ISSN: 2695-2556 (Online)
ISSN: 2651-5679 (Print)

AKSU Journal of Agriculture and Food Sciences 5 (1): 65-77, 2021

Agricultural Sub Sectors' Outputs and Economic Growth in Nigeria: Implication for Agricultural Production Intensification

Sunday B. Akpan*, Samuel J. Udoka and Inimfon V. Patrick
Department of Agricultural Economics and Extension, Akwa Ibom State University, Ikot Akpaden, Mkpat Enin, Akwa Ibom state, Nigeria

Corresponding author: sundayakpan@aksu.edu.ng

Abstract

This research was carried out to provide empirical information on the relationship between agricultural sub sector's production and the growth of Nigerian economy (proxy by the per capita GDP). Time series data were employed in this research and the analyses of the data were done using descriptive tests, unit root tests, multivariate regression based on the autoregressive regressive distributed lag (ARDL) testing bound model approach to cointegration. The result of the data analysis indicated that the agricultural sub sector's production significantly influences the movement of the per capita GDP of Nigeria in both short and long-run periods. The implication of the finding justifies the need for agricultural production intensification as a panacea for sustainable economic growth in the country. The prioritization of the agricultural sector and intensifying agricultural production as means of accelerating economic growth in the country were strongly recommended.

Keywords: agriculture, subsectors, production, economic growth, Nigeria

1. Introduction

Despite the contrary opinions of some experts (Gardner, 2005 & Chebbi, 2010) concerning the contribution of the agricultural sector to the economic development of the Sub-Saharan African (SSA) countries; many authors still hold firm to the positive contribution of the agricultural sector to economic growth of the region (Xinshen *et al.*, 2007, Izuchukwu, 2011; Akpan *et al.*, 2012a, Akpan *et al.*, 2012b, Olajide *et al.*, 2012; Akpan, 2012; Lavorel *et al.*, 2013; Ahungwa *et al.*, 2014; Yusuf, 2014; Akpan & Patrick 2015a, Olaniyi *et al.*, 2015; Kamil *et al.*, 2017, Kenny, 2019 & Akpan, 2019). Subsequent to the submission of Lewis (1954), agricultural sector development is seen as a cogent and prerequisite for sustainable industrial and economic development. Though in recent times, several challenges (conflicts, climate change, extreme poverty, corrupt governance, natural disaster, the changing pattern of consumption, dynamic international trade policies, etc.) have seriously affected the smooth development of the agricultural sector; it is still a major livelihood activity source to the majority of resource-poor and vulnerable population in Africa (Julian *et al.*, 2004; Matahir, 2012; FAO, 2017, Akpan *et al.*, 2019a, Akpan *et al.*, 2019b and Dawd *et al.*, 2019).

In Nigeria, the sector is largely dominated by small-scale farmers who utilized obsolete tools in fragmented land spaces and constituting about 60 — 70% of the country's workforce

(Beinteman & Stadt, 2006 and Nwafor *et al.,* 2011 and Akpan & Udom 2018). The sector has contributed significantly to the growth of the country's GDP, food security, employment generation and stimulation of primary product exports (Akpan *et al.,* 2012a, Margaret & George 2016; Aderibigbe & Manson 2018; IFAD, 2014). The sector is also known to attract a considerable volume of imports, thereby constituting as a catalyst for international trade (Akpan *et al.,* 2015b). Being a traditional sector, it is mostly considered a reliable source of raw materials for industrialization through its backward linkages (Akpan and John, 2020).

During the early independence era, the importance of the agricultural sector was obvious, as the country was one of the major World producers and exporters of oil palm, rubber, cocoa and groundnuts. The sector was the major earner of foreign exchange and constitute the bulk portion of the country's GDP. Following the Lewis (1954) structural transformation theory, the simultaneous relationship between the agricultural sector and the then evolving industrial sector would have propelled the country to an era of sustainable development marked by industrial and agricultural revolutions. However, this was not the case as the contribution of the country's agricultural production for the domestic and global markets witnessed a gradual decline with a corresponding increase in import demand. The emergence of the oil sector in the 1970s stimulated seemingly unsustainable import substitution policies that were meant to boost industrialisation and instead bred corruption and further relegated the agricultural sector to the bottom as a second-tier revenue source in the country.

Following the abysmal performance of the agricultural sector, the Federal Government of Nigeria (FGN) responded by enunciating several policies and programs to boost activities in the sector. Both monetary and fiscal policy instruments were used as sources of intervention in the sector, while tax holidays and custom duties were often employed to boost activities in the sector for several years. Agricultural based programs like Agricultural Development Projects (ADP) in 1974, Operation Feed the Nation (OFN) in 1976, River Basin-Development Authorities (RBDAs) in 1976, Green revolution (GR) in 1980, National Agricultural Land Development Authority (NALDA) in 1992 and FADAMA projects in the 1990s among others were set up with the aims of increasing agricultural production and productivity (Iwuchukwu & Igbokwe, 2012; Akpan *et al.,* 2012c and Federal Ministry of Agriculture and Rural Development, 2016). The sector's responded accordingly as shown in the last column of Table 1. The last column described the average contribution of the agricultural sector to the total GDP. The sector's contribution to the GDP was inconsistent and highly unpredictable and did not reflect the huge resources and myriad of interventions invested and implemented respectively by all tiers of governments. Currently, the country's food import is estimated at $5 billion to $10 billion annually with its devastating effect on the domestic food economy and the external reserve (National Bureau of Statistics, 2021). The pertinent question that arises following the current economic realities, high poverty rate and self-food insufficiency status of Nigeria is; whether the agricultural sector has significantly and sufficiently influenced the economic growth?

Table 1: Contribution of Agricultural Sector in the GDP of Nigeria

Policy period	Average Contribution of agric. Sector in GDP	Average Total GDP	Average % Contribution of Agric. Sector in GDP
1981 – 1985	25.12	165.09	15.00
1986 – 1990	70.93	338.22	20.64
1991 – 1995	367.62	1484.59	23.38
1996 – 2000	1311.68	4936.92	27.15
2001 – 2005	4364.09	14471.85	30.47
2006 – 2010	10167.99	39942.71	25.61
2011 – 2015	16865.19	79595.09	21.29
2016 – 2019	26187.88	121787.11	21.46

Source: Computed by the author and data derived from CBN. Variables are measured in ₦b and at current market prices.

Many scholars have attempted to answer the above question by using theoretical and or empirical frameworks without a consensus inference. For instance, Oluwatoyese & Applanaidu, (2013) found a significant relationship between agricultural sector output and economic growth in Nigeria. Similarly, Oyinbo & Rekwot (2014) carried out an empirical investigation on the relationship between agricultural production and the growth of Nigerian economy with a focus on poverty reduction. The result indicated that agricultural production was significant in influencing the favourable trend of economic growth in Nigeria. In the same vein, Kenny, (2019) empirically examined the role of agricultural sector performance on economic growth of Nigeria. The finding established a significant long-run relationship between the agricultural sector and indicators of economic growth in Nigeria. Similar results were reported by Kamil *et al.*, (2010), Olajide *et al.*. (2012), Oje-Okoro (2011), Akpan, (2012), Ahungwa *et al.*, (2014), Awoyemi *et al.*, (2017) and Inusa *et al.*, (2018). However, Mathew & Adeboye (2010) submitted a contrary view.

From the literature reviewed, it is observed that most researchers used aggregated measures of agricultural output or value to investigate its relationship with economic growth indicator. The agricultural sector consists of sub-sectors (crop, livestock, forestry and fishery) that needs specific policy interventions. Hence, there is an overwhelming need to disaggregate sectoral output or value to sub-sectoral indices to derive specific policy recommendations that will fast track development of the subsectors. It is believed that some sub-sectors of agriculture can easily be manipulated than others to bring about changes in the economic environment. Also, for the last two decades, a lot has happened in Nigeria's macroeconomic environment and the country is swallowed deeper in the scourge of poverty and urgently need proactive policy interventions based on the current realities. Therefore, there is a need to update the available information on the relationship between agricultural sub-sector output and economic growth of Nigeria. The study, therefore, sought to establish the empirical relationship between agricultural sub sector's output and economic growth indicator in Nigeria.

2.0 Research Methods

2.1 Study Area

The study was conducted in Nigeria. The country is situated on the Gulf of Guinea in Sub-Saharan Africa. It lies between 4^0 and 14^0 north of the equator and between longitude 3^0 and 15^0 east of Greenwich. The country has a total land area of about 923,769km^2 (or about 98.3 million hectares) with 853 km of coastline along the northern edge of the Gulf of Guinea and a population of around two hundred (200) million (National Population Commission, 2020). The country is gifted with significant agricultural, mineral, marine and forest resources. Its multiple vegetation zones, plentiful rain, surface water and underground water resources and

moderate climatic extremes allow for the production of diverse food, tree and cash crops. Over 60 per cent of the population is involved in the production of the food crops such as cassava, maize, rice, yams, various beans and legumes, sorghum, ginger, onions, tomatoes, melons and vegetables (Federal Ministry of Environment, 2021). Also, fishery, aquaculture and livestock production such as poultry, goat, sheep, pigs and cattle flourished very well in all regions of the country. The main cash crops are cocoa, cotton, groundnuts, palm oil and rubber (Federal Ministry of Environment, 2021).

2.2 Data source

Secondary data were used in the study. The data were sourced from the World Bank and Food and Agricultural Organization (FAO) as well as the Central Bank of Nigeria. Data covered the period from 1981 to 2020. The choice of the period was based on the availability of data.

2.3 Theoretical Model

The study adopted the framework of Arthur Lewis (1954) theory of structural change. From the theory, an economy starts with two sectors: a rural agricultural sector (At) and an urban industrial sector (Y_t).
Hence,

$$Y_t = \int (A_t) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

According to the theory, the mechanism of economic development is triggered by transferring excess factor of production (labour) from agriculture to more labour demanding industrial sector with an anticipated increase in turnover, profit and re-investment potentials. The economics of scale created in the agricultural sector will result in an increase in output and productivity following the interdependency of the two sectors in terms of supply of factors of production and demand of the outputs. Therefore, this theory focuses on the mechanism by which developing economies can transform their subsistence agricultural system to a modern and advanced agricultural system with the help of an evolving industrial sector through massive investment in structural transformation. Traditionally, the agricultural sector consists of four sub-sectors, namely, crop, livestock, forestry and fishery. Thus, equation 1 can be presented as in equation 2:

$$Y_t = \int (crop_t, livestock_t, forester_t, fishery_t) \dots\dots\dots\dots\dots\dots\dots\dots (2)$$

According to Lewis theory, industrial growth is directly proportional to economic growth and improvement in the agricultural sector. Therefore, equation 2 was expanded to form the structural model used in this study.

2.4 Model Specification/Analytical Technique

The contribution of the agricultural sector to the economic growth (proxy by the per capita GDP) of Nigeria was implicitly stated in a Cobb-Douglas form as thus:

$$PCI_t = f(CRP_t, LIV_t, FOR_t, FIS_t) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

Where,
PCI_t = Per capita GDP (₦/person) an indicator of economic growth
CRP_t = Value of the crop sub-sector in period t (contribution of the crop subsector in the Agricultural component of the economy GDP) in ₦billon,

LIV_t = Value of the livestock sub-sector in period t (contribution of the livestock subsector in the Agricultural component of the economy GDP) in ₦billon,

FORt = Value of the forestry sub-sector in period t (contribution of the forestry subsector in the Agricultural component of the economy GDP) ₦billon. Note this variable was normalized by the total value of agricultural contribution in the national GDP. This was done to achieve stability in the variable.

FIS_t = Value of fishery sub-sector in period t (contribution of the fishery subsector in the Agricultural component of the economy GDP) in ₦billon.

The explanatory variables were selected based on the Central Bank of Nigeria (CBN) disaggregation of the agricultural sector. The agricultural sector is divided into four major subsectors namely: crop, forestry, fishery and livestock. The per capita GDP was preferred over other indicators of economic growth in Nigeria because the data were available, easy to calculate and is difficult to subject the data to manipulation. Though it may be skewed, at least it shows the average purchasing power per person in the country.

2.5 Testing the short and long runs relationships between indicator of economic growth and Agricultural subsector performance indicators

The Autoregressive Distributed Lag (ARDL) bound test approach developed by Pesaran & Shin (1999) and Pesaran *et al.* (2001) was used to investigate the long and the short-run relationship between agricultural productivity indicators and the explanatory variables. The ARDL bound model has three advantages when compared with the Engle & Granger (1987) two-step method and Johansen & Juselius (1990) cointegration method. The ARDL method is applied to deal with the series having mixed stationary issues (i.e. mixture of 1(0) and 1(1)). Hence, it relaxes the assumption that all series must be integrated of the same order. The next advantage is that the ARDL test is relatively more efficient in the case of small and finite sample data sizes. The method produced unbiased estimates of the long-run model (Harris & Sollis, 2003). The bounds test is a simple technique because it allows the co-integration relationship to be estimated by OLS once the lag order of the model is identified, unlike other multivariate co-integration methods.

The ARDL model for equation (3) in logarithm form is expressed as follows:

$$\Delta PCI_t = \beta_0 + \beta_1 \sum_{i=1}^{n_1} \Delta PCI_{t-1} + \beta_2 \sum_{i=1}^{n_2} \Delta CRP_{t-i} + \beta_3 \sum_{i=1}^{n_3} \Delta LIV_{t-i} + \beta_4 \sum_{i=1}^{n_4} \Delta FOR_{t-i} + \beta_5 \sum_{i=1}^{n_5} \Delta FIS_{t-i} + \delta_1 PCI_{t-i} + \delta_2 CRP_{t-i} + \delta_3 LIV_{t-i} + \delta_4 FOR_{t-i} + \delta_5 FIS_{t-i} + U_t \quad \ldots\ldots (4)$$

The specification of the ARDL model was also applied to the rest of the variables in equation (3). The coefficients from β_1 to β_5 represent the short-run coefficients whereas the coefficients from δ_1 to δ_5 represent the long-run coefficients of the ARDL model. Also, β_0 is the drift component, "n" is the maximum lag length while U_t is the stochastic error term.

The bounded F-statistic test was used to check the existence of a stable, long-run relationship among the variables in the model. For instance, if the calculated F-statistic in equation (4) is greater than the appropriate upper bound critical values, the null hypothesis is rejected implying the existence of co-integration relationship. But if the value of the F-statistic is below the lower bound, the null cannot be rejected, indicating the absence of co-integration. Besides, if the F-statistic value lies within the lower and upper bounds, the results are considered inconclusive (Pesaran *et al.*, 2001).

If the bound test shows evidence of co-integration among variables specified for example as in equation 2, the long and the short-run (an error correction model (ECM)) models are specified as follows;
The long-run model:

$$PCI_t = \delta_0 + \delta_1 \sum_{i=1}^{q_1} PCI_{t-i} + \delta_2 \sum_{i=1}^{q_2} CRP_{t-i} + \delta_3 \sum_{i=1}^{q_3} LIV_{t-i} + \delta_4 \sum_{i=1}^{q_4} FOR_{t-i} + \delta_5 \sum_{i=1}^{q_5} FIS_{t-i} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

The short-run model (ECM model):

$$\Delta PCI_t = \beta_0 + \beta_1 \sum_{i=1}^{n_1} \Delta PCI_{t-1} + \beta_2 \sum_{i=1}^{n_2} \Delta CRP_{t-i} + \beta_3 \sum_{i=1}^{n_3} \Delta LIV_{t-i} + \beta_4 \sum_{i=1}^{n_4} \Delta FOR_{t-i} + \beta_5 \sum_{i=1}^{n_5} \Delta FIS_{t-i} + +\emptyset ECM_{t-1} + U_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Where Ø is the error correction term and it measures the speed of adjustment towards the long-run equilibrium, and the remaining coefficients provide the short-run dynamics. To access the performance of the estimated model, RESET test, Serial correlation, normality and Heteroscedasticity tests were conducted, whereas the cumulative sum (CUSUM) test was conducted to verify the stability nature of the model.

3.0 Results and Discussion

3.1 Descriptive Statistics

The descriptive statistics of variables used in the study are presented in Table 2. The coefficient of variability and skewness in all variables are greater than unity. This implies that the specified variables experienced high annual volatility and persistent increment. Also, the annual exponential growth rates of these variables range from 17.15% to 21.97, meaning that all the specified indicators grew steadily almost at the same annual rates.

Table 2. Descriptive Statistics of Variables Used in the Estimated Models

Variable	Min	Max	Mean	Std. deviation	CV	Skewness	Exponential growth rate (%)
CRP	12.817	28297.	6139.1	7880.6	1.2837	1.2054	21.97
LIV	2.5250	2108.9	553.75	690.26	1.2465	1.1014	18.65
FOR	1.1596	285.88	74.026	91.488	1.2359	1.0478	17.15
FIS	0.54048	1212.4	172.00	264.92	1.5403	2.1975	21.31
PCI	1846.6	7.2470e+5	1.8175e+5	2.2274e+5	1.2255	1.0324	18.10

Source: Computed by the author data from the FAO and World Bank, 2020.

3.2 Unit root test

The study used the Augmented Dickey-Fuller (ADF) test developed by Dickey and Fuller in (1979) and the Dickey-Fuller generalized least squares (DF-GLS) unit root test developed by Elliott, Rothenberg and Stock in 1996, which is an improvement of the original ADF test to confirm the unit root of specified variables. The results for both ADF and ADF-GLS unit root tests are presented in Table 3.

Table 3. ADF and ADF-GLS unit root tests on variables used in the specified equation.

	ADF (with constant)				ADF-GLS (with Trend)			
	Lag	**Level**	**1st Diff.**	**Decision**	**Lag**	**Level**	**1st Diff.**	**Decision**
CRP	0	-1.9436	-4.19027***	1(1)	0	1.1390	-4.0919***	1(1)
LIV	0	-2.8021*	-	1(0)	0	1.0928	-2.2380**	1(1)
FOR	0	-2.7836*	-	1(0)	0	-0.4523	-4.5976***	1(1)
FIS	0	-0.5249	-4.8027***	1(1)	0	1.5126	-4.8640***	1(1)
PCI	0	-1.1074	-3.3664**	1(1)	0	1.4939	-3.36642**	1(1)
			Critical values					
1%						-3.77	-3.77	
5%						-3.19	-3.19	
10%						-2.89	-2.89	

Source: computed by the author. Note: ***, ** and * indicate 1%, 5% and 1% significance levels respectively. Note, variables are expressed in natural logarithm.

The results revealed that some variables were stationary at levels; while others were stationary at first difference for ADF equation. However, the variables were stationary at the first difference for ADF-GLS equation. The test equations contain both constant and trend. Since we have a mixture of variables that are 1(0) and 1(1), it implies that the ARDL model can be used to test for co-integration in the specified model.

Before estimating the ARDL model, the optimal lag lengths for the series were determined by using the Akaike Information Criterion (AIC), Schwarz and Bayesian Criteria (SBC). The various lag lengths are shown in Table 4. The calculated F-statistics for the selected equation is presented in the upper portion of Table 4. Note, each of the variables in equation 3, was tested, but the result of equation of our interest is presented for discussion. The Result of the F-statistic for equation 4 (equation of interest) revealed that cointegration exists among the variables specified. The calculated F-statistic for the estimated equation is greater than the tabulate upper bound critical value at 1% level of significance.

Table 4: ARDL Bound Test (unrestricted intercept and no trend)

Equations	**Lag**	**F-Statistic**	**Decision**
F_{PCI}(PCI | CRP, LIV, FOR, FIS)	(0,0,0,0)	14.6943	Co-integration
Critical Values Bound (at K = 4 and n = 39)			
	Lower	Upper	
10%	2.442	3.400	
5%	2.907	3.982	
1%	3.883	5.448	

Source: computed by the author using Eviews 10 and data as described in equation 3. Critical values are derived from Narayan, (2005), restricted intercept and no trend for K = 4.

The finding implies that; the long-run equilibrium or stable equation exists for equation 4. Also, the short run or the ECM model can be generated to capture the dynamics in the economic growth equation in the short run and identified the speed of adjustment as a response to departure from the long-run equilibrium. Following the establishment of the cointegration for the specified equation, Table 5 presents the long-run coefficients for the ARDL model specified in equation 5.

3.3 The Long and Short Runs Coefficients of ARDL model for Economic growth equation

The long-run results revealed that all the subsectors of the agricultural sector had a positive significant inelastic relationship with economic growth indicator (per capita GDP) in Nigeria. For instance, a 10% increase in the value of the crop sub-sector, livestock, forestry and fishery

subsectors will result in about 5.96%, 1.95%, 3.98% and 1.45% increase in the per capita GDP respectively. The inelastic nature of the coefficients of the agricultural subsectors implies that the change in the individual subsector value or output is greater than the change in the per capita GDP within the period considered in this study. Alternatively, a 10% increase in the subsector's value/output, in the long run, will result in a less than 10% increase in the per capita income. The finding revealed that the crop subsector output seems to have a more stimulating impact on economic growth compared to other subsectors outputs. The result suggests that the agricultural subsector output has a significant role to play in shaping the economic growth of Nigeria in the long run. The findings corroborate Oluwatoyese & Applanaidu, (2013); Oyinbo & Rekwot (2014); Kenny, (2019); Kamil *et al.* (2010); Olajide *et al.* (2012); Oje-Okoro (2011); Akpan, (2012); Ahungwa *et al.,* (2014); Awoyemi *et al.,* (2017); and Inusa *et al.,* (2018).

The result in Table 6 presents the error correction representation of the ARDL model for equation 4. It indicates that about 56.03% of the short-run disequilibrium is adjusted towards its long-run equilibrium annually. Alternatively, about 56.03% of disequilibria from the previous year's shock converge back to the long-run equilibrium in the current year.

Table 5: The Long- run Coefficients for Agricultural gross production Index equation

Variable	Coefficient	Standard error	t-value	Probability
Constant	6.7918	0.183	37.070***	<0.0001
Crop subsector	0.5960	0.085	7.002***	<0.0001
Livestock subsector	0.1954	0.087	2.245**	0.031
Forestry subsector	0.3980	0.058	6.881***	<0.0001
Fishery subsector	0.1447	0.058	2.517**	0.017

Source: computed by the author. Note: ***, and ** indicate 1% and 5% significance level respectively. Note, variables are expressed in natural logarithm. ARDL (0,0,0,0,0) selected based on Schwarz Bayesian Criterion

The diagnostic tests for the ECM model revealed R^2 value of 0.80 which means that the agricultural subsector output explained about 80.00% of the adjusted total variations in the per capita GDP in the country. The F-statistic of 47.13 is significant at 1% probability level, indicating that the R^2 is significant and this implies that the equation has goodness of fit. The Durbin-Watson value of 1.71 shows that serial correlation is significant. The ECM model has been shown to be robust against residual autocorrelation. Therefore, the presence of autocorrelation does not affect the estimates (Laurenceson and Chai, 2003). Also, the null hypothesis was not rejected for RESET test, Breusch-Pagan test, normality test, and CUSUM test. This means that the estimated ECM model has structural rigidity, absence of heteroscedasticity, normally distributed error term and is stable within the time frame specified respectively.

The empirical result revealed that, in the short run, all the sub-sectors of the agricultural sector had a positive influence on the per capita GDP of Nigeria. That is, the coefficient of the crop sub-sector, livestock, forestry and fishery sub-sectors in the short run exhibited a significant positive inelastic relationship with the indicator of economic growth in Nigeria. This implies that in the short run the agricultural subsectors' output changes are greater than the change in the per capita GDP in Nigeria. Again, the crop subsector seems to be the most stimulating sub-sector in the short-run period. The finding is supported by Kamil *et al.* (2010); Olajide *et al.* (2012); Oje-Okoro (2011); Akpan, (2012); Ahungwa *et al.,* (2014); Awoyemi *et al.,* (2017); and Inusa *et al.,* (2018).

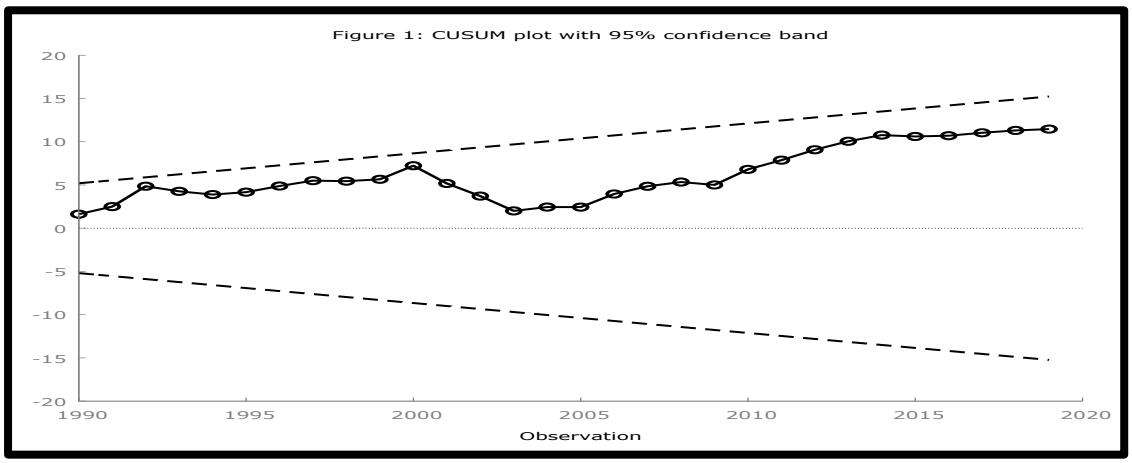
Tale 6: The Short - run Coefficients for Agricultural gross production Index equation.

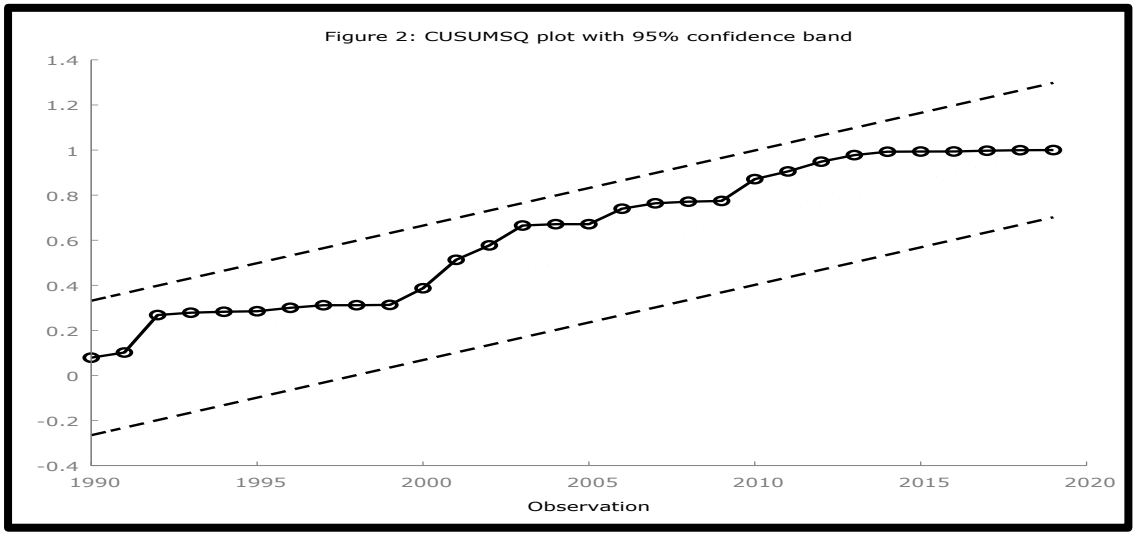
Variable	Coefficient	Standard error	t-value	Probability
Constant	−0.0269	0.0195	−1.381	0.1775
ΔPCI_{t-1}	0.0965	0.1054	0.915	0.3674
ΔCRP_t	0.4970	0.1074	4.628***	<0.0001
ΔLIV_t	0.4187	0.1254	3.339***	0.0023
ΔFOR_t	0.3655	0.1201	3.042***	0.0048
ΔFIS_t	0.0758	0.0337	2.246**	0.0322
ECM_{t-1}	−0.5603	0.1126	−4.978***	<0.0001
	Diagnostic Test			
R-Squared	0.8000	Durbin-Watson		
F(6, 30)	47.134***	Normality of residual		1.964 (0.375)
RESET test	1.630 (0.21)	CUSUM test		2.093 (0.375)
Breusch-Pagan test	9.258 (0.16)	Durbin-Watson		1.711 (0.119)

Source: computed by the author. Note: ***, and ** indicate 1% and 5% significance level respectively. Note, variables are expressed in natural logarithm. ARDL (0,0,0,0,0) selected based on Schwarz Bayesian Criterion.

3.4 Test of the Stability of the ARDL ECM

The cumulative sum (CUSUM) and the cumulative sum of square (CUSUMQ) plot derived from the recursive estimation of the ARDL ECM model is presented in Figures 1 and 2, respectively. The results imply stability in the coefficients of the ARDL ECM over the sample period following the fact that the plot of the CUSUM and CUSUMSQ statistic lie within the critical bands of the 5% confidence interval (or 95% probability level) of parameter stability.





3.5 Implication for Agricultural Production Intensification

The findings have revealed significant positive linkages between the agricultural subsectors production and economic growth parameter in Nigeria. This suggests that increasing the agricultural sector's production would increase the country's economic growth potentials in the short and long-run periods. These findings call for proactive actions on the part of government, farmers and all stakeholders in the agricultural sector to assist in developing a policy framework that will fast track sustainable improvement in the agricultural sector in the country as a panacea for economic growth. This requires a well-planned government and private investment partnership in agriculture supported by modern technology to achieve a sustainable increase in agricultural production. The current rate of economic growth in the country is not satisfactory given the high rate of poverty, insecurity, inflation and infrastructural decayed among others. This, many experts (Akinlo, 2012, Lawrence & Victor 2016) linked to the monolithic petroleum-based economy of Nigeria that is currently under threat from declining global demand following the development of cheap and environmentally friendly alternative energy sources. As noted by Abayomi (1997), the abysmal performance of the Nigerian economy is traceable to the stagnation in agricultural development and a quick turnaround is possible by increasing agricultural production and productivity. As an urgent policy re-direction, Nigeria needs diversification of its economic activities to focus on intensifying agricultural production (with more emphasis on crop production) due to the significant positive influence the sector's outputs have on economic growth in the country. To this end, agricultural production intensification should be prioritized as a means of accelerating economic growth in the country.

4.0 Conclusion and recommendations

The need to establish an empirical relationship between agricultural subsector productions and economic growth in Nigeria to justify the need for intensifying agricultural production was the core objective of this research. Time series data on the value of the crop subsector, livestock subsector, forestry and fishery subsectors as well as the per capita gross domestic product (proxy of economic growth) were used to analyze the objective of the study. The descriptive tests and autoregressive distributed lag (ARDL) bound test of cointegration were used to analyze the data. Following the confirmation of the cointegration of the specified variables, the long and the short-run models of economic growth equations were estimated with the error term having the appropriate sign. The findings showed that, in both long and short-run periods, the crop subsector output, livestock subsector output, forestry and fishery subsector outputs have significant positive relationships with the per capita GDP. This implies that agricultural production is a strong and significant driver of economic growth at present and in future in Nigeria. Premised on this fact, it is suggested that there is an overwhelming justification for the country to intensify sustainable agricultural production in a holistic manner as a strategy to accelerate economic growth now and in future. Hence, it is strongly recommended that the country should prioritize agricultural production and consider the sector as the preferred destination in its current economic-activity diversification drive.

References

Abayomi, O. (1997). The agricultural sector in Nigeria: The way forward. *CBN Bullion, 21,* 14–25.

Aderibigbe, S. O., & Manson, N. (2018). *Nigeria agriculture sector performance review. Regional Strategic Analysis and knowledge Support System—West Africa (ReSAKSS*

WA); International Institute of Tropical Agriculture (IITA). A background report for the Nigeria 2017 agriculture joint sector review.

Ahungwa, G., Haruna, U., & Abdsalam, Y. R. (2012). Trend analysis of the contribution of agriculture to gross domestic product (1960–2012). *Journal of Agricultural and Veterinary Science*, *7*(1), 50–55.

Akinlo, A. E. (2012). How important is oil in Nigeria's economic growth? *Journal of Sustainable Development*, *5*(4), 165–179. https://doi.org/10.5539/jsd.v5n4p165

Akpan, S. B. (2012). Analysis of food crop output volatility in Agricultural policy programme regimes in Nigeria. *Developing Country Studies*, *2*(1), 28–35.

Akpan, S. B. (2012a). Agricultural Productivity and Macro-Economic Variable Fluctuation in Nigeria. Ini-mfon V. *Glory E. and Daniel E. International Journal of Economics and Finance*, *4*(8), 114–125.

Akpan, S. B. (2019). Oil palm fruit supply function in Nigeria. *IFE Journal of Agriculture*, *31*(3: 11) - p. 26.

Akpan, S. B., & John, D. N. (2020). Technical efficiency of small scale cassava based Processors (Cassava grater operators) in Eket Agricultural Zone of Akwa Ibom State, Nigeria. *Nigerian Journal of Agriculture, Food and Environment*, *16*(3), 137–149.

Akpan, S. B., & Patrick, I. V. (2015a). Does Annual Output of palm oil, Palm Kernel and Rubber correlate with some Macroeconomic Policy variables in Nigeria? *Nigerian Journal of Agriculture, Food and Environment*, *11*(1), 66–72.

Akpan, S. B., & Udom, S. D. (2018). Analysis of structure of agricultural land use among small scale arable crop farmers in Oruk-Anam Local Government area of Akwa Ibom State, Nigeria. *African Journal of Agriculture Technology and Environment*, *7*(1), 24–37.

Akpan, S. B., Akpan, O. D., & Essien, U. A. (2012c). Government Agricultural Credit Policy and Macroeconomic Fundamentals: A case study of Agricultural Credit Scheme Fund (ACGSF) in Nigeria. *Public Policy and Administration ResearchVol*, *2*(2), 61–75.

Akpan, S. B., Glory, E. E., & Inimfon, V. P. (2015b). The battle of sugar imports and domestic sugar production in Nigeria: Roles of political, policies, and economic environments. *Economy*, *2*(4), 71–81.

Akpan, S. B., Udoh, E. J., & Umoren, A. A. (2012b). Modelling the dynamic relationship between food crop output volatility and its determinants in Nigeria. *Journal of Agricultural Science*, *4*(8), 36–47.

Akpan, S. B., Uwemedimo, E. O., & Ima-Abasi, S. A. (2019a). Poverty coping strategies of oil palm farmers in Akwa Ibom State, Nigeria. *Nigerian Journal of Agriculture, Food and Environment*, *15*(1), 20–30.

Akpan, S. B., Uwemedimo, E. O., & Ima-Abasi, S. A. (2019b). Poverty coping strategies of oil palm farmers in Akwa Ibom State, Nigeria. *Nigerian Journal of Agriculture, Food and Environment*, *15*(1), 20–30.

Awoyemi, B. O., Afolabi, B., & Akomolafe, K. J. (2017). Agricultural productivity and economic growth: Impact analysis from Nigeria [Scientific research journal]. *SCIRJ*, *V*(X), 1–7.

Beinteman, N. M., & Stadt, G. J. (2006). *Agricultural Research and Development in Sub-Sahara Africa: An era of stagnation*. International Food Policy Research Institute.

Chebbi, H. E. (2010). Agriculture and economic growth in Tunisia. *China Agricultural Economic Review*, *2*(1), 63–78. https://doi.org/10.1108/17561371011017504

Dawd, G., Montague, W. D., & Barbara, J. S. (2019). Challenges and opportunities to the African agriculture and food systems. *African Journal of Food, Agriculture, Nutrition and Development*, *19*(1), 14190–14217.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autorregressive time series with a unit root. *Journal of the American Statistical Association*, *74*(366a), 427–431. https://doi.org/10.1080/01621459.1979.10482531

Elliott, G., Rothenberg, T. J., & Stock, J. H. (1996). Efficient tests for an autoregressive unit root. *Econometrica*, *64*(4), 813–836. https://doi.org/10.2307/2171846

Engle, R. F., & Granger, C. W. J. (1987). Co-integration and error correction: Representation, estimation, and testing. *Econometrica*, *55*(2), 251–276. https://doi.org/10.2307/1913236

Federal Ministry of Agriculture, & Rural Development. (2016). *The agriculture promotion policy (2016–2020), building on the successes of the ATA, closing key gaps, policy and strategy document*.

Food and Agriculture Organization. (2017). *The future of food and agriculture—Trends and challenges*. Rome.

Gardner, B. L. (2005). Causes of rural economic development. *Agricultural Economics*, *32*(s1)(Suppl. 1), 21–41. https://doi.org/10.1111/j.0169-5150.2004.00012.x

Harris, R., & Sollis, R. (2003). *Applied time series modeling and forecasting*. Wiley, West.

Inusa, B. M., Daniel, P. C., Dayagal, D. F., & Chiya, N. S. (2018). Nigerian economic growth and recovery: Role of agriculture. *International Journal of Economics and Management Sciences*, *7*(2), 1–5

Iwuchukwu, J. C., & Igbokwe, E. M. (2012). Lessons from agricultural policies and programmes in Nigeria. *Journal of Law, Policy and Globalization*, *5*, 11–21.

Izuchukwu, O. (2011). Analysis of the contribution of agricultural sector on the Nigerian economic development. *World Review of Business Research*, *1*(1), 191–200.

Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration with applications to the demand for money. *Oxford Bulletin of Economics and Statistics*, *52*(2), 169–210. https://doi.org/10.1111/j.1468-0084.1990.mp52002003.x

Julian, Q., Su, F. T., & Camilla, T. (2004). Land in Africa Market asset or secure livelihood? *Proceedings of the and Summary of Conclusions From the Land in Africa Conference Held in London*.

Kamil, S., Sevin, U., & Festus, V. B. (2017). The contribution of agricultural sector on economic growth of Nigeria. *International Journal of Economics and Financial Issues*, *7*(1), 547–552.

Kamil, S., Seving, U., & Festus, V. B. (2010). The contributions of agriculture sector on economic growth of Nigeria. *International Journal of Economics and Financial Issues, 7*, 547–552.

Kenny, S., & V. (2019). *The role of agricultural sector performance on economic growth in Nigeria*. MPRA Paper no. 93132. https://mpra.ub.uni-muenchen.de/93132/

Laurenceson, J., & Chai, J. C. H. (2003). *Financial reforms and economic development in China* (pp. 1–28). Edward Elgar Publishing.

Lavorel, S., Storkey, J., Bardgett, R. D., de Bello, F., Berg, M. P., Le Roux, X., Moretti, M., Mulder, C., Pakeman, R. J., Díaz, S., & Harrington, R. (2013). A novel framework for linking functional diversity of plants with other trophic levels for the quantification of ecosystem services. *Journal of Vegetation Science*, *24*(5), 942–948. https://doi.org/10.1111/jvs.12083

Lawrence, U. E., & Victor, E. O. (2016). A dynamic analysis of oil revenue and the performance of the agricultural sector in Nigeria. *Journal of Economics and Public Finance*, *2*(1), 203–219. https://doi.org/10.22158/jepf.v2n1p203

Lewis, W. A. (1954). Economic development with unlimited supplies of labor. The Manchester School of Economics and Social Studies, *22*(2), 139–191.

Margaret, A., & George, M. (2016). *Youth employment, agricultural transformation, and rural labor dynamics in Nigeria*, IFPRI Discussion Paper 01579. Development Strategy and Governance Division.

Matahir, H. (2012). The empirical investigation of the nexus between agricultural and industrial sectors in Malaysia. *International Journal of Business and Social Science*, *3*(8), 225–230.

Mathew, A. O., & Adeboye, B. F. (2010). The agricultural sector and economic development: The Nigeria Experience. *Journal of Management and Enterprise Development*, *7*, 1–15.

Narayan, P. K. (2005). The saving and investment nexus for China: Evidence from cointegration tests. *Applied Economics*, *37*(17), 1979–1990. https://doi.org/10.1080/00036840500278103

Nwafor, M., Ehor, E. C., Chukwu, O. J., & Amuka, J. I. (2011). *Cost-effective agriculture growth options for poverty reduction in Nigeria: Evidence and policy implications*. AIAE Research Paper 6. African Institute for Applied Economics.

Oje-Okoro, I. (2011). Analysis of the contribution of agricultural sector on the Nigerian economic development. *World Review of Business Research*, *1*, 191–200.

Olajide, O. T., Akinlabi, B. H., & Tijani, A. A. (2012). Agriculture resource and economic growth in Nigeria. *European Scientific Journal*, *8*(22), 103–115.

Olaniyi, O. Z., Adedokun, M. A., Ogunleye, A. A., & Oladokun, Y. O. M. (2015). An empirical analysis of the contribution of agricultural sector to Nigerian gross domestic product: Implications for economic development. *Developing Country Studies*, *5*(21), 36–42.

Oluwatoyese, O. P., & Applanaidu, S. D. (2013). Effect of agricultural, manufacturing and service sector performance in Nigeria, 1980–2011. *Journal of Economics and Sustainable Development*, *4*, 35–41.

Oyinbo, O., & Rekwot, G. Z. (2014). Agricultural production and economic growth in Nigeria: Implication for rural poverty alleviation. *Quarterly Journal of International Agriculture*, *53*(3), 207–223.

Pesaran, M. H., & Shin, Y. (1999). An autoregressive distributed lag modelling approach to cointegration analysis. In S. Storm (Ed.), *Econometrics and Economic Theory in 20th Century: The Ragnar Frisch Centennial Symposium*. Cambridge University Press.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289–326. https://doi.org/10.1002/jae.616

The Federal Ministry of Environment. (2021). https://environment.gov.ng/. Retrieved May 21, 2021

The national population commission (NPC, 2021). *Estimated Population of Nigeria*. Retrieved 21/4/2021. https://www.nationalpopulation.gov.ng/.

Xinshen, D., Peter, H., Danielle, R., & James, T. (2007). The role of agriculture in development implications for sub-Saharan Africa. *Research Reports*. International Food Policy Research Institute, *153*.

Yusuf, S. A. (2014). *Role of agriculture in economic growth development: Nigeria perspective*. MPRA Paper no. 55536. https://mpra.ub.uni-muenchen.de/55536/.