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Dynamic Effect Of Government Spending On Agricultural Output In Nigeria

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ABSTRACT
The paper examined the dynamic effect of government spending on agricultural output in Nigeria. We established the relationship between government capital and recurrent spending on agriculture and agricultural output in Nigeria in a multiple regression model. The model for the regression analysis has government capital and recurrent expenditure on agriculture, as the explanatory variables whileagricultural output is the dependent variable. Using secondary data from CBN statistical bulletin and applying the econometrics method of co-integration/ error correction mechanism and granger causality testmethods. We discovered that dynamic model depicted by the parsimonious ECM result shows that thecoefficient of government capital and recurrent spending on agriculture were positively related to agricultural output. Also, the coefficient of the ECM shows that there exists a long-run equilibrium relationship among the variables. This is because the coefficient of ECM is negatively signed and significant. Moreover, the Pairwise Granger Causality results show that government capital and recurrentspending on agriculture granger cause agricultural output in Nigeria. Based on these findings, we recommend amongst others that: Since government spending is positively and significantly related toagricultural output, government should increase more of her budgetary allocation to the agricultural sectorin order to boost production output.

KEY WORDS: Dynamic, ECM, Causality, Government Spending, Agricultural Output

1.0 INTRODUCTION

The performance of an economy is usually looked at in terms of sectors. These are the real sector (agricultural, industrial and service), public and external sectors. Sustainable and improved productivity in the Nigerian agricultural sector and its effects on macroeconomic goals have been very important issues over the decades. Thus, the agricultural sector refers to those areas of activities that result in the production of crops and rearing of animals for man use. In the agricultural sector, production is categorized into cash crops, staples, livestock, fishery, forestry and other produce, among others (CBN, 2007).

Nigerian as a country has to work hard to produce goods and services vis-a-vis the agricultural sector to be able to compete favourably with other nations of the world. The ability to compete with other nations is a key element to survival as a nation. Hence, there is need for sustained increase in production in the agricultural sector of the economy (Obayori, 2014). Ewubare and Obayori (2015) also opined that there should be continuity and consistency of macroeconomic policy measures in the agricultural sector. This is because agricultural sector has high capacity to link with industrial sector and high value chain in the sector that can be used for further production.

Thus, high agricultural sector output, with the right combination of other factors as well as good policy environment will result in higher output and economic growth and development. Given particularly the less favorable economic conditions that face most developing countries today, manifested in massive poverty and un-sustained performance of major macroeconomic variables, the need to improve the agricultural sector productivity cannot be over-emphasized. Therefore, Nigeria, like other developing countries of the world views high agricultural production as vital for rapid economic growth and development. Consequently, changes in the relative importance of agriculture have been recognized as the core of the growth and development process.

Meanwhile, public expenditure, which serves as the basis of financing the agricultural sector has constantly fallen short of the public expectation. For instance, a collaborative study carried out by the International Food Policy and Research Institute (IFPRI) and the World Bank in 2008, revealed that federal government of Nigeria public expenditure on agriculture is less than 2% of total federal annual budget expenditure. This is significantly below compared to other developing countries like Kenya (6%), Brazil (18%) and 10% goal set by African Leaders Forum, under the Comprehensive Africa Agricultural Development Programme (Uger, 2013). In spite of this little investment in the sector, agriculture has on the average contributed 32% of

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the country's GDP from 1996 to 2000 and 42% between 2001 and 2009 (CBN 2010).

Given the background above, the main objective of this paper is to analyse the effect of Federal Government spending (capital and recurrent) on agricultural output in Nigeria. The paper is divided into five sections namely: introduction, literature review, methodology, results and discussion and section five centres on conclusion and recommendations.

2.0 LITERATURE REVIEW

This is considered under the following sub-headings: theoretical literature and empirical literature

2.1 Theoretical Literature

The theory of production and theories of public expenditure were the basis for this study.

2.1.1 The Theory of Production

Production theory provides the foundation for identifying the opportunities for growth. The theory of production deals basically with input-output relationships. These input – output relationships can be expressed in physical terms as well as in monetary terms. The physical terms of the production theory involve the technical and technological relations between inputs and output e.g. capital-labour relations, capital-output ratios etc. The monetary terms deal with cost-output relationship, i.e. cost analysis (Ugumba, 2011).

Since the theory of production defines the output of goods and services as a function of the input of factors of production, it could thus be shown algebraically as follows:

Assuming Q represents National Output, K Capital Input, L Labour Input, N Land Input, E Entrepreneur Input: the production function can thus be defined as:

$$Q = Q(K,L,N,E) \quad (2.1)$$

The usual assumption is that the marginal product of each factor of production is positive but diminishing. Meaning that as more of each factor input is introduced in the production process total output increases but at a diminishing rate. Thus:

$$\frac{dQ}{dK}, \frac{dQ}{dL}, \frac{dQ}{dW}, \frac{dQ}{dE} =$$

$$Q_k > 0 : \quad Q_{KK} < 0 \quad (2.2)$$

$$Q_L > 0 : \quad Q_{LL} < 0 \quad (2.3)$$

$$Q_N > 0 : \quad Q_{NN} < O \quad (2.4)$$

$$Q_E > 0 : \quad Q_{EE} < 0 \quad (2.5)$$

Taking the total differential of Q, ΔQ we then have

$$\Delta Q = Q_K \Delta k + Q_L \Delta L + Q_N \Delta N + Q_E \Delta E \quad (2.6)$$

Equation (2.6) shows that increase in output ΔQ is equal to the sum of the products of factor marginal product and increase in factor inputs i.e the total increase in national output is equal to the marginal product of capital times increase in capital plus the marginal product of labour times increase in labour plus marginal product of land times increase in land plus the marginal product of entrepreneurship times increase in entrepreneurship.

The above shows that economic growth from the perspective of the production function based model depends on the quantity of inputs of factor services and factor productivities. Consequently, economic growth and development rest on two sets of elements and these are the quantity of inputs of factor services and the quality of productivity of these factor inputs. Thus, the more the quantity and quality of factor inputs the more the growth of national income and vise viser.

From the stand point of the production function based model, underdevelopment and lack of growth will reflect a state of affairs where a particular society lacks these inputs and or where their quality is poor. In such a society the emphasis should be on increasing the supply of these factors as well as enhancing their productivity in order to attain rapid economic growth.

2.1.2 Theories of Government Expenditure

(a) Wagner's Law of Increasing State Activities (1835-1917)

Adolph Wagner (1835-1917) was a German economist based his law of increasing state activities as historical fails from Germany. According to Wagner, there are inherent tendencies for the activities of different layers of a government (such as central, state and local government) to increase both intensively and extensively. There is a fund and relationship between the growth of an economy and government activities with the result that the government and sector grows faster than the economy. From the original version of this theory, it is not clear whether Wagner was reforms to an increase in absolute level of public spending, the ratio of government expenditure to GNP or Proportion of public sector in the economy. But Musgrave believes that Wagner was thinking of proportion of public sector in the economy. Nisti (1903), not only supported Wagner's thesis but also concluded with empirical evidence that it was equally applied to several other government expenditure which differed widely from each other. All kinds of government (say the central or state government) have exhibited, the same tendency of increasing public spending.

2.2 Empirical Literature

Yusuf and Okoruwa (2013) examined an analysis of federal government expenditure and monetary policy on agricultural

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output in Nigeria. Data was sourced from the CBN statistical bulletin (various issues), and the National Bureau of Statistics. The data covered 1980-2012 and the method of analysis used was the OLS using E-view. The result of the analysis showed that Agricultural Credit Guarantee Scheme Fund, previous year GDP and Consumer Price Index contribute positively to the growth of agricultural GDP, other variables of interest like the interest rate, exchange rate, and government expenditure on agriculture contributed negatively to agricultural GDP growth.

Okezie, Nwosu and Njoku (2013) examined the relationship between Nigeria expenditure on the agricultural sector and agricultural output. Their study used time series data from 1980 to 2011, obtained from the Central Bank of Nigeria Annual Report and employed the Engle-Granger two step modeling (EGM) procedure to co-integration based on unrestricted Error Correction Model and Pair wise Granger Causality tests. Their findings indicate that agricultural contribution to GDP and total government expenditure on agriculture were cointegrated. The speed of adjustment to equilibrium is 88% within a year when the variables wander away from their equilibrium values. Also, the result of granger causality shows that a very weak causality exist between the two variables used in this study.

Aina (2015) examined government spending and the performance of the agricultural sector in Nigeria. H opined that one of the main purposes of government spending is to provide infrastructural facilities and the maintenance of these facilities requires a substantial amount of spending. He also viewed that the relationship between government spending on public infrastructure and economic growth tends to be an important analysis in developing countries, most of which have experienced increasing levels of public expenditure overtime. The author also impacted that expenditure on infrastructure investment and productive activities (in state owned Enterprises) ought to contribute positively to growth, whereas government consumption spending is anticipated to be growth retarding.

Iganiga and Unemhilin (2011) studied the effect of federal government agricultural expenditure and other determinants of agricultural output on the value of agricultural output in Nigeria. A Cobb Douglas Growth Model that included commercial credits to agriculture, consumer price index, annual average rainfall, population growth rate, food importation and GDP growth rate. The study performed comprehensive analysis of data and estimated the Vector Error Correction model. Their results showed that federal government capital expenditure was positively related with agricultural output.

Oji-Okoro (2011) employed multiple regression analysis to examine the contribution of agricultural sector on the Nigerian economic development. They found that a positive relationship with GDP vis a vis domestic saving, government expenditure on agriculture and foreign direct investment between the period of 1986-2007. It was also revealed in the study that 81% of the variation in GDP could be explained by Domestic Savings, Government Expenditure and Foreign Direct Investment.

Using time series data, Lawal (2011) attempted to verify the federal government expenditure on Agriculture from 1979 – 2007. Significant statistical evidence obtained from the analysis showed that government spending does not follow a regular pattern and that the contribution of the agricultural sector to the GDP is in direct relationship with government funding to the sector. Ogwuma (1981) examined public expenditure in Agricultural sector using econometric analysis. Based on his findings, Agricultural financing in Nigeria shows positive relationship between interest rate and loananable funds on the level of Agricultural output.

In assessing macroeconomic policies adopted in Nigeria and their effects on agricultural output growth in Nigeria, Eyo (2008) used the OLS econometric technique and reported that country's exchange rate regime has not encouraged agricultural exports lately. Although credit to the sector had no significant effect on agricultural output growths, its availability greatly depends on how high the nominal interest rates are. On the whole, macroeconomic policies that reduce inflation, increase foreign private investment in agriculture, introduce favorable exchange rates; make agricultural credit to have significant effect on agricultural output in Nigeria.

The focus of Anjinde, Muchie and Olatunji (2011) was on the effect of climate change on agricultural productivity in Nigeria. Descriptive and co-integration analysis are the techniques used to analyze the time series data. The finding demonstrated that the rate of agricultural productivity is persistently higher between 1981 and 1995, followed by a much lower growth rate in the 1996 – 2000 sub-periods. There was variation in the trend pattern of rainfall. Temperature was not relatively constant either. The augmented dickey – fuller test for unit root revealed that agricultural productivity is not stationary likewise the annual rainfall but became stationary after differencing them. Annual temperature on the other hand is stationary at its level. Temperature change was revealed to exert negative effect while rainfall change exerts positive effect on agricultural productivity. However, previous year rainfall was negatively significant in affecting current year agricultural production in Nigeria.

3.0 METHODOLOGY

The model for the study is stated in a nonlinear form in order to put the variables on the same scale and also reduce the problem of multicollinearity.

Thus; $LogAGP = Loga_0 + a_1LogGCX_t + a_2LogGRX_t + U_t$ (3.1)

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Where; AGP= Agricultural Production Output, GCX= Government Capital Expenditure on Agriculture, GRX= Government Recurrent Expenditure on Agriculture, Log = Natural Logarithm, U = Error Term, t= Time/Period

On the apriori, we expect $a_1 > 0$ and $a_2 > 0$

The study employed cointegration/ECM and Granger causality tests to examine and also measure the causal effects of the variables specified in the model. The unit root test via the ADF test precedes the cointegration, ECM and Granger causality tests in order to test for stationarity of the variables. The unit root model is presented thus:

$$\Delta Y_1 = \alpha Y_{t-1} + \sum_{i=1}^{m} \beta \Delta Y_{t-1} + \delta + Y_{1+} \varepsilon_1 \quad (3.2)$$

for levels

$$\Delta\Delta Y_1 = \alpha \Delta Y_{t-1} + \sum_{i=1}^{m} \beta \Delta \Delta Y_{t-1} + \delta + Y_1 + \varepsilon_1 \quad (3.3)$$

for first difference

4.0 RESULTS AND DISCUSSION

ΔY is the first difference of the series, m is the number of lags and t is the time.

Therefore, assuming the integration of order I(1) and cointegration between the agricultural production output, Federal Government Capital Expenditure (GCXt) and Federal Government Recurrent Expenditure (GRX_t). The following ECM, according to Engel, Johansen and Granger (1987), are formulated:

$\Delta AGPt = ln\delta 0 + \Sigma\ \delta i \Delta\ GCXt + \Sigma \delta 2 \Delta GRXt + ECMt\text{-}_1$ (3.4)

From equation 3.4, Δ indicates difference operator, t implies time, δ0 is the intercept and ECMt-1 is the error correction mechanism obtained from the long-run cointegration regression. While δ_1- δ_2 are the coefficients of explanatory variables.

Table 4.1 Unit Root Test for Stationarity (Augmented Dickey Fuller)

Variables	ADF Test	Critical Value			Order of integration
		1% critical value	5% Critical value	10% critical value	
DLOG(AGP)	-3978238	-3.646342	-2.954021	-2.615817	At Level.
DLOG(GCX)	-9.477050	-3.661661	-2.960411	-2.619160	1st Diff.
DLOG(GRX)	-7.660637	-3.679322	-2.967767	-2.622989	1st Diff.

Source: *computed Result (E-view 7.1)*

The unit root test in table 4.3 above shows that at various levels of significance (1%, 5% and 10%), the time series were stationary. From the result AGP was integrated of order zero (at level), while the remaining two variables (GCX and GRX) were integrated of order one (first difference), therefore all the time series in this study are stationary.

Table 4.2: Johansen Test for co-integration

Eigen value	Max-Eigen Statistic	5% critical value	Prob. **	Hypothesis of CE(s)
0.585087	21.99215	21.13162	0.0378	None *
0.439242	14.46162	14.26460	0.0465	At most 1 *
0.145611	3.934212	3.841466	0.0473	At most 2 *

Source: *Computed Result (E-view 7.1)*

Cointegration is conducted based on the test proposed by Johansen. From the table 4.4 above, it shows that there are three co-integrating equations at 5% level of significance. Given that there exists co-integrating equations, the requirement for fitting in an error correction model is satisfied.

Table 4.3 Parsimonious Error Correction Mechanism

Dependent Variable: DLOG(AGP)		
Method: Least Squares		

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Date: 05/14/15 Time: 13:33				
Sample (adjusted): 1983 2013				
Included observations: 29 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.062934	0.098752	0.637288	0.5305
DLOG(AGP(-1))	-0.188944	0.229543	-0.823130	0.4193
DLOG(AGP(-2))	0.030014	0.145373	0.206463	0.8383
DLOG(GCX)	0.010666	0.120296	0.088661	0.9302
DLOG(GCX(-1))	0.164302	0.134557	1.221058	0.2350
DLOG(GRX)	0.074087	0.127278	0.582085	0.5664
ECM(-1)	-0.741215	0.290437	-2.552069	0.0182
R-squared	0.609909	Mean dependent var		0.057148
Adjusted R-squared	0.503520	S.D. dependent var		0.668508
S.E. of regression	0.471040	Akaike info criterion		1.538756
Sum squared resid	4.881322	Schwarz criterion		1.868793
Log likelihood	-15.31196	Hannan-Quinn criter.		1.642119
F-statistic	5.732846	Durbin-Watson stat		1.974564
Prob(F-statistic)	0.001027			

Source: *Computed Result (E-view 7.1)*

The result of the estimated parsimonious error correction model above shows that the coefficient of determination-R^2 is 0.609. Thus, systematic variation in agricultural production output explained by government capital and recurrent expenditure on agricultural is 61 percent. The overall model is significant at 5 percent level of significance as shown by the F-statistic of 5.73 with the probability of 001027. The coefficient of ECM is negatively signed and statistically significant at 5 percent significance level. Thus, it corrects any deviation from short run into long-run equilibrium. The Durbin Watson value of 1.97 which is approximately 2.0, suggests a lesser level of autocorrelation.

Moreover, for the current and one lag length periods, the coefficients of government capital expenditure on agricultural (GCX) are rightly signed but statistically not significant at 5 percent level. This suggests that the government capital spending on agriculture will contribute positively to agricultural output in Nigeria during the period of study. Meanwhile, the non-impact of GCX on AGP during the period of study, suggest that government capital spending on agriculture is not the only variable that will contribute significantly to agricultural output. This depicts a true picture of Nigeria as suggested by Iganiga and Unemhilin (2011) when they affirms that inadequate capital expenditure will not improve the agricultural sector performance in Nigeria. This result also shows a workable economy situation whereby government budget to the agricultural sector is expected to be spends more on capital expenditure e.g the purchase of basic inputs and social amenities.

Moreover, the ECM coefficient of the current forms of government recurrent expenditure on agriculture is positively signed but statistically not significant. Meaning that government recurrent expenditure on agriculture will contribute positively to agricultural output in Nigeria during the period under review.

Table 4.4 Paiwise Granger Causality Test

Pairwise Granger Causality Tests			
Date: 05/16/15 Time: 01:04			
Sample: 1980 2013			
Lags: 3			
Null Hypothesis:	Obs	F-Statistic	Probability
GCX does not Granger Cause AGP	31	6.76354	0.00182
AGP does not Granger Cause GCX		5.58854	0.00472
GRX does not Granger Cause AGP	27	42.6615	7.0E-09
AGP does not Granger Cause GRX		0.09621	0.96123

Source: *Computed Result (E-view 7.1)*

The results in table 4.4 shows that government capital expenditure on agriculture was found to granger cause agricultural production output. Also, government recurrent expenditure was found to granger cause agricultural

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production output. This implies that there was a unidirectional causality between government recurrent expenditure and agricultural production output. While, bidirectional causality between government capital expenditure and agricultural production output. In summary government capital and recurrent expenditure in agricultural sector is a necessary condition for achieving agricultural production output

4.1 Policy Implication

The policy implication of the findings of the study includes; The long run dynamic results show that the variable of the government spending on agricultural sector is rightly signed but not statistically significant. The reason for the above scenario is that the bulk of what contribute to the Nigerian economic growth and development is from the oil sector and specifically, oil revenue. The policy implication here is that despite the policy redirection of government towards improving the agricultural sector, the sector has not contributed very significantly to economic development in Nigeria. This is evidence in crude technology, low value chain, low output, over dependence on foreign made goods amongst others. Also, the long run dynamic results show that there exists a long-run relationship or equilibrium among the variables. This is because the coefficient of ECM is rightly signed (that is negative) and significant. Meaning that the short run dynamics adjust to long run equilibrium relationship. The policy implication is that the pitfalls in the agricultural sector in the short run will be reconciled in the long run by appropriate policy formulation and implementation.

5.0 CONCLUSION AND RECOMMENDATIONS

The study examines the dynamic effects of government spending on agricultural output in Nigeria from 1980 to 2013. It was revealed in the literature that the agricultural sector is the engine of growth and development and therefore an improvement in government spending to the sector is required. The study adopts the co-integration/ECM and granger causality test methods. The results revealed that governments spending on agricultural sector have greater implication on agricultural sector performance in Nigeria during the period of study. Evidence is drawn from the ECM and the granger causality results. To this effect, since agricultural sector driven economy is key to sustainable development, it is therefore overdue for the Nigerian economy to diversify. Also, Nigeria government should increase her budgetary allocation to the agricultural sector in a consistent manner. This is because of its importance to the national economy. In sum, government budgetary allocation to the agricultural sector should be in infrastructural facilities such as good road network and steady electricity in the rural areas where we have bulk of our farmers. The provision of these facilities will conclusively impact positively on the rural farmers' productivity and aggregate agricultural GDP will be enhanced.

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