Empirical analysis of macroeconomic factors and Structural Adjustment Program (SAP) on agricultural output

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Abstract
There has been many significant research efforts that have been devoted to understand the effects of macroeconomic factors on the agriculture sector in Nigeria. In addition to the macroeconomic factors, Structural Adjustment Programme (SAP) over the period 1981 to 2017 will be included into the scenario of this study to examine the effects of these factors on agricultural output in Nigeria. This paper employed co-integration analysis and multivariate Granger causality which is carried out using VECM approach to analyse the causal links among all the variables considered for estimation. The findings showed relationship that exists between the agricultural output which is the dependent variable and the independent variables. It also revealed the variations between the dependent and independent variables which are Gross Domestic Product (GDP) growth rate, interest rate, foreign direct investment (FDI), commercial bank loan on agriculture, SAP and inflation rate. In conclusion, commercial loan on agriculture, FDI, interest and inflation rate were macroeconomic variables that contributed to agricultural output in Nigeria within the period examined.

Keywords: *Agriculture output, Macroeconomics factors, Gross Domestic Product, SAP*

JEL Classification: E6, O13, Q18

INTRODUCTION

In economic development theory propounded by Lewis 1954, agriculture was regarded as the basis for industrial growth and development. Agriculture is the engine of growth and development of most nations; often been touted crucial in the economic development as well as one of the major way out from poverty of most third world countries. Recent researches on the causes of development and underdevelopment have identified agricultural transformation as key to economic liberation of worsening countries. In the development and growth arises for most developing nations from the functions of agriculture are basically from its relationships with other sectors of the economy. In this view, it can be presumed that agriculture is the foremost determinants of achieving economic development and whether war against poverty can be won or lost in the long run Eyo (2008); Omotor, Orubu & Inoni (2009).

In Nigeria, the development of agriculture has been slow in spite of various agricultural policies. In fact, various programmes are being introduced and implemented by the government to improve the situation ever since 1970s. These programmes involved encouraging of mechanized large scale farming by the federal and state government. River Basin Development Authority (RBDA), Operation Feed the Nation (OFN), National Acceleration of Food Production (NAFP), Structural Adjustment Programme (SAP) and so on are part of the programmes introduced. However, SAP was being implemented to serve as an economic liberalization for the country. Likewise the government established the Agricultural Credit Scheme (ACS) to carter for the financial aspect Omotor, Orubu & Inoni (2009). Despite agricultural sector's efforts with characteristics of limited areas used for cultivation, low yields and level of inputs as a result of government dependence on mono-sector economy that is oil, the sector can still be seen as an engine that contributes to the growth of the overall economy of Nigeria.

The nation faced several economic crisis which can be characterized with mass unemployment, rising rates of inflation, huge public debt, disequilibrium in the balance of payments and a severe shortage of essential raw materials; before the economy deregulation by the introduction of SAP in July 1986. Likewise declined in the country's major foreign earner that is oil can also be a factor responsible for the crisis. Recently, the agricultural sector in developing countries have recorded profane declines in terms of its contribution to export earnings and domestic consumption. This observation can be associated with policy indolence among other factors. The SAP adopted in Nigeria in the 1980s, is one policy shift aimed at boosting agricultural production. The introduction of SAP was to remedy the situation by restructuring and diversifying the prolific base of the economy as the major aim. Furthermore, establishing of a realistic and sustainable exchange rate for the naira was part of the objectives to be achieved through the key instruments of SAP which include trade liberalization and tariff reforms Gbosi (1996).

In spite of all these measures, the slow growth of agricultural sector could have created issues like insufficient food for the populace, inadequate raw materials for the industrial sector and decrease in its foreign exchange earnings. However, the growth rate of agricultural output over the years as either be stagnated and failed to keep pace with the countries rapid population growth. This resulted into shortage of food, continuous souring food prices, and mass food importation by the government. Based on this, it is obvious that the Nigerian economy can't achieve desired sustainable growth rate in the low and absence of agricultural output of the country. More so since the serious declined of agricultural output over the past three decades could have been constituting into the high incidence of rural poverty. Therefore necessitate for enhancing of agricultural productivity in developing countries like Nigeria where industrial production is at minimal level.

In the light of these mentioned facts, resulted to the question on what are the macroeconomic factors that affects agricultural output in Nigeria? Since the economic and physical welfare of the country can depend on increasing and stabilizing of agricultural output through more effective policies, technologies, programmes and practices. Likewise, agriculture roles can't be overstressed in transforming the economic framework of any country given that it serves as source of food for animal and man, provision of raw materials and help in the poverty reduction of most countries. Also, it serves as the key sector that provides employment to huge segments of the population and vital to sustained economic growth of most developing countries. More so going about for improvement in a country's economic development and how the country tends to achieve the aim, using agriculture as tool indeed remains an arguable topic Anthony (2010).

The paper aims to empirically investigate the impact of macroeconomic policies on agricultural output in relation to its role as source of food and foreign exchange earnings

to the nation. Therefore, the main focus of the paper is to further evaluate empirically the presence and way of Granger causality between agricultural output and food import value to help the policy makers for having a better insight into economic growth and to formulate effective economic policies.

LITERATURE REVIEW

The achievement of sustainable and inclusive growth has been the main aim of most nations of the world, which has created lot of consideration among the various schools of economic thought extending from the classical to the neo-classical views. In the discussion of growth theory decades, the neo-classical exogenous growth theory has been the dominant school of thought. The Solow-Swan growth model explained that output growth rate is based on two exogenous factors in the long run which are technical progress and growth in labour and capital contributions. This model provided the few links of macroeconomic factors influence on output growth. As a result of this model deficiencies, led to the development of other growth theories such as Feder, Ram and Grossman and Mankiw, Romer and Weil models that encompasses other exogenous variables. According to the Feder's model, there is the inclusion of export as part of the two basic variables (capital and labour) in the general production framework which is the supply side.

However, for examining of the relationship between macroeconomic variables and output, this paper will present models based on the existing literatures where a production function framework in which capital, labour, exports, terms of trade and other factors are used as possible explanatory inputs.

Several studies have been directed to observe the influences of macroeconomic variables on agriculture because of the essentiality of this issue in the growth of nations. In various nations, significant research efforts such as Schuh, 1974; Tweeten, 1980; Gardner, 1981; Chambers & Just, 1982; Orden & Fisher, 1991; Kargbo, 2000; 2007 and so on have been devoted to understanding of macroeconomic variables linkages to agriculture. Schuh (1974) introduced the significance of the effects of macroeconomic policy for agriculture, whereas exchange rates was considered to be as a channel of macroeconomic policy transmission to agricultural sector. Nevertheless, it was argued that the overvaluation of the dollar and policy approaches to battle with the worse adjustment problems of agriculture in U.S in 1950s resulted in fluctuating of a vital share of the technical change's benefits to the consumer. In addition it was discovered that the devaluation of the dollar recently constitutes a key structural change for U. S. agriculture. Similarly, Baek & Koo (2007) investigated on the effects of the exchange rate, income and money supply of the United States and its major trading partners on agricultural trade balance using an autoregressive distributed lag (ARDL) model. It was found that the exchange rate is a crucial determinant of the short and long-run trade balance's manners. The income and money supply in both the United States and the trading partners was found to have significant impacts on U.S. agricultural trade in both the short and long run. In the same manner, Baek & Koo (2009) also examined short and long run effects of exchange rate fluctuations on bilateral trade of agricultural products between the United States and its 10 major trading partners using an ARDL approach to cointegration. In the long run, results revealed that while U.S. agricultural exports are extremely responsive to bilateral exchange rates and foreign income, the country's agricultural imports are generally sensitive to the U.S. domestic income. On the other hand, both the bilateral exchange rates and income in U.S and its trading partners are found to have significant impacts on U.S. agricultural exports and imports in the short run.

Gil, BenKaabia & Chebbi (2009) analysed the impact of alterations in the monetary policy and the exchange rate on agricultural supply, prices and exports using the multivariate cointegration approach covering annual data from 1967 to 2002. Variables

such as interest rate, exchange rates, money supply, inflation, agricultural output and input prices, agricultural supply and exports, income and the rate of commercial openness are considered in the study. The results of the study indicated that changes in the chosen macroeconomic factors have an influence on the agricultural sector, while the reverse effect does not hold. Likewise, Alagh (2011) examined the macroeconomic factors linkage with agriculture in India. From the extensive review of the past works the question "is there a structural constraint in agriculture or does agriculture work in a system in which as demand rises and prices rise, supply responds in the country?" emerged. This question led the study to the analysis of macroeconomic policy variables particularly government expenditure and money supply on agricultural prices and interest rates for agriculture. A partial economy framework using lags to help the specifications of model was used, while a Causal Chain model exhibited the econometrically macro policies impact on agriculture in an important way.

Kargbo (2000) examined impacts of monetary and macroeconomic factors on real food prices in eastern and southern Africa during 1980 to 1996 era. The study used cointegration technique and error correction modelling to test the long-run relationship between real food prices and the selected factors that influence some African countries' behavior. It was found that fluctuations in domestic food production, fused with income, trade, exchange rate and monetary policies have significant impacts on real food prices. Similarly, Colman & Okorie (1998) examined the effects of the trade and foreign exchange management policies of SAP on agricultural export in Nigeria. Protection rates and incidence parameter are used to assess the policy results over the period (1970 – 1992). The findings indicated that the protection of import-competing sectors has not been eradicated and has resulted into the taxation of all export goods, with major proportion of such taxes borne by agricultural exports. The failure to maintain steady policies and slightly weak approach to implementation of some policies, led to the inability of the SAP policy instruments to achieve its aims. Omotor, Orubu & Inoni (2009) examined the effects of policy reform on Nigeria's agricultural exports. The result indicated that agricultural export is significantly influenced by domestic consumption and economic liberalization. Thus, suggested that policy reforms on agricultural productivity should go beyond liberalization of the economy.

In the same manner, Iganiga & Unemhilin (2011) examined the effect of Federal government agricultural expenditure on agricultural output coupled with other variables like aggregate commercial credits to agriculture, consumer price index, annual average rainfall, population growth rate, food importation and GDP growth rate. Co-integration and Error Correction methodology were employed for analysing long and short run impacts of the variables on the agricultural output. It was concluded that investment in the agricultural sector is vital and should be accompanied with supervised credit facilities. In addition, food importation should be ban in order to encourage local producer. Similarly, Lawal (2011) studied on the level of government spending on the agricultural sector and GDP by a simple linear regression. It was found that government spending follow an irregular pattern and that the influence of the agricultural sector to GDP has a direct relationship with government finance to the sector. The study therefore recommended that government should increase her financial plan allocation on agricultural sector because of the sector's main role to economic growth and development of nations. Eyo (2008) examined the effect of macroeconomic policies adopted on agricultural output growth in Nigeria. It was found that exchange rate system lately did not stimulate agricultural export. In all, recommendation on macroeconomic policies that will reduce inflation, increase foreign private investment in agriculture, present encouraging exchange rates, make agricultural credit to have significant effect on agricultural output growth would be helpful in revitalizing government expenditure in the sector and ensure agricultural output growth in country.

Linkages has been established between nation's growth and agriculture, since the agricultural sector's performance is being seen as the prospects of non-oil sector and the economy overall. Likewise several macroeconomic variables and policies has be linked to sectors output growth particularly on agriculture based on this study reviewed, thus necessitate investigating of macroeconomic factors influencing agricultural output in Nigeria.

METHODOLOGY

The study was conducted in Nigeria; one of the sub-Sahara Africa countries situated on the Gulf of Guinea in the western Africa's part. This study utilized secondary data regarding the selected macroeconomic variables and Nigeria's agricultural output. Annual data covering 1981 - 2017 are analysed through the unit root test, Granger causality test and regression analysis. The data were sourced the World Bank Database, Central Bank of Nigeria Statistical Bulletin and Annual financial reports of Statistics of various issues.

Estimation procedure and technique

Augmented Dickey Fuller (ADF) and Philips-Perron (PP) test are employed for conducting of the unit root test; for determining the order of integration.

Model specification

$$Y_t = C_0 + C_1Col_t + C_2Fdi_t + C_3GDPgr_t + C_4SAP_t + C_5Inf_t + C_6Int_t + U_t$$

Where: Y_t = Agricultural output; Col_t = Commercial loan on agriculture; Fdi_t = Foreign direct investment; $GDPgr_t$ = gross domestic product growth rate; SAP_t = Structural adjustment programme (dummy); Inf_t = Inflation rate; Int_t = Interest rate; C_0, C_1, C_2, C_3, C_4, C_5 and C_6 = constants; U_i = error term

Table 1 shows VAR lag order selection criteria for the variables (Agriculture comm__loan_on_agric, FDI, GDP_growth_rate, Inflation_rate, Interest_rate, SAP). The lag order selection criteria table is the computation of various criteria such as Akaike information criterion (AIC), Schwartcz information criterion (SIC) and Hannan-Quinn (HQ), to aid in the selection of the lag order of a regression model. The table exhibits various information criteria for all lags to the maximum specified. Hence, the selected lag from the columns' criteria are portrayed by as asterisk.

Table 1. Lag order selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
1	-893.7603	NA	4.36e+19*	65.01795	67.32821*	65.74149
2	-863.3145	31.49561	2.70e+20	66.29755	70.91807	67.74464
3	-764.4843	54.52700	6.94e+19	62.86099*	69.79176	65.03162*

* indicates lag order selected by the criterion

Table 1 indicates the selected lag for each column criterion with the asterisk (*). The selected lag that was revealed by the criteria - AIC and HQ is lag 3, while lag 1 was chosen by the SC.

EMPIRICAL RESULTS AND DISCUSSION

Unit root test

This test is to observe the stationarity and non-stationarity of the specific data (time series data) to be use. The test is to identify how shocks can be temporary and eliminated overtime towards the actualization of the long run mean values. The test also is to reveal the theoretical correlogram of a stationary and non-stationary series as there is an increase in lag length.

Table 2. ADF and PP unit root test

Variable	ADF		PP		Result
	Constant	Trend and constant	Constant	Trend and constant	
Agriculture	5.99932***	6.15551***	7.67625***	9.62648***	I (1)
Comm. Loans	2.44387***	7.10493***	6.30116***	7.06766***	I (1)
FDI	7.74431***	7.73606***	12.7134***	16.9474***	I (1)
GDP growth	8.42801***	8.29934***	22.2864***	25.1127***	I (1)
Interest rate	6.90695***	6.79369***	29.5365***	31.3619***	I (1)
Inflation rate	6.76622***	6.70065***	24.5455***	30.2939***	I (1)

*Notes: *** denotes rejection of the null hypothesis of a unit root at the 1% significance level.*

According to Table 2, the unit root test result using ADF and PP including lag length selected by Schwarz Criterion (SC) are both at level and first differences of all variables. All variables remain stationary at first difference according to ADF and PP unit root test. In summary, according to the two methods of unit root tests, we can conclude using ADF and PP that all variables (FDI, Commercial bank loan on agriculture, interest rate, agricultural output, inflation rate, GDP growth rate) are stationary at I (1).

Co-integration test

Co-integration test can be conducted once the variables of the regression analysis has successively been stationary at first differences I (1). This test is provides an evidence of long run relationship between the independent and dependent variables.

Table 3. Co-integrating test results

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.974305	279.1775	125.6154	0.0000
At most 1 *	0.960616	172.9955	95.75366	0.0000
At most 2 *	0.691215	79.19794	69.81889	0.0074
At most 3	0.461594	45.11976	47.85613	0.0884
At most 4	0.381468	27.16464	29.79707	0.0977
At most 5	0.313300	13.23287	15.49471	0.1065
At most 6	0.077298	2.333007	3.841466	0.1267

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted cointegration rank test (maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.974305	106.1820	46.23142	0.0000
At most 1 *	0.960616	93.79755	40.07757	0.0000
At most 2 *	0.691215	34.07818	33.87687	0.0473
At most 3	0.461594	17.95513	27.58434	0.4989
At most 4	0.381468	13.93177	21.13162	0.3706
At most 5	0.313300	10.89987	14.26460	0.1593
At most 6	0.077298	2.333007	3.841466	0.1267

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level,
**MacKinnon-Haug-Michelis (1999) p-values

Notes:

(a) r represents the numeral of cointegrating vectors at level of 5%
(b) Trace test symbolizes the inclusion of 3 cointegrating equation at the level of 5%
(c) Max-Eigen value shows that 3 cointegrating equation at 5% significance level
(d) refer to the rejection of the null hypothesis at level of 5%
(e) Critical value are derived from Mackinnon-Haug -Michelis (1999)

Table 3 represents the co-integration rank r test result, which is in line with ADF and PP unit root test of stationary levels, showing that all the variables are integrated at first difference that is I (1). The Trace and Max-Eigenvalue test results indicated that there are three (3) co-integrating equations, which implies the existing of long run relationship between the variables examined. This existence thereby pave way for the use of vector error correction model (VECM) analysis.

VECM analysis

VECM is the important and popular means to measure the correction from disequilibrium of the co-integration test for making of good economic implication. The test assists in eliminating trends from the variables used in the analysis of the previous test to solve the problem of spurious regression.

Table 4. Vector error correction model results

Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:		CointEq1	
Agriculture(-1)	1.000000		
Comm__loan_on_agric(-1)	-75118.51	(4663.87)	[-16.1065]
FDI(-1)	24920.33	(73292.8)	[0.34001]
GDP_growth_rate(-1)	-115484.7	(22834.4)	[-5.05748]
Inflation_rate(-1)	126023.6	(24275.0)	[5.19150]
Interest_rate(-1)	245341.8	(38862.3)	[6.31311]
SAP(-1)	-569812.8	(487716.)	[-1.16833]
C	-997342.1		

Error Correction:	D(Agriculture)	D(Comm__loan_on_agric)	D(FDI)	D(GDP_growth_rate)	D(Inflation_rate)	D(Interest_rate)	D(SAP)
CointEq1	-0.139791	6.39E-06	-1.19E-07	-1.19E-07	1.69E-05	-1.20E-05	-1.20E-08
	(0.07797)	(5.9E-06)	(5.4E-07)	(2.0E-06)	(7.3E-06)	(4.4E-06)	(4.2E-08)
	[-1.79292]	[1.07657]	[-0.22148]	[-0.06001]	[2.31138]	[-2.76177]	[-0.28340]
D(Agriculture(-1))	0.769490	2.44E-05	-3.52E-08	-9.74E-07	-2.42E-06	1.53E-06	-3.18E-08
	(0.15506)	(1.2E-05)	(1.1E-06)	(3.9E-06)	(1.5E-05)	(8.7E-06)	(8.4E-08)
	[4.96263]	[2.06702]	[-0.03285]	[-0.24749]	[-0.16623]	[0.17646]	[-0.37932]
D(Comm__loan_on_agric(-1))	-2577.620	0.120091	-0.013408	0.007211	0.710559	-0.547447	-0.000622
	(4530.82)	(0.34466)	(0.03128)	(0.11506)	(0.42453)	(0.25331)	(0.00245)
	[-0.56891]	[0.34843]	[-0.42866]	[0.06268]	[1.67377]	[-2.16119]	[-0.25339]
D(FDI(-1))	1598.987	-2.351541	-0.311242	0.509259	3.083160	-1.026600	0.008767
	(31665.5)	(2.40883)	(0.21861)	(0.80411)	(2.96696)	(1.77034)	(0.01714)
	[0.05050]	[-0.97622]	[-1.42371]	[0.63332]	[1.03916]	[-0.57989]	[0.51141]
D(GDP_growth_rate(-1))	-19666.63	0.860856	0.058868	-0.411314	0.635114	-0.433711	0.003411
	(10357.8)	(0.78793)	(0.07151)	(0.26303)	(0.97050)	(0.57908)	(0.00561)
	[-1.89872]	[1.09255]	[0.82323]	[-1.56378]	[0.65442]	[-0.74896]	[0.60834]
D(Inflation_rate(-1))	20638.88	-0.770354	0.002782	0.055477	-1.249230	0.593322	0.000992
	(9193.64)	(0.69937)	(0.06347)	(0.23346)	(0.86142)	(0.51400)	(0.00498)
	[2.24491]	[-1.10150]	[0.04383]	[0.23763]	[-1.45020]	[1.15433]	[0.19924]
D(Interest_rate(-1))	38295.28	-1.590450	0.013489	0.027540	-1.351108	0.570266	0.001357
	(15541.4)	(1.18225)	(0.10730)	(0.39466)	(1.45619)	(0.86889)	(0.00841)
	[2.46408]	[-1.34527]	[0.12571]	[0.06978]	[-0.92784]	[0.65632]	[0.16124]
D(SAP(-1))	-369380.4	7.861688	2.446767	-9.832261	68.92877	-39.09758	0.024332
	(436520.)	(33.2066)	(3.01366)	(11.0850)	(40.9007)	(24.4048)	(0.23633)
	[-0.84619]	[0.23675]	[0.81189]	[-0.88699]	[1.68527]	[-1.60204]	[0.10296]
C	183794.8	-0.914759	0.041482	1.049758	-7.500583	5.653206	0.047334
	(98576.7)	(7.49884)	(0.68056)	(2.50325)	(9.23635)	(5.51119)	(0.05337)
	[1.86449]	[-0.12199]	[0.06095]	[0.41936]	[-0.81207]	[1.02577]	[0.88692]
R-squared	0.678097	0.371282	0.211175	0.233936	0.478647	0.503851	0.065778
Adj. R-squared	0.555467	0.131771	-0.089329	-0.057898	0.280036	0.314842	-0.290116
Sum sq. resids	3.08E+12	17829.11	146.8486	1986.787	27048.46	9630.140	0.903081
S.E. equation	383032.2	29.13770	2.644389	9.726711	35.88902	21.41444	0.207374
F-statistic	5.529631	1.550166	0.702735	0.801605	2.409977	2.665748	0.184825
Log likelihood	-422.8943	-138.3790	-66.39123	-105.4643	-144.6310	-129.1400	9.978950
Akaike AIC	28.79295	9.825268	5.026082	7.630954	10.24206	9.209333	-0.065263
Schwarz SC	29.21331	10.24563	5.446441	8.051313	10.66242	9.629692	0.355096
Mean dependent	446597.9	9.683333	0.023423	0.177749	0.148064	0.080000	0.033333
S.D. dependent	574491.3	31.27073	2.533644	9.456796	42.29668	25.87088	0.182574
Determinant resid covariance (dof adj.)			2.59E+19				
Determinant resid covariance			2.14E+18				
Log likelihood			-931.0663				
Akaike information criterion			66.73775				
Schwarz criterion			70.00721				

Table 4 presents the result of VECM, which is subject to change in agriculture (1st column), commercial loan on agriculture (2nd), FDI (3rd), GDP growth rate (4th), inflation rate (5th), interest rate (6th) and SAP (7th). The coefficient of error correction term consists of information as to whether past affect the present values of variables under the study. Meaning any significant coefficient denotes that past equilibrium error influences the outcome of the present.

VECM test using causality

VEC granger causality test on stationary variables is show the ability of one variable to predict or cause the other variables in the model. This test therefore indicates how the variables in the specified model affect each other with distributed lags.

Table 5. VEC Granger causality/block exogeneity Wald tests

Excluded	Chi-sq	Df	Prob.
Dependent variable: D(Agriculture)			
D(Comm__loan_on_agric)	0.323656	1	0.5694
D(FDI)	0.002550	1	0.9597
D(GDP_growth_rate)	3.605153	1	0.0576
D(Inflation_rate)	5.039608	1	0.0248
D(Interest_rate)	6.071666	1	0.0137
D(SAP)	0.716044	1	0.3974
All	9.578659	6	0.1436
Dependent variable: D(Comm__loan_on_agric)			
D(Agriculture)	4.272588	1	0.0387
D(FDI)	0.953002	1	0.3290
D(GDP_growth_rate)	1.193672	1	0.2746
D(Inflation_rate)	1.213292	1	0.2707
D(Interest_rate)	1.809746	1	0.1785
D(SAP)	0.056051	1	0.8128
All	11.56216	6	0.0725
Dependent variable: D(FDI)			
D(Agriculture)	0.001079	1	0.9738
D(Comm__loan_on_agric)	0.183749	1	0.6682
D(GDP_growth_rate)	0.677707	1	0.4104
D(Inflation_rate)	0.001921	1	0.9650
D(Interest_rate)	0.015804	1	0.9000
D(SAP)	0.659170	1	0.4169
All	2.337241	6	0.8862
Dependent variable: D(GDP_growth_rate)			
D(Agriculture)	0.061252	1	0.8045
D(Comm__loan_on_agric)	0.003928	1	0.9500
D(FDI)	0.401093	1	0.5265
D(Inflation_rate)	0.056466	1	0.8122
D(Interest_rate)	0.004869	1	0.9444
D(SAP)	0.786751	1	0.3751
All	1.912426	6	0.9276
Dependent variable: D(Inflation_rate)			
D(Agriculture)	0.027633	1	0.8680
D(Comm__loan_on_agric)	2.801517	1	0.0942
D(FDI)	1.079861	1	0.2987
D(GDP_growth_rate)	0.428267	1	0.5128
D(Interest_rate)	0.860885	1	0.3535
D(SAP)	2.840146	1	0.0919
All	6.599436	6	0.3595
Dependent variable: D(Interest_rate)			
D(Agriculture)	0.031138	1	0.8599
D(Comm__loan_on_agric)	4.670759	1	0.0307
D(FDI)	0.336270	1	0.5620
D(GDP_growth_rate)	0.560946	1	0.4539
D(Inflation_rate)	1.332487	1	0.2484
D(SAP)	2.566547	1	0.1091
All	7.669848	6	0.2633
Dependent variable: D(SAP)			
D(Agriculture)	0.143881	1	0.7045
D(Comm__loan_on_agric)	0.064208	1	0.8000
D(FDI)	0.261536	1	0.6091
D(GDP_growth_rate)	0.370084	1	0.5430
D(Inflation_rate)	0.039695	1	0.8421
D(Interest_rate)	0.025998	1	0.8719
All	1.422120	6	0.9645

Table 5 shows the causation test analysis by using VECM and revealed that there is existence of long run relationship between agriculture and inflation rate, GDP growth rate and interest rate. Also, there is presence of one way causality between commercial loan on agriculture and agriculture. Similarly interest rate has presence of one way causality to commercial loan on agriculture.

Thus in the short and long run, interest rate, foreign direct investment and inflation rate positively influenced the agricultural output which is consistent with the studies of Karbgo (2007), Baek & Koo (2009) and Gil, BenKaabia, & Chebbi (2009). The commercial loans on agriculture oil price has negative sign in determining the performance of agricultural output. The SAP policy included in the model reveals a negative effect on the agricultural output, which follows the findings of Colman & Okorie (1998) and Omotor, Orubu & Inoni (2009). The previous year derivation from long run equilibrium is corrected at an adjustment speed of 13.9 percent. In addition, the granger causality test shows that interest and inflation rate granger causal agricultural output while SAP does not. Also there was indication of commercial loans on agriculture does granger causal agricultural output, likewise interest rate does granger causal commercial loans on agriculture.

CONCLUSION AND RECOMMENDATIONS

Conclusion

The study has been able to establish a long run relationship between the agricultural output and the explanatory variable (FDI, Commercial bank loan on agriculture, interest rate, SAP, inflation rate, GDP growth rate). The study concluded that FDI, Commercial bank loan on agriculture, interest rate, SAP, inflation rate, GDP growth rate are significant variables that affect agricultural output in Nigeria whereas SAP is insignificant. Thus, the insignificant of this variable implies that most policies coming into play in the country's economic needed to be critically examined and well-structured before implemented. Also this study implies that more funds through different means (government and private sectors) can be tailor to boost the agricultural output.

Recommendations

The study hereby recommended that adequate financing of agriculture will improve the sector, likewise government should restructure and make new policy that will encourage farmers to produce more than the present situation.

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