Enhancing Agricultural Value Chain for Economic Diversification in Nigeria

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Abstract

This study examined how enhancing the agricultural value chain can contribute to rapid economic diversification in Nigeria within the period of 1981-2015. The autoregressive distributed lag (ARDL) model was employed as the econometric method of estimation. The inferences were drawn at 5% significant level. The result revealed that the agriculture expenditure had positive and significant impact on agriculture sector productivity in Nigeria. The findings showed that agricultural raw material, agricultural machinery and agricultural land have direct impact on agricultural productivity in Nigeria. Agricultural machinery and agricultural land were found to be statistically significant at 5% significance level. The empirical results revealed that capital and labour have direct impact on economic growth. However, agriculture productivity had positive impact on economic growth in Nigeria. The study concluded that agricultural value chain contributed significantly to the diversification of the Nigerian economy. The study suggests that government should make deliberate efforts to create institutions that will make policy programmes on agricultural development not only to enhance its growth and the overall output growth but also make it inclusive.

Keywords: Agricultural inputs, agricultural expenditure, credit, agricultural productivity, Nigeria.

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1.0 Introduction

In Sub-Saharan Africa (SSA), agriculture has been the major key factor to output growth, poverty reduction and food security. According to Schaffnit-Chatterjee (2014), the sector is important to the region's economies as it generates on average, 25% of gross domestic product (GDP) and much more in many countries. The Food and Agriculture Organization (FAO) noted that the growth in agriculture between 1999 and 2009 was responsible for half of the employment in SSA. The author further suggests that developing the sector in some SSA countries like Nigeria and Angola (over-reliance on oil) is key to diversification of economic activities in these nations. The SSA has been the only region who failed to improve agricultural productivity owing to several factors such as lack of investment, infrastructural decay, unfavourable price policies, insecure land tenure and weak institutions (Schaffnit-Chatterjee, 2014). Despite all these challenges, agriculture remains the mainstay of Sub Saharan African countries including Nigeria.

Nigeria is endowed with huge expanse of fertile land, rivers, streams, lakes, forests and grasslands, as well as a large active population that can sustain highly productive and profitable agricultural sector which can ensure self-sufficiency in food and raw materials for the industrial sector and as well provide gainful employment for the teeming population. The reverse is the case despite the resource endowment of the country. Several factors account for the poor performance of the agricultural sector in Nigeria. These include virtual neglect of the sector, poor access to modern inputs and technology, and lack of optimum credit supply. Aside the problem of poor access to modern technology, the major bane of agricultural development in Nigeria is low investment finance. Therefore, this study examined how enhancing the agricultural value chain contributed to rapid economic diversification in Nigeria within the period of 1981-2015.

It is with this quest for recent empirical-econometric facts that motivated this study, poised with the aim of finding out the factors affecting agriculture productivity and how its value chain has contributed to diversification of economic activities in Nigeria. Different estimation techniques have been used in the agriculture-growth empirics. This study employs the autoregressive distributed lag (ARDL) technique to investigate factors affecting agriculture productivity and how its value chain has contributed to diversification of economic activities in Nigeria. The importance of this approach is that it allows greater insights on the long run relationship between agriculture and output growth. As well, the approach distinguishes the long-run elasticities from short-run elasticities, and uses the short-run model to estimate the speed of adjustment in output growth after a shock to the estimated system. Estimating both the long-run and short-run elaticities are important for both policy purposes and additional econometric modelling, such as forecasting.

The remaining sections of the study are structured as follows: section two addresses the literature review. The third section is the methodology while data analysis and discussion was presented in section four. Conclusion and policy options are in the last section.

2.0 Literature Review

This section undertakes a brief literature review on factors affecting agriculture and its impact on economic growth. In the study of Lavorel et al. (2013), they addressed a question raised by

Gardner (2005) and Eddine Chebbi (2010) on whether agriculture is an engine of growth or not by investigating the casual relationship between agricultural value added per worker and income per capita for 85 countries. The study found a causal relationship between agricultural valued added and growth for the developing countries while that of developed countries remained unclear. This however, goes in line with the assumption that agriculture has been the backbone of developing countries. Matahir (2012) investigated the role of agriculture on economic growth and how it interplays with other sectors in Tunisia using time series Johansen cointegration techniques. The study suggested that agricultural sectors should be taken as vital tools of inter-sectorial growth policies. The author also posited that although agricultural sectors has not benefited immensely from the growth of service and commerce sector of Tunisia but its contribution to economic growth cannot be overemphasized. Jatuporn *et al*. (2011) also noted that agriculture is a major contributor to Thailand economy. Similarly, a study by Katircioglu (2006) emphasized the importance of agriculture sector on the overall growth and development of Northern Cyprus. The findings further revealed that bi-casual and long-run dynamic relationship existed between agriculture and macroeconomic indicators. He concluded that the feedback from agricultural sector played a huge role in the development of the economy.

Furthermore, Udih (2014) used primary and secondary sources of information extracted from five (5) banks and ten (10) agricultural enterprises in Delta State, Nigeria to investigate the impact of banks credit on agricultural development. Empirical findings were carried out using percentage ranking, mean, standard deviation and Pearson product moment correlation. The findings showed that banks' credits and advances to agricultural entrepreneurs promotes agricultural development and productivity, and that regulated banks' credits to the agricultural entrepreneurs has no or little impact on the entrepreneurship performance. Obilor (2013) examined the impact of agricultural credit scheme fund, agricultural product prices, government fund allocation and commercial banks' credit to agricultural sector on agricultural productivity in Nigeria. The result revealed that Agricultural Credit Guarantee Scheme Fund and government fund allocation to agriculture produced a significant positive effect on agricultural productivity, while the other variables produced a significant negative effect.

In addition, Nwankwo (2013) investigated the agricultural financing options in Nigeria and their implication on the growth of Nigerian economy. Using the ordinary least square method, the study revealed that agricultural financing had significant impact on the economic growth of Nigeria. The result further indicated that loan repayment rate has negative and significant impact on the growth of Nigerian economy over the years. Kareem *et al*. (2013) examined the macroeconomic factors (such as food import value, interest rate, commercial bank loans on agriculture, GDP growth rate and foreign direct investment) influencing agricultural output in Nigeria. Using multiple regression analysis technique, the result shows that foreign direct investment, commercial bank loan, interest rate and food import value have positive relationship with agricultural output.

More so, Enyim, Ewno and Okoro (2013) applied econometric tests such as unit root, co-integration, error correction model and Grange causality test to examine the relationship between banking sector credit and performance of the agricultural sector in Nigeria. The findings show that government expenditure on agriculture has insignificant impact on agricultural productivity.

It also revealed that commercial banks' credit to the agricultural sector has a positive impact on agricultural productivity. Olajide, Akinlabi and Tijani (2013) empirically examined the impact of agriculture resources on economic growth in Nigeria. Using the ordinary least square method, the findings confirmed that agricultural sector has been neglected during the period of oil boom despite its positive relationship with output growth in the country. Uma, Eboh and Obidike (2013) appraised the influence of agriculture on economic growth in Nigeria from 1970 to 2009 using the Ordinary Least Square method and found that the contribution of the livestock, fishing, and crop production were insignificant whereas forestry significant contribute to output growth.

Using Vector Auto regressive model, Nadira and Aminu (2014) investigated the impact of agricultural and credit guarantee scheme fund (ACGSF) on economic growth in Nigeria within the period of 1978 and 2011. Empirical findings revealed that improved and efficient credit programme is required in the sector so that productivity of the sector can increased and promote economic growth. Omorogiuwa, Zivkovic and Ademoh (2014) investigated the role of economic factors on agricultural productivity and overall economic development of the Nigerian economy. The authors concluded that the basis of agriculture development should start with the empowerment of the poor.

Having review the empirical work carried out on the related studies, it was found that much has been done. With the agricultural sector being so productive with arguably massive potential, why then has it been neglected? The answer to this question prompts the motivation for this study. Also, the review exposed the study to the fact that most of these studies one way or the others suffered methodological problem which must have reflected in the result of the analysis. This study seeks to evaluate the objectives using the autoregressive distributed lag (ARDL) model to establish short-run and long-run estimates.

3.0 Methodology

This study has its theoretical backing from the Jorgenson's neoclassical model of a dual economy which sees the agricultural sector characterized by constant returns to scale with all factors variable (except the supply of land that is fixed) as given by Cobb-Douglas production function:

$$Y = A^{\alpha t} L^{\beta} P^{1-\beta} \quad (1)$$

Where; Y represent agricultural output, $A^{\alpha t}$ is technical change which takes place at a constant rate (α) in the time (t), L is fixed quantity of land available in the economy, β is the share of landlords in the product which takes the form of rent, P is total population in this sector, and $1-\beta$ is the share of labour in product paid. In enhancing agricultural productivity enough to eradicate rural poverty and create appropriate positive externalities for the industrial sector, increasing opportunities for technical progress is the required and sufficient condition. The study formulates this model:

$$AGP = f(AGEXP, AGRM, AGMCH, AGLD, CBC, INT) \quad (2)$$

Where; *AGP* represents agricultural productivity; *AGEXP* represents agricultural recurrent expenditure; agricultural inputs such as agricultural raw material (*AGRM*), agricultural machinery (*AGMCH*), agricultural land (*AGLD*), commercial bank credit (CBC) and interest rate (INT). In linear form, the model becomes:

$$AGP = \alpha_0 + \alpha_1 AGEXP + \alpha_2 AGRM + \alpha_3 AGMCH + \alpha_4 AGLD + \alpha_5 CBC + \alpha_6 INT + \mu \quad (3)$$

Where the coefficients of α_1, α_2, α_3, $\alpha_5 > 0$, $\alpha_6 < 0$ and μ = error term. The model specified is interested in testing the intensity of chosen opportunities on agricultural output expansion, since opportunity enhancement has been identified as the most efficient means to overall economic development. Then, there is need to determine what opportunity combinations have greater effects on agricultural output expansion, in order to generate appropriate living standard in developing nations like Nigeria.

The apriori expectations are that: ∂AGP/∂AGEXP > 0, ∂AGP/∂AGRM > 0, ∂AGP/∂AGMCH > 0, ∂AGP/∂AGLD > 0, ∂AGP/∂CBC > 0 and ∂AGP/∂INT < 0.

Moreover, as a result of the inconsistencies of the ordinary least square method of data estimation; the co-integration and error correction technique of the ARDL approach were employed to reveal long-run relations as well as short-run and long-run estimates. This is an improvement over the OLS technique. Before any sensible regression analysis of equation model can be made, it is essential to identify the order of integration of each time series provided that the variable can be transformed into a stationary variable through differencing, concerning the dynamic agricultural output model in equation above which is rewritten as:

$$AGP = \alpha_0 + \alpha_1 AGEXP + \alpha_2 AGRM + \alpha_3 AGMCH + \alpha_4 AGLD + \alpha_5 CBC + \alpha_6 INT + \mu \quad (4)$$

The differenced model can be written as:

$$dAGP = \alpha_0 + \alpha_1 dAGEXP + \alpha_2 dAGRM + \alpha_3 dAGMCH + \alpha_4 dAGLD + \alpha_5 dCBC + \alpha_6 dINT + \mu \quad (5)$$

The study is also interested in examining the impact of agricultural productivity on the economic growth in Nigeria. Following the framework of the endogenous model as stated above, the model is stated as:

$$GDP = \alpha_0 + \alpha_1 CAP + \alpha_2 LAB + \alpha_3 AGP + \mu \quad (6)$$

Where; GDP = gross domestic product; CAP = capital, LAB = labour force; AGP = agriculture productivity; $\alpha_0, \alpha_1, \alpha_3$ = parameters; and μ = error term. All the data are in natural logarithm. The apriori expectation provides expected signs and significance of the values of the coefficient of the parameters under review on the part of the empirical evidence and theoretical assertions. All, the incorporated instruments in the modified model are expected to enhance agriculture sector productivity in Nigeria positively if channeled into the right sector paths except for interest rates.

The study will use the Autoregressive Distributed Lag (ARDL) bounds approach by Pesaran, Shin and Smith (2001) to examine how enhancing the agricultural value chain can contribute to rapid economic diversification in the long and the short run periods in Nigeria. With this approach, the dependent variables are expressed as a function of the lagged value of itself and the current and the lagged values of the explanatory variables.

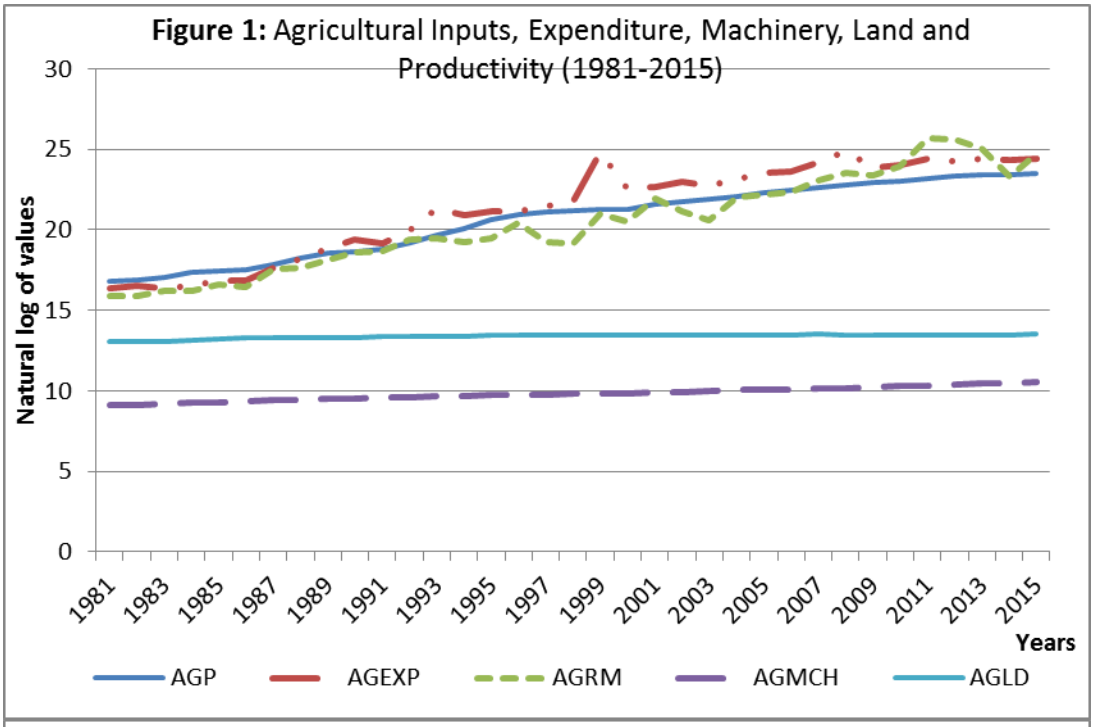
The Bounds cointegration test involves estimating the above equation and restricting the parameters of the lag level variables to zero. Based on this equation, the study tested the following null and alternative hypotheses. The null hypotheses indicate no cointegration and no level relationship against the alternative hypotheses implies cointegration. The F-statistics indicate the existence of cointegrating relationship among the variables. This is tested by the significance of the lag levels of the variables using the F-test. The calculated F-statistic is compared with the two critical values for the upper and lower bounds tabulated by Narayan (2004). If the calculated value is greater than the upper bounds level; it implies long-run relationship; if the value is lesser than the lower bounds value, it means no long-run relationship; and if it is between both upper and lower bounds, the result is inconclusive.

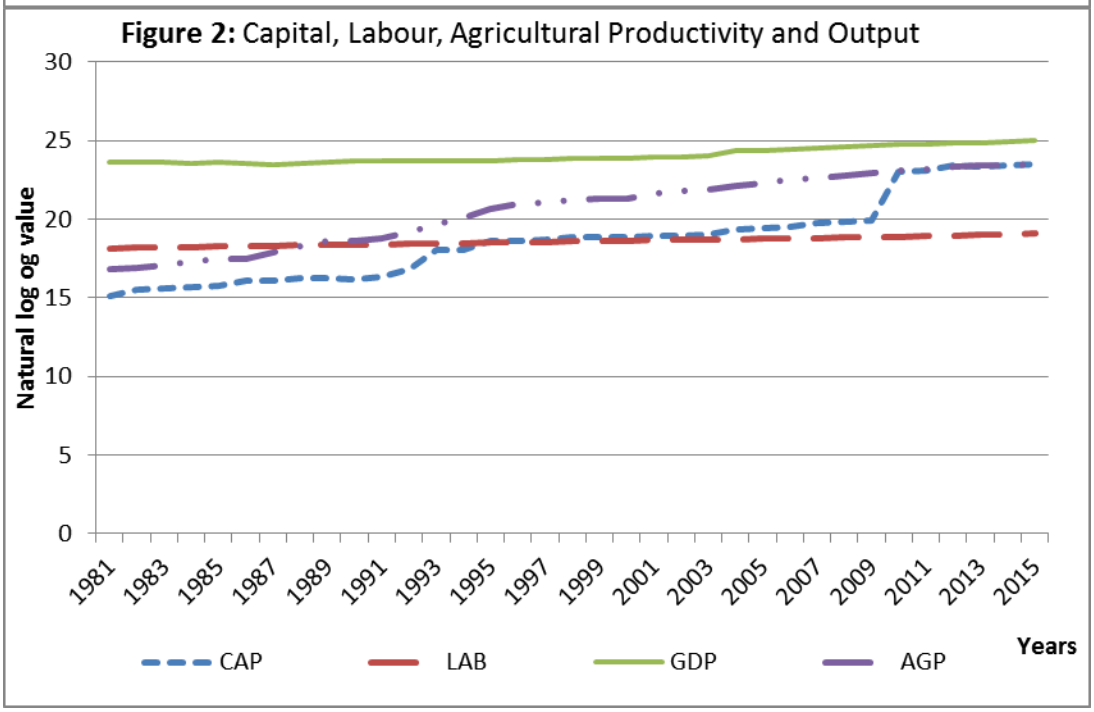
Prior to the ARDL bound test, the study will examine the stationarity level of the indicators using the Augmented Dickey Fuller (ADF) test. The Econometric Views 9.0 was used as the statistical package for the estimation of the multiple regression model. Furthermore, the study also conducted diagnostic and stability tests using the serial correlation, normality, functional form and heteroskedasticity tests.

4.0 Empirical Analysis and Discussion

4.1 Descriptive Analysis

The study accesses the trend of agricultural productivity, agricultural inputs, capital, labour force and economic growth in Nigeria between two decades after independence till 2015. The time series plot of agricultural inputs, agricultural expenditure, agricultural machinery, agricultural land and agricultural productivity is presented in Figure 1, while the time series plot of capital, labour, agricultural productivity and output growth are presented in Figure 2.





From the above Figure 4.1, it reveals the time series plots of all the indicators follow the same pattern from 1981 till 2015. The patterns then change appearance in opposite ways for agricultural raw materials and agricultural expenditure from 1991 till 2002. A similar movement was also witnessed from 2004 to 2015. Figure 4.2 shows that both the labour and gross domestic product move in the same direction but their movement in relation to agricultural productivity is

not clear enough to indicate whether it is positive or negative. The inconclusiveness of the direction of our variables necessitates the need for an empirical analysis.

Table 1: Descriptive Statistics

	AGP	AGEXP	AGRM	AGMCH	AGLD	CAP	LAB	GDP
Mean	20.604	21.296	20.411	9.8219	13.393	18.700	18.582	24.051
Median	21.194	21.785	20.418	9.8147	13.445	18.842	18.577	23.831
Maximum	23.500	24.904	25.704	10.556	13.581	23.498	19.086	24.969
Minimum	16.788	16.363	15.870	9.0994	13.065	15.139	18.143	23.447
Std. Dev.	2.2419	2.9218	2.9500	0.4051	0.1287	2.5766	0.2683	0.4919
Skewness	-0.3424	-0.4823	0.1275	0.0442	-1.2551	0.5714	0.0812	0.6579
Kurtosis	1.6990	1.8093	1.9730	2.0536	3.7151	2.3982	1.9043	1.8750
Jarque-Bera	3.1525	3.4248	1.6331	1.3175	9.9346	2.4328	1.7892	4.3704
Probability	0.2068	0.1804	0.4420	0.5175	0.0070	0.2963	0.4088	0.1125
Obs.	35	35	35	35	35	35	35	35

Source: Authors' computation (2017).

Table 1 shows that the average value of agricultural productivity (AGP), agricultural expenditure (AGEXP), agricultural raw material (AGRM), agricultural machinery (AGMCH), agricultural land (AGLD), capital (CAP), labour force (LAB) and gross domestic product (GDP) stood at 20.6%, 21.3%, 20.4%, 9.8%, 13.4%, 18.7%, 18.6% and 24.1% respectively. All the variables have standard deviation values lower than their respective minimum value from the distribution. The probability value of the Jarque-Bera statistics for all variables shows their distribution level at mean zero and constant variance.

Table 2: Correlation Analysis (Ordinary)

	AGP	***AGEXP***	***AGRM***	***AGMCH***	***AGLD***	***CAP***	***LAB***	***GDP***
AGP	1							
AGEXP	0.9765	1						
AGRM	0.9579	0.9365	1					
AGMCH	0.9767	0.9402	0.9733	1				
AGLD	0.9024	0.9127	0.8327	0.8677	1			
CAP	0.9250	0.8730	0.9420	0.9613	0.7636	1		
LAB	0.9797	0.9436	0.9738	0.9981	0.8603	0.9578	1	
GDP	0.8773	0.8174	0.9230	0.9304	0.6544	0.9236	0.9384	1

Source: Authors' computation (2017).

Table 2 shows the correlation coefficients of the variables employed for analysis. From the table, the variability of relationship among the variables ranges from strong positive through moderate positive relations. Also, the dependent variables show different level of association among themselves.

Table 3: ADF Unit Root Test Results

Variable	ADF Tau Statistics		Order of Integration
	Intercept	Linear Trend	
AGP	-2.9884 (0) [-2.9540]**	-3.5964 (0) [-3.5529]**	1
AGEXP	-4.0880 (0) [-3.6463]*	-5.1689 (1) [-4.2733]*	0
AGRM	-6.2107 (0) [-3.6463]*	-6.1084 (0) [-4.2627]*	1
AGMCH	-3.8012 (0) [-3.6463]*	-3.7776 (0) [-3.5530]**	0
AGLD	-3.7158 (0) [-3.6463]*	-3.7054 (0) [-3.5530]**	1
CAP	-5.8071 (0) [-3.6463]*	-5.8256 (0) [-4.2627]*	1
LAB	-3.4972 (2) [-2.9604]**	-4.0181 (2) [-3.5629]**	0
GDP	-5.9107 (0) [-3.5885]*	-6.4217 (0) [-4.1809]*	1

Note: ** significant at 1%; ** significant at 5%; *** significant at 10% Mackinnon critical values and are shown in parenthesis. The lagged numbers shown in brackets are selected using the minimum Schwarz and Akaike Information criteria.*
Source: Authors' computation (2017).

4.2 Unit Root Test Results

Table 3 presents the results of the time series properties of the variables included in the model. This pre-test was carried out before estimating the long-run and short-run relationship among agricultural productivity, agricultural inputs, capital, labour force and economic growth in Nigeria (1981-2015). The Augmented Dickey Fuller (ADF) unit root test results presented in Table 3 revealed that agricultural expenditure (AGEXP), agricultural machinery (AGMCH) and labour force (LAB) were stationary at levels [I(0)]. However, agricultural productivity (AGP), agricultural raw material (AGRM), agricultural land (AGLD), capital (CAP) and gross domestic product (GDP) were reported to be stationary at first difference [I(1)]. Thus, these series are non-mean reverting at levels and do not converge to their long-run equilibrium until they are first differenced.

4.3 Autoregressive Distributed Lag (ARDL) Results

Econometric literature argued that regressing a stationary series on non-stationary series has severe implications in drawing policy inference. The data series provides evidence for the use of Autoregressive Distributed Lag (ARDL) technique of analysis. As posited by Pesaran *et al.*, (2001), ARDL is more suitable for variables at different order of integration. The F-statistics estimate for testing the existence of long-run relationship among agricultural productivity, agricultural inputs, capital, labour force and economic growth in Nigeria are presented in Table 4.

Table 4: Existence of Long-Run Relationship Models

Test Statistic	**Value**	**k**
F-statistics (AGP| AGEXP)	6.764	1
F-statistics (AGP| AGRM, AGMCH, AGLD)	5.471	3
F-statistics (GDP| CAP, LAB, AGP)	4.924	3
Critical Value Bounds		
Significance (AGP| AGEXP)	**I0 Bound**	**I1 Bound**
10%	4.04	4.78
5%	4.94	5.73
2.5%	5.77	6.68
1%	6.84	7.84
Significance (AGP| AGRM, AGMCH, AGLD)	**I0 Bound**	**I1 Bound**
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61
Significance (GDP| CAP, LAB, AGP)	**I0 Bound**	**I1 Bound**
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

Source: Author's computation (2017).

The estimated F-statistics of the normalized equations (F_{arb} = 6.764, 5.471, 4.924) were greater than the lower and upper critical bound at 5% significance level. It implies that the null hypothesis of no long-run relationship is rejected at 5% significance level. The implication of the above estimation is that there is existence of long-run relationship between agricultural productivity and agriculture expenditure in Nigeria. Also, it was found that long-run relationship between agriculture raw material, agriculture machinery, agricultural land and agricultural productivity in Nigeria. Likewise, there is existence of long-run relationship between capital, labour, agricultural productivity and economic growth in Nigeria. All the models have equilibrium condition that keeps them together in the long-run.

4.4 Results of Long-run and Short-run Estimates of Agriculture Expenditure and Agriculture Productivity

The table below (Table 5) reveals the long-run estimates between agricultural expenditure and agricultural productivity in Nigeria.

Table 5: Long Run Coefficients [ARDL: 2,2]

Dependent Variable: Agricultural Productivity (AGP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AGEXP	0.6969	0.0445	15.6706	0.0000*
C	6.3853	1.0927	5.8435	0.0000*

Source: Authors' computation (2017).

The long-run estimates suggested that agriculture expenditure had positive and significant impact on agriculture sector productivity in Nigeria and this conform with the theoretical expectation. This implies that for a one per cent increase in agriculture expenditure, the Nigerian agriculture sector productivity grows by 0.697 per cent. The short-run dynamic relationship between agriculture expenditure and agriculture sector productivity in the Nigeria indicating the second part of the estimated ARDL model is reported below in Table 6. The lag lengths were selected based on Akaike Information Criterion (AIC). The table below reveals the short-run dynamic estimates among variables of interest.

Table 6: Estimated Short-run Error Correction Model [ARDL: 2,2]

Dependent Variable: Agricultural Productivity (ΔAGP)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(AGP(-1))	0.518379	0.138236	3.749955	0.0009
D(AGEXP(-1))	0.036710	0.028139	1.304598	0.2030
D(AGEXP(-2))	-0.084784	0.029938	-2.832000	0.0086
ECT(-1)	-0.167605	0.052301	-3.204608	0.0035

Source: Authors' computation (2017).

The short-run estimates suggested that the first lag of agricultural productivity (AGP) exact positive impact on the current level of agricultural productivity in Nigeria. Thus, the short-run estimates of the first and second lags of agricultural expenditure have positive and negative effects on the current level of agricultural productivity in Nigeria. The error correction term indicates the speed of adjustment to restores equilibrium in the model. The value is negative also significant at 1% significance level. Specifically, the lag of the error correction term (ECT) was found statistically significant at 1% level with the co-efficient of -0.1676. This indicates that 16.8% of the distortion in the short-run is corrected in the first year in attainting equilibrium or agricultural productivity on the basis of the changes in the agricultural expenditure in Nigeria.

4.5 Results of Long-run and Short-run Estimates of Agricultural Inputs and Agricultural Productivity

Table 7 reveals the long-run estimates between agricultural inputs and agricultural productivity in Nigeria. The long-run estimates suggested that agricultural raw material (AGRM), agricultural machinery (AGMCH) and agricultural land (AGLD) have direct impact on agricultural productivity in Nigeria. In magnitude terms, this implies that for a 1% change in agricultural raw material (AGRM), agricultural machinery (AGMCH) and agricultural land (AGLD); the agricultural productivity of the Nigerian economy increases by 0.30%, 0.72% and 7.62% respectively. Agricultural land was found to be statistically significant at 5% significance level.

Table 7: Long Run Coefficients [ARDL: 2,0,0,1]

Dependent Variable: Agricultural Productivity (AGP)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
AGRM	0.299090	0.255598	1.170157	0.2526
AGMCH	0.719484	2.329286	0.308886	0.7599
AGLD	7.624640	2.954346	2.580821	0.0159
C	-93.916459	31.827503	-2.950796	0.0066

Source: Authors' computation (2017).

The short-run dynamic relationship between agricultural inputs and agricultural productivity in the Nigeria indicating the second part of the estimated ARDL model is reported below in Table 8. The lag lengths were selected based on Akaike Information Criterion (AIC). The table below reveals the short-run dynamic estimates among variables of interest.

Table 8: Estimated Short-run Error Correction Model [ARDL: 2,0,0,1]

Dependent Variable: Agricultural Productivity (ΔAGP)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(AGP(-1))	0.428387	0.151309	2.831216	0.0088
D(AGRM(-1))	0.038513	0.028672	1.343201	0.1908
D(AGMCH(-1))	0.092645	0.325446	0.284672	0.7782
D(AGLD(-1))	-0.101966	0.756098	-0.134858	0.8938
ECT(-1)	-0.128766	0.052496	-2.452876	0.0212

Source: Authors' computation (2017).

The short-run estimates suggested that the first lag of agricultural productivity exact positive impact on the current level of agricultural productivity in Nigeria. Thus, the short-run estimates of the first lags of agricultural land, machinery and raw material have positive effects on the current level of agricultural productivity in Nigeria. The error correction term indicates the speed of adjustment to restores equilibrium in the model. The value is negative also significant at 1% significance level. Specifically, the lag of the error correction term (ECT) was found statistically significant at 1% level with the co-efficient of -0.1288. This indicates that 12.9% of the distortion in the short-run is corrected in the first year in attainting equilibrium or agricultural productivity on the basis of the changes in the agricultural land, machinery and raw material in Nigeria.

4.6 Results of Long-run and Short-run Estimates of Agricultural Productivity and Economic Growth

Table 9 reveals the long-run estimates between agricultural productivity and economic growth in Nigeria. The long-run estimates suggested that capital (CAP) and labour (LAB) have direct impact on economic growth (GDP) of Nigeria and these follow a'priori expectation. In magnitude terms, this implies that for a 10% growth in capital (CAP) and labour (LAB); the output growth (GDP) of the Nigerian economy increases by 0.97% and 7.74% respectively. However, agriculture productivity (AGP) had positive impact on economic growth (GDP) in Nigeria. A 10% increase in agricultural productivity enhances economic growth by 4.88%.

Labour and agricultural productivity were found to be significant at 5% and 10% significance level except capital which was insignificant at 0.05 and 0.1 critical value.

Table 9: Long Run Coefficients [ARDL: 1,0,2,2]

Dependent Variable: Economic Growth (GDP)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
CAP	0.096736	0.107544	0.899504	0.3773
LAB	0.774359	0.299824	2.582715	0.0163
AGP	-0.487480	0.256700	-1.899030	0.0696
C	-10.641453	4.885353	-2.178236	0.0394

Source: Authors' computation (2017).

The short-run dynamic relationship between agricultural productivity and economic growth in the Nigeria indicating the second part of the estimated ARDL model is reported below in Table 10. The lag lengths were selected based on Akaike Information Criterion (AIC). The table below reveals the short-run dynamic estimates among variables of interest.

Table 10: Estimated Short-run Error Correction Model [ARDL: 1,0,2,2]

Dependent Variable: Economic Growth (ΔGDP)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	0.017729	0.015160	1.169467	0.2537
D(CAP(-1))	3.366449	2.724986	1.235400	0.2286
D(LAB(-1))	-5.831842	5.468886	-1.066367	0.2969
D(AGP(-1))	0.197268	0.106766	1.847661	0.0770
D(AGP(-2))	0.214408	0.101919	2.103716	0.0461
ECT(-1)	-0.183267	0.098104	-1.868084	0.0740

Source: Authors' computation (2017).

The short-run estimates suggested that the first and second lags of agricultural productivity exact positive impact on the current level of economic growth in Nigeria. Thus, the short-run estimates of the first lags of capital and labour have negative effects on the current level of economic growth in Nigeria. The error correction term indicates the speed of adjustment to restores equilibrium in the model. The value is negative also significant at 1% significance level. Specifically, the lag of the error correction term (ECT) was found statistically significant at 1% level with the co-efficient of -0.1833. This indicates that 18.3% of the distortion in the short-run is corrected in the first year in attainting equilibrium or economic growth on the basis of the changes in the labour, capital and agricultural productivity in Nigeria.

Table 11: Diagnostic Tests of Selected ARDL Model

Model I (AGP| AGEXP)	
Serial Correlation: 1.6475 [0.2128]	Normality Test: 1.8838 [0.3899]
Functional Form: 0.4906 [0.6278]	Heteroskedasticity Test: 1.4199 [0.2489]
Model II (AGP| AGRM, AGMCH, AGLD)	
Serial Correlation: 0.9568 [0.3983]	Normality Test: 0.1891 [0.7213]
Functional Form: 0.4349 [0.6673]	Heteroskedasticity Test: 0.7614 [0.6067]
Model III (GDP| CAP, LAB, AGP)	
Serial Correlation: 1.3573 [0.2781]	Normality Test: 0.1926 [0.6785]
Functional Form: 0.4388 [0.6649]	Heteroskedasticity Test: 0.2663 [0.9709]

Source: Authors' computation (2017).

4.7 Diagnostic Tests

The estimated ARDL model is tested for heteroscedasticity, serial correlation, functional form misspecification, parameter stability and normality. The results from these tests are shown in the Table 11. The estimated ARDL model revealed that the models passed the serial correlation, normal test and heteroskedasticity tests. Likewise, the Ramsey RESET tests were also satisfactory for the ARDL model.

5.0 Conclusion and Policy Options

This paper investigates how enhancing the agricultural value chain contributed to rapid economic diversification in Nigeria within the period of 1981-2015. Using the autoregressive distributed lag (ARDL) model, there is existence of long-run relationship between agricultural productivity and agriculture expenditure in Nigeria. It further revealed that long-run relationship existed between agriculture raw material, agriculture machinery, agricultural land and agricultural productivity in the country. Empirical findings showed that the agriculture expenditure had positive and significant impact on agriculture sector productivity in Nigeria. It was also found that agricultural raw material, agricultural machinery and agricultural land had direct impact on agricultural productivity in Nigeria. Agricultural machinery and agricultural land were found to be statistically significant at 5% significance level. The empirical results revealed that capital and labour have direct impact on economic growth. However, agriculture productivity had positive impact on economic growth in Nigeria. The study concluded that agricultural value chain contributed significantly to the diversification of the Nigerian economy. The study suggests that government should make deliberate efforts to create institutions that will make policy programmes on agricultural development not only to enhance its growth and the overall output growth but also make it inclusive.

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