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LONG-RUN AND SHORT-RUN RESPONSES OF AGRICULTURAL SECTOR GROWTH TO ITS DETERMINANTS IN NIGERIA

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ABSTRACT

The study examined the long-run and short-run responses of agricultural sector growth to its determinants in Nigeria using time series data (1981-2015). Dynamic Ordinary Least Square (DOLS) method was employed in the analysis of the data. Jarque-Bera Normality Test, Breusch-Godfrey serial correlation LM test, Engle Granger 2-Step Test for Co-Integration and CUSUM of Squares Test were used to test for normality, serial correlation and structural dynamic stability of the data. The trend of agricultural sector growth revealed that sustained growth of the sector has been experienced since 2001 up till 2015. The results revealed that agricultural sector growth was positively and significantly influenced by capital expenditure in the sector, which was proxy by Total Government Agricultural Expenditure (TGAE), in the long-run; while in the short-run, the sector growth was positively and significantly influenced by labour employment. It is therefore recommended that for sustained agricultural sector growth and development in the country, increased capital expenditure in the sector should be pursued with sustained vigour. Since agriculture sector shows immediate and significant response to employment, it should be made attractive to youth employment by provision of incentive. This would ensure dual gain of tackling unemployment problem in the country and ensure agricultural sector growth.

Key words: determinant, agricultural sector growth, Nigeria

INTRODUCTION

Nigeria's agricultural sector, which has potential of providing national economic growth and development in terms of employment creation, export market creation, poverty eradication and largest contribution to GDP, remain a showdown of itself. To address the poor growth rate, the government took a receptive stance towards diversification and began initiating agricultural reforms and implementing diverse intervention programmes for the sector such as Operation Feed the Nation launched in 1976, Green Revolution Programme launched in 1979, and the establishment of agencies like the National Agricultural Land Development Authority (NALDA), River Basin Development Authority (RBDA) and the Directorate of Food, Road and Rural Infrastructure (DFRRI) just to mention a few. These interventions and reforms saw agriculture expenditure (% of total government expenditure) increase from about 3% in 1980 to as high as 16.8% in 1985 (Central Bank of Nigeria, 2012). The expenditure remained volatile with an average of 4.51% per annum between 1994 and 1998 and 3.53% between 1999 and 2005 (Central Bank of Nigeria, 2012).

The improvements recorded by the agricultural sector in recent times can be attributed to the government's concerted efforts to diversify the economy (Ogbeh, 2016). These include various allocations to the sector in terms of lending and budgetary provisions. Many financial windows have been made available through the intervention of the Central Bank of Nigeria (CBN), Bank of Industry (BOI), Bank of Agriculture (BOA), and Federal Government Small and Medium Enterprises (SMEs) Loans Scheme. The Anchor Borrower Programme of CBN/FMARD and Youth Empowerment in Agriculture Programme (YEAP) are providing opportunities to the youth and women to embark on bankable enterprises in agriculture (Ogbeh, 2016). To ensure improved funding in line with its diversification drive, the Federal Government budgeted ₦123.44 Billion for agriculture in 2017 as against ₦75.80 Billion for 2016 (Federal Government Appropriation Bill, 2017). These efforts were further strengthened with the launch of an Agriculture Promotion Policy (APP), which seeks to address the drawbacks of the Agricultural Transformation Agenda (ATA) set by the previous administration. Unfortunately, many

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challenges still continue to hinder development in the sector such as inadequate access to credit, domestic consumption, foreign exchange and poor technology adoption (Agricultural Promotion Policy, 2016). Other specific challenges include insufficient access to a variety of seeds, access to land for investment, infrastructural deficiency mainly in power and transportation, poor commodity exchange/off-take agreement (Agricultural Promotion Policy, 2016).

The potential contribution of agriculture to economic growth has been an on-going subject of much controversy among development economists. Several authors argued that growth in the overall economy depends on the development of agricultural sector (Schuttz, 1964; Gollin *et al.,* 2002). The growth in the agricultural sector could be a catalyst for national output growth via its effect on rural incomes and provision of resources for transformation into an industrialized economy (Thirtle *et al*., 2003). Johnston and Mellor (1961) postulated that agriculture contributes to the economic growth and development through five inter-sectoral linkages, which are (i) supply of surplus labour to firm in the industrial sector, (ii) supply of food for domestic consumption, (iii) provision of market for industrial output, (iv) supply of domestic savings and industrial investment and (v) supply of foreign exchange from agriculture export earnings to finance import of intermediate and capital goods.

Agricultural sector comprises crop production, livestock, forestry and fishery. Individual sectoral contribution to the total agricultural nominal Gross Domestic Product in 2015 is provided in Figure 1. According to National Bureau of Statistics (2019) database, crop production sector contributed about 89% of agricultural GDP in 2015. This followed insignificantly by livestock subsector, which contributed about 7% to the total agricultural sector GDP. Figure 1 shows that forestry subsector has the least contribution to the aggregate sector GDP.

The long and short run phenomena are situations faced at different stages of an enterprise. The agricultural sector in Nigeria is no different. The behaviour of sectors in the light of the long and short-run experiences have suggested development of the industry to accommodate the occurrences of such phenomena. To better understand the sector and develop interventionist plans towards its development, there is need to study and understand the long-run and short-run responses of the agricultural sector in Nigeria to its determinants. Hence, the study is aimed at identifying the possible determinants of long-run and short-run responses of the agricultural sector in Nigeria. Specifically, the study is aimed at describing the trend of agricultural sector growth in Nigeria from 1981-2015, and estimating short-run and long-run responses of agricultural sector growth in Nigeria.

MATERIALS AND METHODS

The study was conducted in Nigeria. Time series data (1981-2015) were used for this study. The data were sourced from Central Bank of Nigeria, National Bureau of Statistics and Federal Ministry of Agriculture and Rural Development. Analytical Techniques:

a) The Cobb-Douglas functional form is widely used to represent the relationship of an output to inputs. The Cobb – Douglas growth model is:

$$Y = AL^{\beta} K^{\alpha} \quad \text{..... (1)}$$

where *Y* is total production (Agriculture share of all goods produced in a year) (OUTP) (₦), *K* is capital input (total government agriculture expenditure (TGAE) (₦), *L* is labour input (Employment in Agriculture (% of total employment) (EMAG) (%), *A* is efficiency parameter (inflation rate, IFN) (%), and α and β are the **o**utput elasticities of capital and labour, respectively. These values are constants determined by available technology.

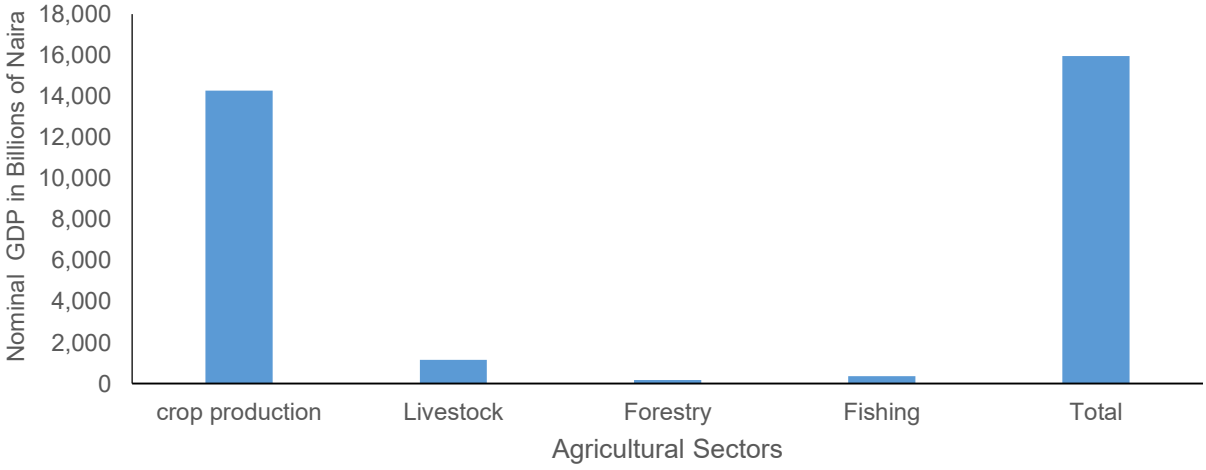

Figure 1: Agricultural sector nominal gross domestic product in 2015**. Source:** NBS (2019)

b) By log-linearizing the equation 1 becomes:
$LnOUTP_t = ln\beta o + \beta_1 lnTGAE_t + \beta_2\, lnEMAG_t + \beta_3$

$lnIFN_t + \mu$ ..... (2)

Equation 2 was specified using Dynamic Ordinary Square (DOLS) framework as suggested by Stock and Watson (1993). The DOLS model is specified as follows:

$$LnYt = \Psi_1 + \Psi_{2i} lnX_{it} + \ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

where Y_t is dependent variable at time T, and X_{it} is vector for independent variables at time T.

Model 3 was specified to capture short run structural form of DOLS model as followed:

$$Ln\Delta Yt = \Psi_1 + \Psi_{2i} ln\Delta X_{it} + \sum_{i=+K}^{-K} \varphi_i\, ln\Delta\, X_{t-1} + \gamma ECT_{t-1} + \mu_t \quad \ldots\ldots\ldots(4)$$

where Δ is first difference of the variables in the model; ECT_{t-1} is error correction term, Ln is natural log. Both unit root test on the residuals generated from structural model (equation 2), and Engle-Granger co-integration test were carried out.

RESULTS AND DISCUSSION

Trend of Agricultural Sector Growth in Nigeria

The trend of agricultural sector growth is shown in Figure 2. The Figure shows the sector growth in naira between 1981 and 2015 proxy by real GDP. From the Figure, it was observed that there were fluctuations between 1981 and 1991. The value of the agricultural GDP in these 10 years fluctuated above ₦10 billion naira but less than ₦20 billion. Between 1992 and 1995, there was stability and less fluctuation but stagnated growth in the sector was observed. There was slight improvement in sector growth from 1996-2000. Sector growth reached ₦20 billion naira in 2001 (9% rise over the previous years). From 2001 to 2015, steady growth of the sector was observed with each year surpassing the previous year. Sector growth rose by 30% to the GDP of nearly ₦70 billion in 2015. This shows that the sector has shown resilient in its growth.

Engle Granger 2-Step Test for Co-Integration

The 2-step test of co-integration involved estimation of regression model based on the model 2 in the methodology, though the IFN variable was removed from the model for the paucity of data. The residuals (error terms) were obtained from the estimated results of the model as first step (Table 1). This was followed by application of unit-root test using Augmented Dickey Fuller (ADF) model. The test, as a condition, did not include a constant or a trend terms in the ADF model structure. The ADF test result shows that the H_0 (null hypothesis) of presence of unit root in the error terms could be rejected (Table 1). This implies that the error term in the regression equation was stationary. Even if individual time series were non-stationary, their linear combination must be stationary to ensure co-integration of the variables. The second step involved comparing the ADF test result with co-integration test statistic of Engle and Granger. The EG test is based on the normalization assumption and admits only one co-integrating equation. The result confirmed the presence of co-integration among the variables in the model 2.

Table 1: Two-step EG co-integration test

Variable	Coefficient	Std. Error	t-statistic	Prob
Constant	3.34	0.83	4.05	0.0003
TGAE	0.58	0.11	5.35	0.0000
EMAG	-1.33	0.37	-3.64	0.0010
R^2 = 0.92				
ADF			-3.86	0.0003

Source: Estimated values, 2019

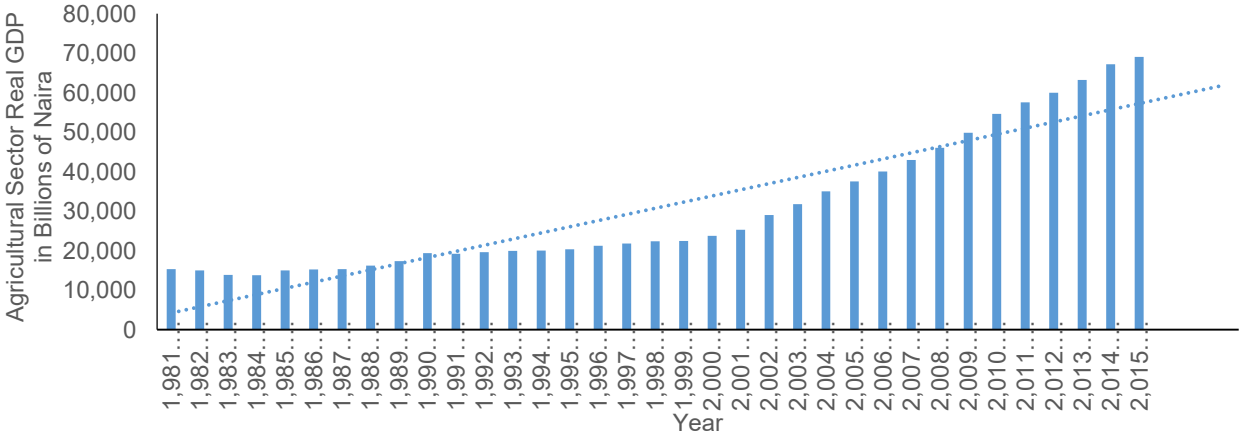

Figure 2: Agricultural sector growth (PROXY BY REAL GDP) 1981- 2015

Long-Run Response of Agricultural Sector Growth
The long run response of the agricultural sector growth to its determinants was estimated based on the model 3 in the methodology. The result in the Table 2 shows that the growth of agricultural sector was positively and significantly influenced by capital deployment in the sector in the long-run. Given the result in Table 2, however, labour employment did not show any influence on the sector in the long-run. The result implies that total government agricultural expenditure (TGAE) is significant in the long run in determining the growth in the in the agricultural sector in Nigeria while labour employment had no significant influence on agricultural output in the long run.

The nexus between economic growth and public expenditure has been researched by various authors in Nigeria (Akpan, 2005; Maku, 2009; Udoh, 2011; Loto, 2011). However, a definitive result has never been arrived at by all authors. Outcomes have often come out with mixed results while some accounts have been consistent with the findings in this study others have been incongruent. For example, while studying government expenditure and economic growth in Nigeria, Akpan (2005) found no significant relationship between most of the components of government expenditure (including agriculture) and economic growth. Similarly, Magu (2009) showed that private and public investments have insignificant effect on economic growth in Nigeria. Also, Loto (2011) researched on impact of government sectoral expenditure on economic growth and discovered that in the short-run, expenditure on agriculture was negatively related to economic growth. All of these findings were inconsistent with the present finding. However, Udoh (2011) observed that increase in public expenditure has a positive influence on the growth of the agricultural output.

Short-Run Response of Agricultural Sector Growth
The short-run response of the agricultural sector was determined through model 4 in the methodology. In fulfilment of the requirement for the confirmation of the validity of estimated result, various tests were carried out on the estimated result of model 4. These included normality, autocorrelation and dynamic stability tests. For the normality test, Figure 3 shows that Jarqua-Bera test statistic (H_0: normality distribution of variables in the model) cannot be rejected. This implies that estimated result of the model satisfied normality test.

On the serial correlation of the estimated result, Breusch-Godfrey autocorrelation test also showed that null hypothesis (H_0) of no autocorrelation among the variables in the estimated result could not be rejected as shown in Table 3. This further confirmed that the variables in the model did not suffer autocorrelation problem.

Table 2: Long-run response of agricultural sector growth to its determinants

Variables	Coeffi-cient	Std. error	t-statistic	Prob
EMAG	-0.01	0.66	-0.02	0.98
TGAE	0.26	0.12	2.19	0.04
EMAG(1)	-0.18	0.52	-0.35	0.73
EMAG (-1)	-0.56	0.55	-1.02	0.32
TGAE (1)	0.33	0.11	2.95	0.01
TGAE (-1)	0.18	0.12	1.53	0.14
C	1.97	0.93	2.12	0.04
$R^2 = 0.96$ F-statistic				0.00

Source: Estimated values, 2019

Table 3: Breusch-Godfrey serial correlation LM test

F-statistic	0.325839	Prob. F(2,24)	0.7251
Obs*R-squared	0.845934	Prob. Chi-Square(2)	0.6551

Source: Estimated result, 2019

For the structural dynamic stability test of the estimated model, CUSUM of Square test shows that the estimated model result was dynamically stable as shown in the Figure 4.

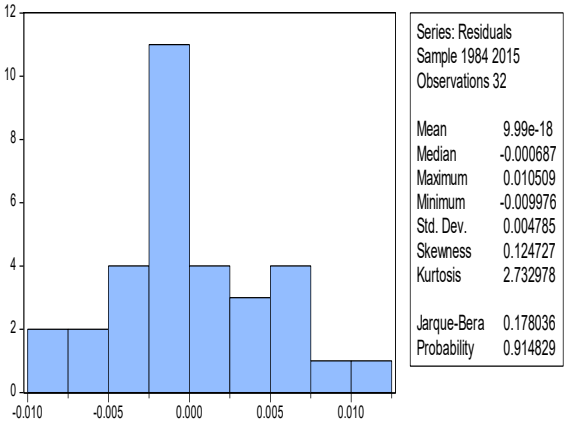

Figure 3: Jarque-Bera normality test

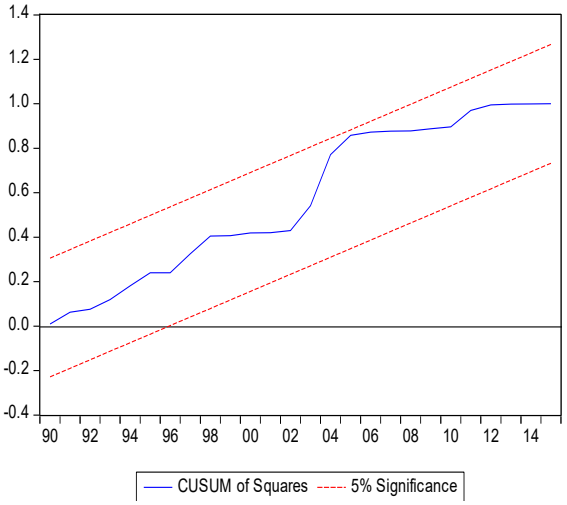

Figure 4: Cusum of squares test result

Having satisfied normality, serial correlation and structural dynamic stability tests, the estimated result for the short-run response of the agricultural sector growth to its determinants is provided in Table 4. The speed of adjustment for residual (error correction term) with a lag period [RD (–1)] shows that the model corrected the previous period's level of disequilibrium. The negative sign and statistical significance of estimated coefficient for residual RD (–1) is also an evidence for the existence of co- integrating relationship among the variables in the model (Dutta and Ahmed, 1999). The result in the Table 4 shows that the growth of agricultural sector was positively and significantly influenced by labour employment in the sector in the short-run. Given the result in Table 4, however, capital deployment did not show any influence on the sector in the short-run. This implies that for the short-run, increase in labour force is more likely to lead to agricultural sector growth rather than increased government expenditure

The implication of this finding is that there is direct relationship between level of employment in the sector and the sectoral growth in the short run which was not observed in the long-run. The result, therefore, revealed 0.37% increase in growth of the agriculture sector would result from 1% rise in employment in the sector. Therefore, as the sector grows, its capacity to offer employment to the teeming unemployed youths in Nigeria would rise.

CONCLUSION AND RECOMMENDATIONS

Based on the findings from the research, it can be concluded that there exist strong and significant long-run and short-run responses of agricultural sector growth to its determinants in Nigeria. However, while public sector expenditure variable has significant influence on agriculture sector growth in the long run, it was insignificant in the short in run. Furthermore, determinant such as employment in agriculture, which was observed to be insignificant in the long run, exhibited significant influence on the agricultural sector growth in the short-run. It is recommended that for Sustained agricultural sector growth and development in the country, increase in the capital expenditure in the sector should be pursued with sustained vigour. Also, since agriculture sector shows immediate and significant response to employment, the sector should therefore be made attractive to youth employment by provision of incentive. This would ensure dual gain of tackling unemployment problem in the country and ensure agricultural sector growth.

Table 4: Short-run response of agricultural sector growth to its determinants

Variables	Coefficient	Std. Error	t-statistic	Prob
D[LOUTP (–1)]	0.06	0.17	0.32	0.74
D[TGAE (–1)]	0.04	0.03	1.53	0.14
D[EMAG]	0.37	0.14	2.60	0.02
D[EMAG (–1)]	0.42	0.15	2.74	0.01
ECT (–1)	-0.36	0.13	-2.77	0.01
C	0.04	0.02	1.93	0.07

Source: Estimated values, 2019

REFERENCES

Agricultural Promotion Policy (2016). Policy and Strategy Document. Federal Ministry of Agriculture and Rural Development. Accessed from *http://nssp.ifpri.info/files/2016-Nigeria-Agric-Sector-Policy-Roadmap* on 15/12/2018

Akpan N.I. (2005). Government expenditure and economic growth in Nigeria: A disaggregated approach. *CBN Financial & Economic Review*, **43 (1),** 12-20

Central Bank of Nigeria (2012). Developments in the external sector. External Sector Committee Reports, Quarter3, Issue 1 No. 3, p. 6

Dutta D. and Ahmed N. (1999). An aggregate import demand function for Bangladesh: a co-integration approach. *Applied Economics,* **31 (4),** 465-472

Federal Government Appropriation Bill (2017). National Budget for 2017. National Bureau of Statistics, Abuja

Gollin D., Parente S.L. and Rogerson R. (2002). The role of agriculture in development. *American Economic Review*, **92 (2),** 160-164

Johnston B. and Mellor J. (1961). The role of agriculture in economic development. *American Economic Review*, **51 (4),** 556-593

Loto M.A. (2011). Impact of government sectoral expenditure on economic growth. *Journal of Economics & International Finance*, **3 (11),** 646-652

Maku O.E (2009). Does government spur economic growth in Nigeria?' MPRA Paper No.17941. Available at http://mpra.ub.uni-muenchen.de/17941/. Accessed on 11th Nov., 2018

National Bureau of Statistics (2019). Nigeria Gross Domestic Product Report. Abuja, pp. 1-98

Ogbeh A. (2016). An address by honorable minister of agriculture at the general assembly of Northern Traditional Rulers' Council (NTRC) titled "Agriculture in a Recessionary Economy: Challenges and Prospects". 29th November, Abuja, pp. 1-11

Schuttz T.W. (1964). *Transforming traditional agriculture New Haven*, Yale University Press, p. 212

Stock and Watson (1993). A simple estimator of cointegrating vectors in higher order integrated systems. *Econometrica*, 16(4):783-820

Thirtle C., Lin L. and Piesse J. (2003). The impact of research-led agricultural productivity growth on poverty reduction in Africa, Asia and Latin America. *World Development*, **31 (2),** 1959-1975

Udoh E. (2011). An examination of public expenditure, public investment and agricultural sector growth in Nigeria: Bounds testing approach. *Journal of Business & Social sciences*, **2 (1),** 285-292