The negative sign of trade openness was in consistency with *a priori* expectations. In the case of trade openness, its economic implication is that there is an increase in farm imported goods which results in a decline in the rate of agricultural out in the country.

Diagnostics Test for ARDL

Heteroskedasticity Test

Table 6: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.359136	Prob. F(10,23)	0.1430
Obs*R-squared	17.21577	Prob. Chi-Square(10)	0.1697
Scaled explained SS	10.70857	Prob. Chi-Square(10)	0.3807

From the result, the F-statistic is greater than 0.05. Hence, indicate that the ARCH test is free of Heteroskedasticity

Serial Correlation LM Test

Table 7: Breusch-Godfrey Serial Correlation LM Test

F-statistic	2.069357	Prob. F(2,21)	0.1513
Obs*R-squared	5.597594	Prob. Chi-Square(2)	0.1609

The serial correlation LM test suggests that the residual of the ARDL model did not suffer from autocorrelation. Therefore, The LM test indicates no serial correlation problem since the p-value is greater than 0.05.

Conclusion and Policy Recommendations

This study examined the effect of Dutch Disease on agricultural sector output in Nigeria using annual data spanning from 1986 to 2021. The overall result of the study showed there is co-movement of a long-run relationship between a dependent variable and independent variables. The findings also revealed that there is a significant negative relationship between agricultural output and some explanatory variables such as oil revenue (OILRV), the real exchange rate (REXCH), and interest rate (INTR) with coefficients of -0.002184, -0.900190, and -0.000783 respectively. The result of the study also exhibited that there is a significant positive relationship between agricultural output and other regressors like government expenditure (GEXP) and trade openness (TOP) with coefficients of 0.006516 and 0.900129 respectively. In line with the findings of this study, it was recommended that the Agricultural sector should be regarded as a prerequisite and a core sector that could boost development as well contribute a greater percentage to the government's revenue through diversification of the economy. Moreover, government should fashion out holistic policy measures to ensure a floating exchange rate and also make interest rates friendly for the farmers so as to boost agricultural output in Nigeria.

References

Adebisi, T. E. (2012). A Vector Autoregressive Analysis of oil and exchange rate in Nigeria: A case of Dutch disease, *British Journal of Arts and Social Sciences, 11(1).*

Ahmad, M., Ahmad, Z., Tetlay K. A. &, Heisey, P. W. (1993). Varietal change in post green revolution agriculture: empirical evidence for wheat in Pakistan, *Journal of Agricultural Economics, 44(3),* 428-442.

Aliyu, A. A. (2011). Nigeria's oil boom, was agriculture really neglected? *International journal of Statistics and Applications, 14(1),* 01-09.

Ammani, A. (2011). Nigeria's Oilboom Period (1973-1983): Was Agriculture Really 16 Neglected? *International Journal of Statistics and Applications 1(1),* 6-9.

Bature, B. N. (2013). The dutch disease and the diversification of an economy: Some case studies, *Journal of Humanities and Social Science (JOSR-JHSS), 15(5),* 06-14.

Corden, W. M. (1984). Booming sector and Dutch disease economics: survey and consolidation. *Oxford economic papers, 36(3),* 359-380.

Fasanya, O. I., Onakoya, A. B. O. & Adabanija, M. A., (2013). Oil discovery and sectoral performance in Nigeria: An appraisal of the Dutch disease, *The IUP Journal of Applied Economics, 12(2),* 25- 40.

Gujariti, D. N. & Porter, D. C. (2009). *Basic econometrics (5th edition), New York, McGraw Hill.*

Irefin, D. & Yaaba, B. N. (2012). Determinants of foreign reserves in Nigeria: An Autoregressive Distributed Lag Approach. *CBN Journal of applied statistics, 2(2).*

Ijirshar, U. V. (2015). The empirical analysis of Oil revenue and Industrial growth in Nigeria, *African Journal of Business Management,* 599-607.

Iimi, A. (2006). Did Botswana escape from the resource curse? *IMF Working Papers, 6(138),* 1-12.

Laguda, H. A. (2019). The impact of Dutch disease in Nigeria: Published M.Sc. thesis, Eastern Illinois University.

Manyong, V. M., Ikpi, A., Olayemi J. K., Yusuf, S. A., Omonona, B.T., Okaruwa, V. et al. (2005). *Agriculture in Nigeria: Identifying opportunities for increased commercialization and investment,* IITA, Ibadan, Nigeria, 159.

Marwan, A. & James, B. (2021). Oil boom, exchange rate and sectoral output: An empirical analysis of Dutch disease in oil-rich countries, *Resources Policy*, *74(1),* 1-14.

Moradi, M., Salehi, M, Keivanfar, M. (2010). A study of the effect of oil price fluctuation on industrial and agricultural products in Iran, *Asian Journal on Quality, 11(3),* 303-316.

Obie, P. (2022). Reverse Dutch disease with trade costs: Prospects for agriculture in Africa oil –rich economies, *Journal of International Economics, 138(1),* 1-12.

Ogbonna, I. C., Uwajumogu, N. R., Chijioke, G., & Nwokoye, E. S. (2013). Oil exploration and agricultural commodity export in Nigeria: An empirical evaluation of the extent and impact of the Dutch disease, *Journal of Humanities and Social Science, 14(1),* 1-10.

Okolo, D. A., (2004). Regional study on agricultural support: Nigeria's case, being special study report prepared for food and agricultural organization (FAO), *Science and Education,* 1-100.

Oji- Okoro, I. (2011). Analysis of the contribution of agricultural sector on the Nigerian economic development, *World review of business research. 1(1),* 191-200.

Olusi, J. O., Olagunju, M. A. (2005). The primary sectors of the economy and the Dutch disease in Nigeria, *The Pakistan Development Review, 44,* 159-175.

Onakoya, A. B. (2013). Foreign direct investments and economic growth in Nigeria: A disaggregated sector analysis, *Journal of Economics and Sustainable Development 3(10).*

Onuka, I. (2017). Reversing Nigeria's food import dependency-agricultural transformation economic development. *Agricultural Development Asian Online Journal Publishing Group, 2(1),* 1-12.

Otaha, J. I. (2012). Dutch disease and Nigeria oil economy, *An International Multidisciplinary Journal, Ethiopia. 6(1),* 82-90.

Ross, A. (1986). The United Kingdom‟s experience with North Sea oil and gas. *IDS Bulletin,* 14-21.

Sachs, J. D. & Warner, A.M. (1997). The curse of natural resources, *European Economic Review, 45(4), 827-838.*

Sekumade, A. B. (2009). The effects of petroleum dependency on agricultural trade in Nigeria: An error correlation modeling (ECM) approach, *Scientific Research and Essay, 4(11),* 1385-1391.

Smith, B. (2014). Dutch disease and the oil and boom and bust, Department of Economic, *Oxcarre Research Paper, 133,* 1-28.

Stijns, J. P. (2003). An empirical test of the Dutch disease hypothesis. *A Gravity Model of Trade. 82-83.*

Van-Wijnbergen, S. (1984). The Dutch disease: A disease after all? *The Economic Journal, 94(373),* 41-55.