DETERMINANTS OF FEDERAL GOVERNMENT EXPENDITURE POLICY ON AGRICULTURE IN NIGERIA

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Abstract

The study assessed the determinants of federal government agricultural expenditure policies and the implications of these policies from 1960-2007. The study covered the Nigerian Nation and used federal level time series data to achieve the set down objectives. The analytical method consisted of descriptive analysis, stationarity test, granger model, co-integration and error correction model (ecm) to verify the characteristics of the data, ascertain the existence of causality/determinants of agricultural expenditure, in addition to long run relationships. The causality tests indicated that the real government agricultural expenditure in Nigeria had been largely determined by the level of public financial resources in the country, while the ecm revealed that there was no long run neutrality of change between agricultural expenditures and the tested determinants. The study recommended the need for the Federal Government to channel resources into investments which require few public resources and has demonstrated potentials for transforming the rural economy through increased incomes for small farmers and rapid diffusion of new technologies.

Keywords: Expenditure on Agriculture, Granger Model, Co-Integration, Error Correction Model

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Introduction

Expenditure policies on Agriculture in Nigeria have undergone numerous evolutional changes since the country attained independence in 1960. These changes were mainly a reflection of changes in government philosophy to agricultural development, while the philosophical changes were in themselves often brought by changes in government. Between 1960 and 2007, the country witnessed six military regimes and five civilian eras (spanning 29 and 18 years, respectively), which implemented varied policy measures in line with the priority of the government. FAO (2012) observed that the rationale for public investment in agriculture rest on three interrelated benefits that can come from economic growth and poverty reduction, food and nutrition security and environmental sustainability. Iganiga and Unemhilin (2011) on their part revealed that federal government capital expenditure was positively related to agricultural output, while Loto (2011) showed that in the short run, expenditure on agriculture was found to be negatively related to economic growth. Also, Longe (1984) hinted that political, social, and economic factors, which are closely related to the stage of development, were the major factors responsible for the observed pattern of government expenditure. This is in consonance with the assertion by Fosu (1991) that economic and political forces, coupled with the combination of policy objectives to be achieved were likely determinants of public expenditure on agriculture. Meanwhile, Birner and Palaniswamy (2006) affirmed that political challenges made it difficult to increase public spending on agriculture, while DFID and World Bank (2004) observed that the reduction in expenditure to agriculture has been driven by factors such as structural adjustment and an ideological shift away from state intervention in agriculture. In a broad sense however, federal government policy on agricultural development, including expenditure had undergone three major phases, the first, which was the period of decentralized approach to agricultural development, was from 1960 to about 1969.The second from 1970 to 1985, witnessed increased Federal Government participation, while the third, which is still unfolding, from 1986 to the present time is the era of economic reforms (FMARD, 2010). Despite these attempts, Tewodaj *et al* (2008) noted that public spending in Nigeria has been exceedingly low. According to them, less than 2 percent of total federal expenditure was allotted to agriculture between 2001 and 2005, far lower than the other key sectors such as education, health and water. This raises questions on the determinants of federal government expenditure policies on agriculture in Nigeria. The objective of this study therefore was to assess the determinants of federal government expenditure policies and the implications of these policies to agriculture from 1960 - 2007, when Chief Olusegun Obasanjo finished his eight year tenure.

Methodology

Area of Study, Scope and Sources of Data

The study is a macro level analysis of Nigeria's expenditure policy. Nigeria attained independence from Britain on October 01, 1960, and became a Republic in 1963. The Country is located in West Africa and is bordered by Cameroon to the south east, Benin to the south west, and Niger to the north. Nigeria has a land area of 924,000km^2 and a population of 140,003,542 million (National Bureau of Statistics, 2012). The average per capital income (estimated by the World Bank in 2006) was US$300 per annum. Although, the country relies heavily on the petroleum sector which generates over half of government revenue and more than 90 per cent of foreign exchange earnings, agriculture continues to play a focal role in the economy. The study used yearly time series data for Nigeria spanning 1960 - 2007. This is necessary so that the effects of Federal Government expenditure policy on the mixed performance of the agricultural sector can be captured side by side with the effects of the economy during the early 60s, the oil boom era, the civil war of 1967-1970 and SAP reforms up to the close of Chief Olusegun Obasanjo's Civilian regime. The effective sample size of 47 years observations utilized is 21 data points more than the minimum required for effective diagnostic test for time series properties. The data used for the accomplishment of the objectives of this study and specifically for the estimation of the parameters of the models were based on secondary time series data. The sources of these data were from the National Bureau of Statistics (NBS), Central Bank of Nigeria (CBN), Federal Ministry of Agriculture and Rural Development (FMARD), National Programme for Agriculture and Food Security (NPAFS), Federal Ministry of Finance (FMF), Accountant General of the Federation (AGF), Federal Meteorological Department and the National Centre for Economic Management and Administration (NCEMA).

Analytical Technique

This study made use of in-depth descriptive analysis of the relevant macro-economic variables that have direct or indirect bearing on the federal government's expenditure on agriculture in

Nigeria, coupled with econometric modeling. The Granger economic model, co-integration and error correction models were used to assess causality and the type of relationships. The causality model is as presented below:

Model 1: Causality Tests

The standard economic causality tests described by Granger (1969, 1980) were utilized to determine the variables that affected the level of government expenditure on agriculture. Trotter *et al* (1992) observed that proving a statistical relationship did not prove causality. He affirmed that there was no test for causality in everyday sense, rather what was referred to as causality was the Granger - causality, which was what econometricians referred to as causality. According to him, one variable `Granger - cause' a second variable if prediction of the current value of the second was improved by the knowledge of the past of values of the first.

$$G_A(t) = d_{oj} + \sum_{i=1}^{M} d_{ij} G_A(t-i) + U_2j(t) \quad \ldots\ldots\ldots (1)$$

$$G_A(t) = C_{oj} + \sum_{i=1}^{M} C_{ij} G_A(t-i) + \sum_{I=1}^{M} f_{ij} W_j(t\text{-}i) + U_3j(t) \quad \ldots\ldots\ldots (2)$$

Where G_A is the public agricultural expenditure levels and U_2 and U_3 denote stochastic error terms that satisfy the normal classical regression assumptions. The W_{jth} determinants are defined as follows:

Q_A	=	real gross domestic product originating from the agric sector.
P_N	=	national consumer price index
P_f	=	food component of national consumer price index
UP	=	urban consumer price index
P_i	=	food component of urban consumer price index
Pc	=	real foreign price of cocoa
Pcot	=	real foreign price of cotton
Y_AL_A	=	agric net value added per unit of agric. labour
T_R	=	real total tax revenue
C_R	=	real net domestic credit to government

C_A = real aggregate agricultural credit
F_R = total foreign reserves
G_R = real total government expenditure
G_E = real government expenditure on education
G_{AM} = real government expenditure on administration
G_D = real total government expenditure on defence
G_H = real government expenditure on health
POP = economically active population in agric
Ai = agric import
A_E = agric. export
G_{AA} = gross capital formation in agriculture
UPi = food component of urban consumer price index

From the respective sum of squares of the error terms, the decision criteria for causality is that, if Fci is greater than the tabulated F at a specified level of significance, then the null hypothesis that the potential determinants W_j does not cause the level of public agricultural expenditure is rejected in favour of the alternative hypothesis that W_1 does cause public agricultural expenditure. If causality runs from W_1 to G_A, then public agricultural expenditure is endogenous with respect to W_j. Similarly, if causality is not found between the variables, then government agricultural expenditure is exogenous with respect to W_j.

Model 2: Stationarity and Co-integration Tests

For a guide to an appropriate specification of equations (1) and (2), the characteristics of the time series data used for estimating the models was examined in order to avoid spurious regression which results from the regression of two or more non-stationery series. Yule (1926); Granger and Newbold (1974), have referred to regression results from non-stationary data as examples of "nonsense" or "spurious" regression, because inferences from such results can be misleading. Stationarity test is performed on the levels of the variables, while co-integration test is performed on the error term of the static regression specified in the levels. The presence of co-integration means that long run equilibrium relationship exists between or among the non-stationary dependent and independent variables. Granger and Newbold 1977, Davidson *et al,* 1978 and

Granger and Engle (1985) have all shown that the existence of co-integration is a sufficient condition for the formulation of a model that allows for the incorporation of an error correction mechanism (ECM). The inclusion of the ECM in a model ensures that the long run relationship is preserved.

The Augumented Dickey Fuller (ADF) test for stationarity is as presented in the following regression equation below:

$$\text{ADF: } dY_t = \acute{\alpha}_o + \acute{\alpha}_1 Y_{t-1} + \sum r_1 dY_{t-k} + \sum_t \quad (1)$$

Where:

dY_t = ΔY_t (Dependent variable/Determinant)

$\sum_t$ = White-noise process

K = length of lag on the dependent variable necessary to make the white noise process, $\sum_t$

For the equations, the following holds:

i. The null hypothesis is that $\acute{\alpha} = 1$, i.e. the variable Y_t has unit root or is non-stationary.

ii. The alternative hypothesis is $\acute{\alpha}_1 = 0$, i.e. the variable is stationary or integrated of the order 0 - I

iii. A large negative value for the coefficient, $\acute{\alpha}_1$ leads to the rejection of the null hypothesis.

Two series can co-integrate if they are of the same order of integration. The co-integration model was specified as follows:

$$A_{Et} = \alpha + \beta F_t + \lambda_t \quad (2)$$

Where

A_{Et} = Real Agricultural Expenditure

F_t = determinant

λ_t = stochastic term

If γ in equation (3) is zero, then λ_t is non- stationary and the two series, even if they are of the same order of integration, are not cointegrated.

$$\Delta \lambda_t = -\gamma \lambda_{t-1} + \Theta t \quad (3)$$

Where Θt = White noise

If the test for co-integration in equations (2) and (3) above prove positive, then there is an associated Error Correction Model (ECM) specified as follows (Komolafe, 1996; Greene, 2003):

$$\Delta A_{Et} = {}_{-\rho}\lambda_{t-1} + \sum_{I=1}^{p} \beta \Delta F_{t-1} + \sum_{I=1}^{p} \eta \Delta A_{Et-1} + V_t \qquad (4)$$

Where

${}_{-\rho}\lambda_{t-1}$ = disequilibrium term

P = number of differencing required to make the data stationary.

V_t = random error term.

All other variables as previously defined.

Granger causality (Granger, 1969; Granger and Newbold, 1974) can also be inferred from equation (4) if β and η are non zero.

Results and Discussion

The results of the stationarity test (Table 1) showed that after comparing the ADF values against the Mackinnon critical values at the five per cent and 10 per cent level of significance, nine (9) variables namely: urban consumer price index (U_p), food component of urban consumer price index (U_{pi}), real foreign producer price of cocoa (P_c), real foreign price of cotton (P_{cot}) and the real net domestic credit to government (C_R), federal government expenditure on health(G_H), population (Pop), agricultural import (Ai) and agricultural export(A_E) were stationary at levels. The exercise further shows that thirteen (13) variables namely: real federal government agricultural expenditure (G_A), Real Agric. GDP (Q_A), consumer price index(Pi), agric net value added per unit of labour (Y_A/Y_L), real total tax revenue (T_R) were stationary at first difference. Others include: real aggregate agricultural credit (C_A), total foreign reserve (F_R), real total government expenditure (G_R), government expenditure on education (G_E,) government expenditure on administration (G_{AM}), government expenditure on defence (G_D) and real capital formation (G_{AA}). One immediate conclusion from this analysis is that any dynamic specification of the model in the levels of the series for most of the variables is likely to be inappropriate and may be plagued by problems of spurious regression (Adam, 1992). It is also argued that economic results of the model in the levels of the series may not be ideal for policy making. This proposition thus lends credence to the earlier doubts cast over the efficacy of past studies in policy decisions.

The results of the co-integration test (Table 2) showed that there were two co - integrating equations (vector) in the set of normalized co integrating vectors for two out of the twenty estimated equations, that is, the real federal government agricultural expenditure and real producer price of cotton (G_A, Pcot), real federal government agricultural expenditure and producer price of cocoa (G_A, Pc), while one co integrating equation each was observed for three equations namely: real federal government agricultural expenditure and food import (G_A, A_1), real federal government agricultural expenditure and agricultural export (G_A, A_E), real federal agricultural expenditure and population(G_A, Pop). These results showed that causality must exist in at least one direction and possibly in both in instances where co - integration equations were noticed. The results further revealed the existence of equilibrium condition that keeps the variables in proportion to each other in the long run. All causality tests were performed using the pair wise granger approach at the 5 per cent and 10 per cent level of statistical significance and Durbin Watson's statistic was applied to test for first order autocorrelation (Table 3). The variables that were found to cause public agriculture spending in the granger sense with a 2 year lag include: real total tax revenue ($\mathbf{T_R}$), real total federal government expenditure ($\mathbf{G_R}$), and real federal expenditure on administration ($\mathbf{G_{AM}}$).These results indicate that the level of real government agricultural expenditure in Nigeria have been largely determined by the need to achieve agricultural policy targets relating to the level of real public financial resources, as indicated by real government total tax revenue, real total federal government expenditures and real federal expenditure on administration. The results of the ECM for all the five estimated equations revealed that only equation 2 had a fairly good fit, with the coefficients of multiple determinations (R^2), ranging from 48.4 per cent to 75.5 per cent in the 5 models estimated. The results further indicated that there was no associated ECM and consequently, no indication of any kind of granger causality in the long run, as depicted by the sign and disequilibrium term. This is an indication that the relationship between federal government agricultural expenditure and the five co-integrated determinants, namely; agricultural import, agricultural export, economically active population in agriculture and the real producer prices of cocoa and cotton did not have a defined long term pattern. The result is indicative of how the federal government agricultural expenditures had been determined in Nigeria over the years.

Conclusions and Recommendations

The study established that the real government agricultural expenditure in Nigeria have been determined by the level of public financial resources in the Country. Thus, in order to enhance the effectiveness of agricultural expenditure in Nigeria, the Federal Government should give priority to: increasing the spending on productivity enhancing investments (especially agricultural research and extension), rural infrastructures (especially roads and education), small scale irrigation and rural development targeted directly to the rural poor; enhance the volume of expenditure to viable sub-sectors: such as livestock, fisheries and forestry; upscale the proportion of agricultural recurrent expenditures, considering its importance to the sustenance of existing agricultural projects, sustain democratic governance, in view of their tendency to support agriculture more, enhance and diversify the level of government revenue, being determinants of government expenditure on agriculture.

Table 1: Results of Tests for Stationarity (ADF Unit Root Tests)

Variables	ADF value	Mackinnon critical value 5%	Mackinnon critical value 10%	No of Lags
G_{A**}	-3.5259	-2.9705	-2.6242	1
Q_{A**}	-5.7273	-2.9446	-2.6105	1
P_{N**}	-1.7350	-1.9504	-1.6206	1
P_{i**}	-1.8231	-1.9504	-1.6206	1
UP*	-1.9498	-1.9501	-1.6205	0
Upi*	-2.6431	-2.9422	-2.6092	0
P_{C*}	-5.0553	-2.9499	-2.6133	0
P_{COT*}	-3.7038	-2.9591	-2.6181	0
DY/LA**	-3.6788	-2.9446	-2.6105	1
T_{R**}	-4.7611	-2.9446	-2.6105	1
C_{R*}	-1.6579	-1.9501	-1.6205	0
C_{A**}	-4.8349	-2.9446	-2.6105	1
F_{R**}	-4.4460	-2.9446	-2.6105	1
G_{R**}	-4.6048	-2.9446	-2.6105	1
G_{E**}	-5.1503	-2.9446	-2.6105	1
G_{AM**}	-3.1377	-2.9446	-2.6105	1
G_{D**}	-4.6443	-2.9446	-2.6105	1
G_{H*}	-2.9310	-2.9446	-2.6092	0
POP*	3.4337	-2.9558	-2.6164	0
Ai*	-6.0418	-2.9422	-2.6092	0
G_{AA**}	-4.4377	-2.9446	-2.6105	1
A_{E*}	-3.4656	-3.5386	-3.2009	0

Source: Extracted from computer output

* Indicates variables that are stationary at levels

**Indicates variable that are stationary at first difference

Table 2.0: Determinants of the Level of Real Annual Federal Government Agricultural Expenditure in Nigeria (Johansen Co integration Test Results).

Equation	Eigen Value	Likelihood Ratio	5% critical value	1% critical value	Hypothesized no of co integration equation (HNCE)	Series in equation
1.	0.611984	32.41849	25.32	30.45	None**	G_A, Ai
	0.123051	4.070496	12.25	16.26	At most 1(+)	
2.	0.583215	30.51523	25.32	30.45	None**	G_A, A_E
	0.132689	4.270716	12.25	16.26	At most 1(+)	
3.	0.169488	10.6928	18.17	23.46	None	G_A, C_A
	0.147188	4.835711	3.74	6.4	At most 1*	
4.	0.319656	13.87215	25.32	30.45	None	G_A, C_R
	0.090254	2.932283	12.25	16.26	At most 1	
5.	0.245391	10.99765	25.32	30.45	None	G_A, Q_A
	0.100094	3.269424	12.25	16.26	At most 1	
6.	0.377937	21.62693	25.32	30.45	None	G_A, G_{AA}
	0.225228	7.9108	12.25	16.26	At most 1	
7.	0.286715	16.06258	25.32	30.45	None	G_A, G_{AM}
	0.217105	7.58747	12.25	16.26	At most 1	
8.	0.230545	13.5566	25.32	30.45	None	G_A, G_D
	0.163505	5.53458	12.25	16.26	At most 1	
9.	0.195254	10.58968	25.32	30.45	None	G_A, G_E
	0.11695	3.855587	12.25	16.26	At most 1	
10.	0.328523	14.49049	25.32	30.45	None	G_A,G_H
	0.152901	5.144054	12.25	16.26	At most 1	
11.	0.213283	10.26371	25.32	30.45	None	G_A,G_R
	0.087165	2.827213	12.25	16.26	At most 1	
12.	0.192581	10.35133	25.32	30.45	None	G_A, P_I
	0.11308	3.720023	12.25	16.26	At most 1	
13.	0.364711	17.01125	15.41	20.04	None*	G_A, P_C
	0.124465	3.85467	3.76	6.65	At most 1*(++)	
14.	0.393959	17.02526	15.41	20.04	None*	G_A, P_{COT}
	0.143083	4.014772	3.76	6.65	At most 1*(++)	
15.	0.133961	4.489602	15.41	20.04	None	G_A,P_N
	0.001	0.031016	3.76	6.65	At most 1	
16.	0.639925	29.2084	12.53	16.31	None**	G_A, Pop
	0.131035	3.651756	3.84	6.51	At most 1(+)	
17.	0.274089	13.03539	19.96	24.6	None	G_A, T_R
	0 .095314	3.105202	9.24	12.97	At most 1	
18.	0.142595	8.62948	15.41	20.04	None	G_A, Up

	0.117084	3.74602	3.96	6.65	At most 1*	
19.	0.189807	10.54688	15.41	20.04	None	G_A, U_{PI}
	0.121676	4.021915	3.76	6.65	At most 1*	
20.	0.237691	12.6111	18.17	23.46	None	G_A, YALA
	0.103778	2.1865	3.74	6.40	At most 1	

Source: Extracted from the computer output.

* (**): Denotes rejection of the null hypothesis at 5% (1%) significant level

+: Indicates one co – integrating equation at 5% significant level

+ +: Indicates two co – integrating equations at 5% significant level

Table 3. : Determinants of the Level of Real Federal Government Expenditure on Agriculture in Nigeria: Causality Test Results

Variable	R^2	F_{ci}	Durbin Watson H^b	Existence of Causality	Period Covered
Q_A	0.4237	1.092	2.4663	No	1960-2007
P_N	0.7109	0.2216	2.3211	No	1960-2007
P_I	0.6106	0.1972	2.3820	No	1960-2007
UP	0.6109	0.2210	2.3211	No	1960-2007
UP_I	0.7208	0.1837	2.3211	No	1960-2007
P_C	0.6120	0.0347	2.4642	No	1960-2007
P_{COT}	0.6107	0.5884	2.3212	No	1960-2007
YA/LA	0.9155	0.0254	2.2546	No	1960-2007
T_R	0.8031	3.5020	2.3246	Yes	1960-2007
C_R	0.5936	0.4471	2.3286	No	1960-2007
C_A	0.4002	1.0391	2.2908	No	1960-2007
F_R	0.7109	0.0153	2.3217	No	1960-2007
G_R	0.5203	3.3808	2.3167	Yes	1960-2007
G_E	0.9766	0.2096	2.4727	No	1960-2007
G_{AM}	0.6506	3.2120	2.3636	Yes	1960-2007
G_D	0.8271	2.3833	2.2920	No	1960-2007
G_H	0.5363	2.1927	2.2798	No	1960-2007
POP	0.41002	0.7206	2.2950	No	1960-2007
A_I	0.5106	0.3174	2.3217	No	1960-2007
G_{AA}	0.7202	2.4088	2.1453	No	1960-2007
A_E	0.4004	0.1136	2.3056	No	1960-2007

Source: Computed from computer output

* Causality observed at 10 percent level of significance

REFERENCES

Birner, R. and Palinwang, N. (2006). The Political Changes of Treasury Public Spending for Agricultural Development in Africa. Paper presented at the International Conference on Championing Agricultural Successes for Africa's Fufuru: A Parliamentarians Dialogue on NEPAD. Somerset West, South Africa,.May 2006.

FAO (2012). Food and Agriculture Organization of the United Nations. State of Food and Agriculture, Rome, Italy.

FMARD (2010). Federal Ministry of Agriculture and Rural Development, National Agricultural and Food Security Strategy, Updated (2010-2020), Abuja, Nigeria.

Fosu, K. Y. (1994). "Determinants and Effectiveness of Government Expenditure Policy in Ghana's Agricultural Sector". *Issues in African Rural Development 2.*

Granger, C.W.J. (1969). "Investigation Causal relations by econometric models and cross-spectral methods". *Econometrica* Vol 37, pp. 424-38.

Granger, C. W. J. (1980). "Testing for causality: A personal view point". *Journal of Economic Dynamics and Control*, Vol 2, pp. 329-52.

Granger, C.W.J. and Newbold, P. (1974). Spurious regressions in Econometrics. Journal of Econometrics, **2:** 111-120.

Granger, C.W.J. and Engle, R.F. (1985). Co-Integration & Error Correction: Representation, Estimation, and Testing. *Econometrica,* Vol.55, No2, pp.251-276.

Greene, W.H. 2003. Econometric analysis, fifth edition. New Jersey, Prentice Hall, Upper Saddle River.

Iganiga, B. O. and Unemhilin, D.O. (2011). The Impact of FGN Agricultural Expenditure on Agricultural Output in Nigeria. *J Economics,* 2(2): 81-88.

Komolafe, O. S. (1997). "Modeling Nigeria's External Sector. A Cointegration Approach". Revised Final Report Submitted to the African Economic Research Consortium (AERC), Nairobi, Kenya.

Longe, J. B. (1984). "The Growth and Structure of Federal Government Expenditure in Nigeria". *The Nigerian Journal of Economic and Social Studies.* Vol. 26, No.1, pp 85-102.

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

NBS (2012). National Bureau of Statistics. Nigeria Poverty Profile, Abuja, Nigeria.

Tewodaj, M. ; Michael, M.; Lev, F. ; Adubi, A. ; Simeon, E. ; Nwoko, C. ; Taiwo, O. ; Nege, C.; Okonji, P. and Chete, L. (2008). Agricultural Spending in Nigeria. *IFPRI Discussion Paper 00702.*

Trotter, B. W. (1992). Applying Price Analysis to Market System: method and example from the Indonesia Rice Market:, Marketing Season Phan National Resource Institute.