Asian Journal of Agricultural Extension, Economics & Sociology
11(2): 1-10, 2016; Article no.AJAEES.25491
ISSN: 2320-7027

SCIENCEDOMAIN *international*
www.sciencedomain.org

The Impact of Public Agricultural Expenditure on Agricultural Output in Nigeria (1981-2014)

Abula Matthew[1*] and Ben D. Mordecai[1]

[1]Department of Economics, Faculty of Social Sciences, Kogi State University, Nigeria.

Authors' contributions

This work was carried out in collaboration between both authors. Author AM designed the study, wrote the first draft of the manuscript and literature review. Author BDM performed the econometric analysis of the study which enabled us to draw the recommendations and conclusion from the result findings. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJAEES/2016/25491
Editor(s):
(1) Zhao Chen, Department of Biological Sciences, College of Agriculture, Forestry and Life Sciences, Clemson University, USA.
Reviewers:
(1) Sergey A. Surkov, International Institute of Management LINK Zukovsky, Moscow, Russia.
(2) A. Henri-Ukoha, University of Port Harcourt, Choba, Nigeria.
(3) Surendra Singh, Kumaun University, Nainital, India.
Complete Peer review History: http://sciencedomain.org/review-history/14500

Original Research Article

Received 5th March 2016
Accepted 29th April 2016
Published 7th May 2016

ABSTRACT

This study investigated the impact of public agricultural expenditure on agricultural output in Nigeria for the period 1981 to 2014 with time series data obtained from the Statistical Bulletin and Annual Reports of the Central Bank of Nigeria, 2014. The Augmented Dickey-Fuller test, Johansen Co-integration test, Error Correction Method (ECM) and Granger Causality test were employed as analytical tools in the course of the study. Agricultural output was explained by public agricultural expenditure, commercial bank loans to the agricultural sector and interest rates. The Johansen Co-integration test revealed that there exists a long-run relationship between agricultural output, public agricultural expenditure, commercial bank loans to the agricultural sector and interest rates in Nigeria. The results of the parsimonious ECM model showed that public agricultural expenditure has a significant negative impact on agricultural output while commercial bank loans to the agricultural sector and interest rate have insignificant positive impacts on agricultural output in Nigeria. The value of the coefficient of determination (R^2) of 0.630677 showed that the exogenous variables in the ECM equation viz; public agricultural expenditure, commercial bank loans to the

**Corresponding author: E-mail: abulamatthew@yahoo.com;*

agricultural sector and interest rate explains over 63% of the systematic variations in agricultural output. The error correction term was highly significant at the 5% level with the appropriate negative sign, indicating that the adjustment is in the right direction to restore the long-run relationship. The study concluded that the negative impact of public agricultural expenditure on agricultural output may have resulted due to discrepancies that existed between the amount allocated to the agricultural sector and the amount actually spent on the sector in the country. We therefore recommended that monitoring agencies be established by the federal government to ensure that the amount allocated to the agricultural sector is actually and judiciously spent on the sector in Nigeria.

Keywords: Agriculture; agricultural output; public expenditure on agriculture; commercial bank loans to the agricultural sector; interest rate.

1. INTRODUCTION

1.1 Background to the Study

The role of agriculture in economic growth and development in any nation is crucial and it is a sign of prosperity and development [1,2,3,4,5]. These roles include sources of food for the growing population, raw materials for the manufacturing sectors, reduction of inflationary pressure, earner of foreign exchange, labour force empowerment, source of income and savings for the farmers, improvement in their living standards and market for products of the manufacturing sector [6].

In realization of these roles, the government over the years has almost been the sole provider of financial and other capital resources to support agriculture. The government has embarked on various policies and programmes aimed at strengthening the sector in order to continue performing its roles, as well as measures for combating poverty. Notable among these policies are the Operation Feed the Nation (OFN), the Green Revolution (GR), Land Use Decree, Fertilizer Company of Nigeria (NAFCON), the National Agriculture Land Development Authority (NALDA) and the latest is the Agriculture Development Project (ADP). Meanwhile, these policies have not helped much in improving significantly the agricultural sector as the costs involved are still more than the benefits realized [7].

Average total annual expenditure on agriculture, has been on the increase over the years. Total annual expenditure on agriculture increased on the average from N0.02 billion in the 1981-1986 periods through an average of N0.2 billion per annum in 1987-1992 to N1.84 billion in 1993-1998 periods. Total annual expenditure on agriculture increased significantly on the average during President Olusegun Obasanjo's regime (1999-2006) to N16.97 billion and further to N37.13 billion during the Late President Umar Yar'adua's administration, but fell to N36.19 billion during President Goodluck Jonathan's administration (2011-2014) [8]. Despite these huge sums of money allocated to the sector over the years, the state of agriculture in Nigeria still remains poor and largely underdeveloped.

Agricultural sector output has fluctuated widely and productivity has also declined. In terms of contribution to GDP, available statistics from the CBN shows that the agricultural sector's share of GDP increased from 28% in 1985 to 32% in 1988, dropped to 31% in 1989, rose to 37% in 1990 but fell significantly to 24% in 1992, it increased again to 37% in1994. It was 32% in 1996 and rose to 40% in 1998, dropped again to 27% in 2000, increased to 37% and fell to 31% in 2002 and 2006 respectively. The per centage contribution of the agricultural sector to GDP fell persistently from 0.37 in 2009 to 0.22 in 2012 and to 0.20 in 2014 [8].

The poor state of the sector has been blamed on oil glut and its consequences on several occasions, as this pattern was not an outcome of increased productivity in the non-agricultural sectors as expected of the industrialization process; rather it was the result of low productivity due to negligence of the agriculture sector [9,10]. This paper therefore examined the impact of public agricultural expenditure on agricultural output in Nigeria.

The paper is organized as follows: first, the introduction, following is the literature review and theoretical framework. Third, the methodology and model estimation are discussed. Fourth is the discussion of results, and finally, conclusion and recommendations.

2. LITERATURE REVIEW

2.1 Conceptual Review

2.1.1 Agriculture

Agriculture is the art and science of crop and livestock production. In its broadest sense, agriculture comprises the entire range of technologies associated with the production of useful products from plants and animals, including soil cultivation, crop and livestock management, and the activities of processing and marketing [11]. In this study agricultural output is taken to mean the value of agricultural GDP of the four sub-sectors (crops, fisheries, forestry, and livestock) of the economy.

2.1.2 Public expenditure on agriculture

Public expenditure on agriculture includes spending by local/municipal, regional and national governments on agriculture from annual budgetary allocation. It is the expenditure on crop development, seed production and distribution, fertilizer procurement, agricultural mechanization, extension services, control of pests and diseases, soil conservation, irrigation, research etc.

2.2 Empirical Literature Review

[12] examined the effects of government spending on the agricultural sector in Nigeria. The ordinary least square of multiple regression, the Johansson co-integration techniques and the error correction model were used for the analysis. The results showed that the coefficient of determination is 0.9468 and the coefficient of the ECM appeared with negative sign and statistically significant. The lag two and three forms of the explanatory variable, GEA were positive and statistically significant. Based on the findings, the study recommended for an increased funding of the agricultural sector in Nigeria.

[13] examined the impact of Federal Government's expenditure on agricultural sector. He used a Simple regression with the view of analyzing the data which indicated the impact of agricultural expenditure on its output from 1991 to 2010. The R^2 was 1% indicating a weak relationship between the variables as a result of inadequate funding. He recommended that government should reinforce its budgetary allocations to the agricultural sector, ensure proper release of funds, monitor agricultural inputs distribution to farmers and create commodity markets.

The study carried out by [14] on the effectiveness of government annual budgetary allocation to agriculture and the role of monetary policy instruments in the growth of agricultural GDP in Nigeria using the OLS technique showed that Agricultural Credit Guarantee Scheme Fund, previous year GDP and Consumer Price Index contributed 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. The study therefore recommended that government should increase her spending to agricultural sector, monitor the fund allocated and provide the necessary infrastructural facilities like good road network, electricity health and water for the rural populace.

Analyzing the relationship between Nigeria's government expenditure on the agricultural sector and its contribution to economic growth, [15] employed the Engle-Granger two step modelling (EGM) procedure to co-integration based on unrestricted Error Correction Model and Pair wise Granger Causality tests. They found that agricultural contribution to GDP and total government expenditure on agriculture are co-integrated. The speed of adjustment to equilibrium was 88% within a year when the variables wander away from their equilibrium values. Based on the result of the granger causality, the paper concluded that a very weak causality exists between the two variables used in this study and that any reduction in government expenditure on agriculture would have a negative repercussion on economic growth in Nigeria.

[7] examined the impact of federal government agricultural expenditure on agricultural output in Nigeria. The study covers the period 1970 to 2008 employing the ECM technique. Their findings show that the federal government capital expenditure was positively related to agricultural output. However, with one year lag period, it showed that the impact of government expenditure on agriculture is not instantaneous. Though the study observed that the investment in agricultural sector is imperative and that it should be complemented with monitored credit facilities, and food importation should be banned to encourage local producers.

[16] examined the relationship between public expenditure, private investment and agricultural output growth in Nigeria over the period 1970-2008. The bounds test and Autoregressive distributed lag (ARDL) modelling approach was used to analyze both short-run and long-run impacts of public expenditure, private investment (both domestic investment and foreign direct investment) on agricultural output growth in Nigeria. Results of the error correction model showed that public expenditure has a positive influence on the growth of agricultural output. However, foreign investment has insignificant impact in the short-run. Hence, he recommended that policymakers should combine both private and public investment in a complementary manner to ensure that both short-run and long-run productivity of the agricultural sector is not undermined.

[17] reported that in terms of capital allocation to agriculture in Nigeria, it was an average of 4.74 per cent from 1970-1980. But, from 1980-2000, it rose to 7.00 per cent and 10 per cent from 2001-2007, though revealing an increase, but still falls short of Food and Agricultural organization (FAO) recommendation that 25 per cent of government capital budget be assigned to the agricultural development capital budget.

[18] examined the impact of government agricultural expenditure on the growth of the Nigerian economy from 1960 to 2012. The study employed E-view 7.2 statistical output as a window in exploring the possible links between government agricultural expenditure and economic growth. The results revealed that government agricultural expenditure has a significant direct relationship with economic growth. The paper however recommended that government should ensure that credit is made available to farmers with relatively low interest rate, intensify effort on how to control inflation rate, increase the budgetary allocation to agricultural sector to 25% as recommended by agricultural development capital budget, Nigerian economy is to be diversified in order not to make crude oil as the mainstay of Nigerian economy rather agricultural(agrarian) sector because it helps in terms of food supply, employment generations, poverty reduction etc., hence economic growth.

2.3 Theoretical Framework

The Keynesian theory was adopted as the framework of this study. Keynes regards public expenditures as an exogenous factor which can be utilized as a policy instruments to enhance output. According to the Keynesian school of thought, increase in government spending leads to a multiple rice in total output of an economy [19]. This as posited by Keynes is the multiplier effect of government expenditure.

$$Y = C + I + G\ (X-M) \tag{2.1}$$

Where; Y = Output, C = Consumption, I = Investment, G = Government Expenditure, X-M = Net Export (Export minus Import). The change in output will be equal to the multiplier times the change in government expenditure.

$$\Delta Y = 1\ \left(\frac{\Delta G}{1-b}\right) \tag{2.2}$$

Where $= \frac{1}{1-b} = K$

$$\Delta Y = K\Delta G$$

Therefore, change in output all over change in government expenditure is equal to the multiplier.

$$\frac{\Delta Y}{\Delta G} = K \tag{2.3}$$

Hence, expansionary fiscal policy can be used to influence macroeconomic performance and hence increase output growth. This theory suggests that government spending can contribute positively to sectorial growth (like the agricultural sector) in an economy.

In this theory we assume that the agricultural sector output comprising of the output of the four sub-sectors of the sector (crops, fisheries, forestry, and livestock) is a function of the consumption of agricultural output, investment in agriculture, government expenditure on agriculture and net export of agricultural output.

$$Y_A = C_A + I_A + G_A + (X_A - M_A) \tag{2.4}$$

Where; C_A = Consumption of Agricultural Output, I_A = Investment in Agriculture, G_A = Government Expenditure on Agriculture and $X_A - M_A$ = Net Export of Agricultural Output.

Thus, an increase in government expenditure on agriculture is likely to lead to a multiple increase in agricultural output. The relevance of this theory to the Nigerian economy is that it describes how the government of the country can help bring about growth in the agricultural sector through its expenditure on the sector.

3. METHODOLOGY

3.1 Model Specification

In order to capture the effects of public expenditure on agricultural output in Nigeria, [12] in their study adopted the model of the form:

$$AGR = F(GEA, DBA, GCF) \quad (3.1)$$

Where; AGR = Agricultural Production, GEA = Government expenditure in Agriculture Net, DBA= Deposit money bank loan to agriculture and GCF = Gross fixed capital formation.

This study modified the empirical work of [12] to capture the influence of public agricultural expenditure on agricultural output in Nigeria. A multiple regression model is used with agricultural output (AGOUT) as the dependent variable, while public agricultural expenditure, commercial bank loans to the agricultural sector and interest rates are taken as the independent variables. The model is therefore given below:

The functional form of the model is as follows:

$$AGOUT = f(PXA, CRAGS, INR) \quad (3.2)$$

Where:

AGOUT = Agricultural Output

PXA = Public Agricultural Expenditure

CRAGS = Commercial Bank Loans to the Agricultural Sector

INR= Interest Rates

The stochastic form of the model is:

$$AGOUT = \beta_0 + \beta_1 PXA + \beta_2 CRAGS + \beta_3 INR + \mu \quad (3.3)$$

Equation (3.3) above is transformed into an Error correction model as:

$$\Delta AGOUT_t = \beta_0 + \sum_{j=0}^{n} \beta_1 \Delta PXA_{t-j} + \sum_{j=0}^{n} \beta_2 \Delta CRAGS_{t-j} + \sum_{j=0}^{n} \beta_3 \Delta INR_{t-j} + \mu_{t-1} + \mu_t \quad (3.4)$$

Where Δ denotes first difference, β_0 is the constant term, β_1, β_2 and β_3 are coefficients to be estimated, μ_{t-1} is the one period lag of the residual from the regression (equation 3.3), the empirical estimate of the equilibrium error term, μ is the error term and j = 0, 1, 2… n, this is the lag length of each variable.

Our apriori expectations are:

β_1 and $\beta_2 > 0$, and $\beta_3 < 0$.

3.2 Data Estimation Technique

The specification and estimation of the models requires that we test the time series properties of the data in order to determine whether or not the variables contain integrated components, hence, the Augmented Dickey Fuller (ADF) test was used to check for stationarity (presence of a unit root) of the variables and to what degree. After testing for the stationarity of the variables, the next step is to test for co-integration. The decision to apply a co-integration test is to determine whether there is or not a co-integration equation for a group of non-stationary series. If a long-run equilibrium relationship exists among the variables then there must be an associated adjustment model, and so, the Error Correction Model (ECM) was used to test for the speed of adjustment from short-run to long-run equilibrium and the individual significance of the model. Lastly, the granger causality was used to check for causality among the variables.

3.3 Nature and Sources of Data

This study examined the impact of public agricultural expenditure on agricultural output in Nigeria for the period 1981 to 2014. The study used secondary type of time series data for the variables, agricultural output, public agricultural expenditure, commercial bank loans to the agricultural sector and interest rates, obtained from the Statistical Bulletin and Annual Report of the Central Bank of Nigeria, [8]. Agricultural output reflects the output of the four sub-sectors (crops, fisheries, forestry and livestock) of the sector in Nigeria.

4. PRESENTATION OF RESULTS AND ANALYSIS

4.1 Stationarity Test

Non-stationary data produces spurious regression, hence the result may be misleading. Therefore, it was cognizant to establish the stationarity of data.

The result of the ADF test statistics (in Table 1) showed that PXA and INR attained stationarity in their level form while AGOUT and CRAGS became stationary after their first difference, as indicated by their probability values which were less than 0.05 and the values of their calculated ADF statistics which were higher than their critical values (in absolute terms) at the 5% level. In this direction, we say that their series are integrated of the order one, that is 1(1).

4.2 The Co-integration Test

The co-integration test was carried out using the Johansen technique and it produced the results below (Tables 2 and 3).

The Trace statistic and the Max-Eigen statistic indicated one co-integrating equation at the 0.05 level. The results of the Johansen Co-integration tests rejects the null hypothesis of no co-integration, i.e. no long-run relationship between the dependent and the independent variables in favour of at least 1, co-integrating vector. This implies that there is long-run relationship between agricultural output, public agricultural expenditure, commercial bank loans to the agricultural sector and interest rates.

4.3 Error Correction Estimates

For this study, we developed an over-parameterized model (ECM 1) and then the parsimonious model (ECM 2).

The R^2 of the over-parameterized model presented in Table 4 signified that all the explanatory variables in the model accounts for 89.4275% total variation in AGOUT while the remaining 10.5725% is accounted for by the error term. The F-Statistic value of 13.84122 with the probability values of 0.000001 shows that the whole model is statistically significant. The error correction term i.e. ECM(-1) is negative but insignificant. Its coefficient of -0.201645 implied that the speed at which the short-run equation converges to equilibrium in the long-run is moderate.

We however simplified the error correction model by estimating a parsimonious model (ECM 2) which was developed from the over-parameterized model (ECM 1).

Table 1. ADF unit root test

Variable	Augmented dickey fuller statistic	Critical value	Probability	Level of significance %	Order of integration
AGOUT	-5.514109	-2.957110	0.0001	5	1(1)
PXA	-2.975627	-2.954021	0.0477	5	1(0)
CRAGS	-4.267898	-2.957110	0.0021	5	1(1)
INR	-3.324502	-2.954021	0.0217	5	1(0)

Source: Author's computation from E-views 7.1

Table 2. Test for Johansen co-integration using trace statistic

Hypothesized no. of CE(s)	Eigen value	Trace statistic	5 percent critical value
None *	0.685333	64.14511	47.85613
At most 1	0.342021	27.14545	29.79707
At most 2	0.212780	13.75082	15.49471
At most 3 *	0.173426	6.094911	3.841466

* denotes rejection of the hypothesis at the 5% level
Trace test indicates 1 cointegrating equation at the 5% level

Source: Author's computation from E-views 7.1

Table 3. Test for Johansen co-integration using Max-Eigen value

Hypothesized no. of CE(s)	Eigen value	Max-eigen statistic	5 percent critical value
None *	0.685333	36.99966	27.58434
At most 1	0.342021	13.39464	21.13162
At most 2	0.212780	7.655906	14.26460
At most 3 *	0.173426	6.094911	3.841466

*(**) denotes rejection of the hypothesis at the 5% level
Max-Eigen value test indicates 1 cointegrating equation at 5% level

Source: Author's computation from E-views 7.1

Table 4. Result of the over parameterized agricultural output model in Nigeria (ECM 1)

Variable	Dependent variable: D(AGOUT)			
	Coefficient	**Standard error**	**t-statistic**	**Prob.**
C	342.7009	255.6859	1.340320	0.1968
D(AGOUT(-1),2)	-0.343756	0.183441	-1.873926	0.0773
D(PXA,2)	-29.77473	15.44213	-1.928149	0.0698
D(CRAGS,2)	-36.59854	8.637844	-4.237000	0.0005
D(INR,2)	75.63646	62.98484	1.200868	0.2454
D(PXA(-1),2)	-64.51453	18.99872	-3.395730	0.0032
D(CRAGS(-1),2)	-35.01676	12.17240	-2.876733	0.0100
D(INR(-1),2)	163.6948	82.96456	1.973069	0.0640
D(PXA(-2),2)	-28.18290	15.93495	-1.768622	0.0939
D(CRAGS(-2),2)	-51.57495	10.36741	-4.974717	0.0001
D(INR(-2),2)	111.0438	59.94688	1.852370	0.0804
ECM(-1)	-0.201645	0.186972	-1.078476	0.2951
R-squared	0.894275			
Adjusted R-squared	0.829666			
F-statistic	13.84122			
Prob(F-statistic)	0.000001			
Durbin-Watson stat	2.102450			

Source: Author's computation from E-views 7.1.

Table 5. Result of the parsimonious agricultural output model in Nigeria

Variable	Dependent variable: D(AGOUT)			
	Coefficient	**Standard error**	**t-statistic**	**Prob.**
C	64.59826	388.0919	0.166451	0.8691
D(AGOUT(-1),2)	-0.761838	0.181840	-4.189601	0.0003
D(PXA(-1),2)	-46.55329	13.34740	-3.487817	0.0018
D(CRAGS(-1),2)	8.979077	10.14974	0.884661	0.3848
D(INR(-1),2)	42.36410	51.78597	0.818061	0.4211
ECM(-1)	-0.751958	0.245309	-3.065353	0.0052
R-squared	0.630677			
Adjusted R-squared	0.556813			
F-statistic	8.538299			
Prob(F-statistic)	0.000080			
Durbin-Watson stat	2.572717			

Source: Author's computation from E-views 7.1.

The above results in the parsimonious model (Table 5) show that PXA has a significant negative relationship with AGOUT contrary to our apriori expectation. A unit increase in PXA leads to 46.55329 units decrease in AGOUT. This finding suggests that public funds have not been actually spent or judiciously spent on the agricultural sector to bring about output growth in the sector.

Also, CRAGS and INR have insignificant positive impacts on AGOUT. A unit increase in CRAGS and INR consequently leads to 8.979077 and 42.36410 units increase in AGOUT respectively. The result of CRAGS conforms to our apriori expectation while that of INR does not. It however implied that CRAGS and INR does not play any significant role in determining the level of agricultural output in Nigeria.

The value of the coefficient of determination (R^2) of 0.630677 shows that the exogenous variables in the ECM 2 equation, PXA, CRAGS and INR explains over 63% of the systematic variations in AGOUT while the remaining 37% variations in AGOUT are caused by factors outside the model captured in the stochastic term (μ). Taking into consideration the degree of freedom, the Adjusted $\bar{R}^2$ dips down a little to 0.556813. This confirms the goodness of fit of the model.

Furthermore, the f-statistical value (8.538299) was highly statistically significant at the 5% level going by its probability value of 0.000080. This

implies that PXA, CRAGS and INR taken together, have significant linear relationship with the dependent variable, AGOUT. The Durbin-Watson statistic of 2.572717 was indicative of the presence of a negative serial autocorrelation in the model.

The error correction term for changes in AGOUT was highly significant at the 5% level with the appropriate negative sign indicating that the adjustment is in the right direction to restore the long-run relationship. It's coefficient of -0.751958 means that the present value in AGOUT adjusts rapidly to previous changes in PXA, CRAGS and INR by over 75%.

4.4 Granger Causality Test

This was used to check for causality between the variables. The rule states that if the probability value of the F-statistic is between 0 and 0.05 there is a causal relationship, otherwise, there is no causal relationship. The result of the Pairwise Granger's causality among the variables is provided in the Table 6.

Table 6. Granger causality test results

Null hypothesis:	Obs	F-statistic	Prob.
PXA does not Granger cause AGOUT	32	10.5801	0.0004
AGOUT does not Granger cause PXA		1.11028	0.3440
CRAGS does not Granger cause AGOUT	32	3.96630	0.0309
AGOUT does not Granger cause CRAGS		9.86799	0.0006
LR does not Granger cause AGOUT	32	0.27918	0.7586
AGOUT does not Granger cause LR		0.28472	0.7545

Source: Author's computation from E-views 7.1.

The result of the Granger causality above implies that a one way causal relationship exists between PXA and AGOUT, while there exists a bidirectional causal relationship between CRAGS and AGOUT. However, no causal relationship exists between INR and AGOUT in Nigeria.

5. DISCUSSION OF RESULTS

The finding of the co-integration test implied that there exists a long-run relationship between agricultural output, public agricultural expenditure, commercial bank loans to the agricultural sector and interest rates. The parsimonious ECM model revealed that public agricultural expenditure has a significant negative impact on agricultural output. This finding appears to dispute existing knowledge as regards the relevance of public expenditure on agriculture in the process of agricultural output expansion in Nigeria. However, a deeper diagnosis will reveal things worth knowing. It is appropriate that we ask the following questions: what would be the consequences of rising public agricultural expenditure on agricultural output when the amount allocated to the sector in the country is not what is actually spent on the sector? What would be the consequences of public agricultural expenditure on agricultural output when the agencies established by the federal government of the country mismanage and embezzle funds allocated to the sector? What would be the consequences of public agricultural expenditure on agricultural output in Nigeria when, in fact corruption persist in the country. The answers to the above cases are quite self-evident. Agricultural output will surely decline if funds allocated to the sector in the country are not actually and judiciously spent.

However, commercial bank loans to the agricultural sector and interest rate have insignificant positive impacts on agricultural output. This implies that commercial bank loans to the agricultural sector does not play any important role in expanding agricultural output and even, interest rate does not significantly determine agricultural output growth in the economy.

Also, the implication of the result of the Granger Causality test is that past values of public agricultural expenditure contains information that can be used to predict the future values of agricultural output in the country. A bidirectional causal relationship exists between commercial bank loans to the agricultural sector and agricultural output while no causal relationship exists between interest rate and agricultural output in Nigeria.

6. SUMMARY, CONCLUSION AND RECOMMENDATION

6.1 Summary

In investigating the impact of public agricultural expenditure on agricultural output in Nigeria for the period 1981 to 2014, we modelled agricultural output (AGOUT) against public

agricultural expenditure (PXA), commercial bank loans to the agricultural sector (GRAGS) and interest rates (INR). We employed the Augmented Dickey-Fuller test, Johansen Co-integration test, Error Correction Method (ECM) and Granger Causality test. The Johansen Co-integration test revealed that a long-run relationship exists between agricultural output, public agricultural expenditure, commercial bank loans to the agricultural sector and interest rates in Nigeria. The results of the parsimonious ECM model showed that public agricultural expenditure has a significant negative impact on agricultural output while commercial bank loans to the agricultural sector and interest rate have insignificant positive impacts on agricultural output in Nigeria. The value of the coefficient of determination (R^2) of 0.630677 showed that the exogenous variables in the ECM equation viz; public agricultural expenditure, commercial bank loans to the agricultural sector and interest rate, explains over 63% of the systematic variations in agricultural output and the f-statistical value (8.538299) is highly statistically significant at the 5% level indicating that public agricultural expenditure, commercial bank loans to the agricultural sector and interest rate taken together, have significant linear relationship with agricultural output in Nigeria. The Durbin-Watson statistic of 2.572717 indicated the presence of a negative serial autocorrelation in the model. The parsimonious error correction term for changes in agricultural output was highly significant at the 5% level with the appropriate negative sign indicating that the adjustment is in the right direction to restore the long-run relationship. It's coefficient of -0.751958 means that the present value in agricultural output adjusts rapidly to previous changes in public agricultural expenditure, commercial bank loans to the agricultural sector and interest rate by over 75%. The Granger causality test revealed that a one way causal relationship exists between public agricultural expenditure and agricultural output in Nigeria. The causation flows from public agricultural expenditure to agricultural output, while there exists a bidirectional causal relationship between commercial bank loans to the agricultural sector and agricultural output. However, no causal relationship exists between interest rate and agricultural output in Nigeria.

6.2 Conclusion

On the basis of the results it was concluded that there exist discrepancies between the amount allocated to the agricultural sector and the amount actually spent on the sector. Also, commercial bank loans to the agricultural sector does not play an important role in expanding agricultural output while interest rates does not significantly determine agricultural output growth in the economy.

6.3 Recommendations

We therefore recommended that effective monitoring agencies be established by the federal government of Nigeria to ensure that the amount allocated to the agricultural sector is actually and judiciously spent.

Infrastructural facilities such as good road network, good bore-hole water and electricity should also be concentrated in the rural areas of the country where we have bulk of our farmers. The provision of these facilities would conclusively impact positively on the rural farmers' productivity and aggregate agricultural GDP will be enhanced.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Arora VPS, Bargali SS, Rawat JS. Climate change: Challenges, impacts and role of biotechnology in mitigation and adaptation. Progressive Agriculture. 2011;11(Conf.): 8-15.
2. Mishra A, Swamy SL, Bargali SS, Singh, AK. Tree growth, biomass and productivity of wheat under five promising clones of populous deltoids. Int J of Ecology and Environmental Sciences. 2010;36(3):167-174.
3. Parihaar RS, Bargali K, Bargali SS. Status of an indigenous Agroforestry system: A case study in Kumaun Himalaya, India. Indian J of Agric Sci. 2015;85(3):442-447.
4. Shahi CV, Bargali K, Bargali SS. Seed germination and seedling growth parameters of rice (*Oryza Sativa* L.) Varieties as affected by salt and water stress. Indian J of Agric Sci. 2015;85(1): 102-108.
5. Vibhuti CS, Bargali K, Bargali SS. Influence of seed size and salt stress on seed germination and seedling growth of wheat (*Triticum aestivum* L.). Indian J of Agric Sci. 2015;85(9):1134-1137.

6. Food and Agriculture Organization. The state of food security in the world. FAO. Rome; 2006.
7. Iganiga B, Unemhilin D. The impact of federal government agricultural expenditure on agricultural output in Nigeria. J of Eco. 2011;2(2):81-88.
8. Central Bank of Nigeria. Statistical Bulletin; 2014.
   (Accessed 31 December 2014)
   Available: http://statistics.cbn.gov. ng/cbn-onlinestats
9. Christiaensen L, Demery L, Kuhl J. The role of agriculture in poverty reduction: An empirical perspective. World Bank Policy Research Working Paper, No. 4013; 2007.
10. Falola T, Heaton M. A history of Nigeria. New York: Cambrige University Press; 2008.
11. Ebere C, Osundina KC. Government expenditure on agriculture and economic growth in Nigeria. Int J of Sci & Res. 2014; 9(3):188-194.
12. Ewubare DB, Eyitope JA. The effects of public expenditure on agricultural production output in Nigeria. J of Res in Hum & Soc Sci. 2015;11(3):07-23.
13. Francis IU. The impact of federal government's expenditure on the agricultural sector in Nigeria. PATNSUK Journal. 2013;9(1):114-122.
    Available:www.patnsukjournal.net/currentissue
14. Yusuf WA, Adesope AAA, Okoruwa VO. An analysis of federal government expenditure and monetary policy on agricultural output in Nigeria. Int J of Eco, Fin & Man Sci. 2013;1(6):310-317.
15. Okezie AI, Nwosu C, Njoku AC. An assessment of Nigeria expenditure on the agricultural sector: It's Relationship with agricultural output. J of Eco and Int Fin. 2013;5(5):177-186.
16. Udoh E. An examination of public expenditure, private investment and agricultural sector growth in Nigeria: Bounds testing approach. Int J of Bus & Soc Sci. 2011;13(2):285-292.
17. Food and Agriculture Organization. FAO Statistical Database; 2008.
    Available: http://faostat.fao.org
18. Shuaib IM, Igbinosun FE, Ahmed AE. Impact of Government agricultural expenditure on the growth of the Nigerian economy. Asian J of Agric Ext, Eco & Sociology. 2015;6(1):23-33.
19. Jhingan ML. Macroeconomic theory. 12th ed. New Delhi: Vrinda Publications Ltd; 2010.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/14500