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Impact of Nigerian Agricultural Expenditure on Agricultural Sector Output

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Abstract
This research examines the impact of Nigerian agricultural expenditure on agricultural sector output. To achieve this, time series data obtained from the Central Bank of Nigeria were analyzed using the Error Correction Model (ECM). The findings indicate that both government capital and recurrent agricultural expenditures have positive relationships with agricultural sector output. However, only capital expenditure had significant impact on agricultural sector output in Nigeria. The implication of this finding is that if the federal government channels more budgetary allocation to the agricultural sector, agricultural sector output will increase in the long-run. The findings also showed that there was an inverse relationship between interest rate and inflation rate against agricultural sector output. This implies that the monetary authorities should consider lowering interest rate and combating inflation a monetary policy priority. In conclusion, the study recommended that agricultural budget execution rate should be improved through quick budget passage and timely implementation. More importantly, such expenditures should be closely monitored.
Keywords: Nigerian Agricultural Expenditure, Agricultural Sector Output, Error Correction Model

Introduction

Nigeria is blessed with cultivatable land, forest, rangeland wildlife, water resources just to mention but a few. These endowments positioned Nigeria as a leading producer of most agricultural products in the region of Africa. Research has shown that the non-oil sector growth depended more from agriculture. It is important to note that, agriculture has been the main source of gainful employment in Nigeria, source of food for the Nigerian teeming population in Nigeria, source of local raw materials for industries in Nigeria and also a source of revenue to the Nigerian government.

However, according to the International Fund for Agricultural Development (IFAD), only 46 percent of Nigeria's arable land is cultivated; with small holder farmers, mostly in the rural areas producing about 90 percent of the nation's food. On a bad note, these farmers and other stakeholders in the agribusiness sub-sector have also had to grapple with the problem of farmer – herder conflicts and floods. Recently, the 2020 Global Report of Food Crises by the Food Security Information Network (FSIN) grouped Nigeria among the 10 countries in the World with the largest populations in food crises. Specifically, according to FSIN, 5 million people in Nigeria are actually food insecure and in need of urgent attention.

A study on the impact of agricultural expenditure on agricultural output is therefore very important to help inform policy decisions regarding resource allocation towards agricultural production growth and development in Nigeria. Furthermore, the conflicting results on whether government agricultural expenditure has positive impact as indicated by the studies of (Udo, 2015; Chinedu, Daniel and Ezekwe, 2018) or negative impact as indicated by the study of (Ebiringa and Charles-Anyaogu, 2012) will be reconciled.

Some Stylized Facts

For the purpose of this study, time series data from 1981 to 2020 were used. They were sourced from the Statistical Bulletin of the Central Bank of Nigeria. An analysis of the data in the Table in appendix 1 shows that agricultural output represented by AGO in Nigeria showed positive increase from 1981 to 2020. However, agricultural expenditure which was classified into agricultural recurrent expenditure (AGREX) and agricultural capital expenditure (AGCEX) did not follow the same pattern, but fluctuated. This is shown by charts 1 and chart 2 in appendix 2. Nevertheless, in 1999 AGREX witnessed significant increase from 2.89 billion naira to 59.32 billion naira, but dropped sharply again to 6.34 billion naira. The implication of this was that AGO increased marginally until 2008 when AGREX was increased again by the Nigerian government to 65.4 billion naira. However, AGCEX in 1999 witnessed an increase from 200.86 billion naira to 323.58 billion naira and had continued fluctuating till 2020. The implication of this is that the Nigerian agricultural sector has witnessed laggard output growth all these years as can be observed in chart 3. One major factor responsible for this, is the undefined Nigerian agricultural expenditure pattern.

Empirical Review

The study of Abula and Ben (2016) examined the impact of public expenditure on agricultural output on economic development in Nigeria using annual time series data spanning 1986 to 2014 and established that agricultural output plays significant impact in Nigeria's economic development. Economic development proxied by per capita income was explained by agricultural output and public agricultural expenditure. The study made use of Vector Autoregressive model. The variance decomposition analysis revealed that the greater contribution to shocks in economic development apart from feedback shocks was received from shocks to agriculture. The results of the impulse response function in support of the variance decomposition analysis showed that per capita income responded positively to shocks in agricultural output throughout the ten-year period, while the response of per capita income to shocks in public agricultural expenditure was negative in the first two year period but became positive throughout the last eight periods.

Ayeomoni and Aladejana (2016) studied the relationship between agricultural credit and economic growth in Nigeria. The study employed time series data from Central Bank of Nigeria, Statistical Bulletin and National Bureau of Statistics which spanned from 1986-2014. This study adopted Auto-Regressive Distributed Lag (ARDL) approach in the investigation. Results of the study showed that short and long run relationship existed between agricultural credit and economic growth in both short and long run respectively. Furthermore, real exchange rate and private domestic investment variables had positive effect on economic growth whereas inflation rate revealed an inverse relationship in the model. The study concluded that economic growth is influenced by dynamic variables such as credit to agricultural sector, real exchange rate, real interest rate, private domestic investment and inflation rate in Nigeria. The study therefore suggested that concerted efforts should be made by policy makers to increase the level of productivity of agricultural sector in Nigeria through adequate credit to the sector so as to boost the growth of the economy.

In the study of Chinedu, Daniel and Ezekwe (2018) on the impact of sectoral spreads of government expenditure on economic growth in Nigeria, it was established that

Government expenditure on Agriculture and Defence had positive significant impact on economic performance in Nigeria while Government expenditure on Transportation, Communication, Health and Education were not statistically significant. This result implies that expenditure on Agriculture improves the economic performance of the Nigerian economy.

Ogoru, Adullmalik and Park (2018) examined government expenditure on agriculture and its impact on unemployment reduction in Nigeria from 1999 - 2015. Result revealed that the relationship between government expenditure and unemployment in Nigeria was not statistically significant. According to the study, government expenditure had no reducing effect on unemployment in Nigeria. The study therefore, recommended that the federal government intervention in quadrupling of agriculture votes in the annual budget up to the 10% Maputo Declaration of 2003 for enormous progress will be a way out in unemployment reduction in Nigeria.

Obansa and Maduekwe (2013) carried their study on agriculture financing and economic growth in Nigeria. They study adopted econometric techniques such as Ordinary Least Square analytic technique, Augmented Dickey Fuller (ADF) unit root test and Granger Causality tests. Results indicated that there is a bidirectional causality between economic growth and agriculture financing. The study suggests further that productivity investment will be more appropriately financed with foreign direct private loan, share capital, foreign direct investment and development stocks.

Odi (2013) carried a study on agricultural financing from the perspective of Nigerian agricultural co-operative and rural development bank (NACRDB). The study made use of Ordinary Least Square (OLS) method and quantitative research design. Results from the study indicated that; there is a significant relationship between agricultural financing and the growth of the Nigerian economy and that the level of loan repayment rate over the years had indeed negatively impacted on the growth of the economy.

Uger (2013) examined the impact of federal government's expenditure on agricultural sector. The data used were sourced from the Central Bank of Nigeria statistical Bulletin. The linear regression model with the application of Ordinary Least Squares (OLS) technique were used in data analysis. The result of the study showed that there exists a weak positive relationship between federal government agricultural expenditure and agricultural output.

Ebiringa and Charles-Anyaogu (2012) evaluated the impact of expenditures on some priority sectors on economic growth in Nigeria. They used a Cochrane-Orcutt and ECM method to measure the long run effect of selected macroeconomic variable's economic growth. Their result showed that expenditure on Telecommunication, Defence and Security, Education and Health Sector have positive significant impact on Nigeria's economic growth. However, expenditure on Transportation and Agriculture had negative significant impact on Nigeria's economic growth.

Udoh (2011) examined the relationship between public expenditure, private investment and growth in the agricultural sector in Nigeria. The study made use of data from 1970 to 2008, their growth model incorporated variables such as agricultural output, labor force participation rate, gross fixed capital formation and total foreign direct investment. The VECM was used in this study. Result of the Vector Error Correction Model showed that there was a

positive relationship between public expenditure and agricultural output in the short run.

Methods

In this research, government agricultural capital and recurrent expenditures, deposit money banks credit to agriculture, interest rate and inflation served as the independent variables while agricultural output served as the dependent variable. The model is expressed in implicit and explicit forms below:

In Implicit Form:

$$AGO = f(AGREX, AGCEX, DMBCA, INTR, INF) \quad \ldots\ldots(4.1)$$

In Explicit Form:

$$AGO = \beta_O + \beta_1 AGREX + \beta_2 AGCEX + \beta_3 DMBCA + \beta_4 INTR + \beta_5 INF + \mu \quad \ldots\ldots(4.2)$$

Where;

f = Functional Relationship

AGO = Agricultural Output

AGREX = Agricultural Recurrent Expenditure

AGCEX = Agricultural Capital Expenditure

DMBCA = Deposit Money Banks Credit to Agricultural Sector

INTR = Interest Rate

INF = Inflation Rate

$\beta' s =$ The Parameters of the independent variables to be estimated.

μ = Stochastic Error Term

1. Results

Unit Roots Test Result

Table 1

VARIABLE	ADF STAT.	CRITICAL VAL.	ORDER
AGO	-5.049498	-1.950117	I(1)
AGREX	-6.963699	-3.540328	I(1)
AGCEX	-5.033394	-1.950117	I(1)
DMBCA	-7.133682	-3.536601	I(1)
INTR	-5.191203	-3.552973	I(0)
INF	-5.318822	-3.548490	I(1)

Source: *Author's Computation Using E-views 10.*

From table1 above, agricultural output (AGO), AGREX, AGCEX, DMBCA and INF were stationary at order one while INTR was stationary at the level form.

Cointegration Test Result with Engel-Granger Method

Table 2

Null Hypothesis: D(RESID01) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.293854	0.0000
Test critical values:	1% level	-4.226815	
	5% level	-3.536601	
	10% level	-3.200320	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESID01,2)
Method: Least Squares
Date: 08/27/21 Time: 23:25
Sample (adjusted): 1983 2020
Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RESID01(-1))	-1.277678	0.175172	-7.293854	0.0000
C	274.1796	520.0901	0.527177	0.6015
@TREND(1981)	-17.96321	22.94178	-0.782891	0.4391

R-squared	0.611655	Mean dependent var	-86.20599
Adjusted R-squared	0.588811	S.D. dependent var	2322.793
S.E. of regression	1489.469	Akaike info criterion	17.52783
Sum squared resid	75429573	Schwarz criterion	17.65845
Log likelihood	-321.2649	Hannan-Quinn criter.	17.57388
F-statistic	26.77547	Durbin-Watson stat	1.917593
Prob(F-statistic)	0.000000		

Source: *Author's Computation Using E-views 10.*

Result in table 2 above indicated that there is co-integration among the series. Co-integration indicates the presence of a combination of non-stationary variables that are stationary. As earlier indicated, the study employed the Engel-Granger procedure. As presented in the Table 2, the ADF and critical value yielded values for analysis. The ADF of the residuals yielded -7.293854 with a corresponding probability value of 0.0000 < 0.05 at level form. We therefore conclude that the variables are co-integrated, hence; there exists a long-run relationship among the variables under study.

Error Correction Model Regression Result

Table 3

Dependent Variable: D(AGO)
Method: Least Squares
Date: 08/27/21 Time: 23:50

Sample (adjusted): 1982 2020
Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	487.4249	158.9532	3.066467	0.0045
D(AGREX)	5.905217	10.52358	0.561141	0.5787
D(AGRCEX)	4.544248	1.741608	2.609226	0.0138
D(DMBCA)	12.15095	3.481087	3.490563	0.0015
D(INTR)	-6.348091	35.20657	-0.180310	0.8581
D(INF)	-3.055461	8.852180	-0.345165	0.7323
ECM(-1)	-0.038080	0.111084	-0.342806	0.7341

R-squared	0.539765	Mean dependent var	839.1339
Adjusted R-squared	0.431333	S.D. dependent var	1054.540
S.E. of regression	862.3191	Akaike info criterion	16.52195
Sum squared resid	230514.21	Schwarz criterion	16.82361
Log likelihood	-306.9170	Hannan-Quinn criter.	16.62928
F-statistic	4.055658	Durbin-Watson stat	2.177109
Prob(F-statistic)	0.004095		

Source: *Author's Computation Using E-views 10.*

Result in table 3 above indicated that agricultural recurrent expenditure (AGREX) yielded a positive numerical coefficient with the magnitude of 5.905217. This entails that a 1% increase in AGREX will lead to a 5.905217 increase in agricultural output and vice-versa. This conforms to economic a priori expectation given that an increase in recurrent agricultural expenditure is expected to increase agricultural output through the multiplier effect. Result further reveals that a one percent increase in agricultural capital expenditure (AGRCEX) will lead to a 4.544248 increase in agricultural output and vice versa. This also conforms to economic a priori expectation.

Deposit Money Banks Credit to Agricultural Sector (DMBCA) yielded a positive numerical coefficient at the value of 12.15095. This entails that an increase in DMBCA by one percent, is expected to increase the level of agricultural output by 12.15095.

Interest rate (INTR) coefficient which yielded a negative coefficient of -6.348091 implies that there exists an inverse relationship between interest rate and agricultural output for the period under analysis. This confirms to economic a priori expectation because an economic theory supports an inverse relationship between interest rate and agricultural output.

Inflation rate coefficient yielded a negative numerical coefficient at the magnitude of -3.055461. This implies that there is an inverse relationship between inflation rate and agricultural output in Nigeria for the period under analysis. This also conforms to economic a priori expectation.

The F- statistic ratio of 4.055658 with probability ratio of 0.004095 reveals that the test is statistically significant at the entire regression plane. The (R^2) of 0.539765 entails that approximately 53.9% of the variations in agricultural output (AGO) is explained by changes in specified independent variables.

The coefficient of the ECM, term which measures the speed of the adjustment of the variables at which equilibrium is restored, yielded -0.038080. This entails that the speed at which equilibrium is restored is at approximately 3.8%. The speed suggests that agricultural output (AGO) in Nigeria adjusts slowly to the long-run equilibrium changes in the explanatory variables and it gives the proportion of the disequilibrium error accumulated in the previous period that is corrected in the current period.

Autocorrelation Test (Breusch-Godfrey)

Table 4

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	8.631058	Prob. F(2,29)	0.0011
Obs*R-squared	14.17921	Prob. Chi-Square(2)	0.6698

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 08/27/21 Time: 00:37
Sample: 1982 2020
Included observations: 39
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	220.2809	141.1001	1.561168	0.1293
D(RAGRICEXP)	1.270328	28.89243	00.142854	0.8874
D(CAGRICEXP)	-1.480378	1.475134	-1.003555	0.3239
D(DMBCA)	-5.180336	3.157415	-1.640689	0.1117
D(INTR)	13.36397	29.02647	0.460406	0.6487
D(INF)	-1.124204	7.255835	-0.154938	0.8779
ECM(-1)	-0.277565	0.117517	-2.361917	0.0251
RESID(-1)	0.640527	0.227209	2.819103	0.0086
RESID(-2)	0.705729	0.189358	3.726951	0.0008

R-squared	0.373137	Mean dependent var	1.20E-13
Adjusted R-squared	0.200210	S.D. dependent var	789.3107
S.E. of regression	705.8885	Akaike info criterion	16.16019
Sum squared resid	144500 79	Schwarz criterion	16.54803
Log likelihood	-298.0435	Hannan-Quinn criter.	16.29818
F-statistic	2.157765	Durbin-Watson stat	1.882293
Prob(F-statistic)	0.062049		

Source: *Author's Computation Using E-views 10*

Breusch-Godfrey (BG) serial correlation LM test was carried out to evaluate the presence of autocorrelation problem in the model. The BG output reported in table 4.4 shows that the probability of Chi-Square (X^2) yielded 0.6698. Since 0.6698 is greater than 0.05 (0.6698 > 0.05), the null hypothesis of no serial correlation presence is accepted. Hence, we conclude that there is no presence of serial correlation in the model.

2. Discussion of Findings

The major findings of this study show that agricultural capital and recurrent expenditures have a positive relationship with agricultural output. The implication of this finding is that if the federal government channels more budgetary allocation to the agriculture sector, there is an expectation of a tremendous increase in agricultural output in the long-run. The findings also show that there is an inverse relationship between interest rate and inflation rate against agricultural output. This implies that the monetary authorities should consider lowering interest rate for the agricultural sector and continue to combat inflation rate in the country. These findings are in line with the findings of Uger (2013) who examined the impact of federal government's expenditure on agricultural sector. The linear regression with the application of Ordinary Least Squares (OLS) technique was applied and the result shows that there exists positive relationship between federal government agricultural expenditure (financing) and agricultural output although a weak one. In addition, the findings is also in tandem with the findings of Udoh (2011) who estimated the relationship between public expenditure and agricultural output growth in Nigeria over the period 1970-2011. Results of the vector error correction model showed that increase in public expenditure has a positive influence on the growth of the agricultural output.

Summary of Findings

Agricultural capital and recurrent expenditures have a positive relationship with agricultural sector output. The null hypotheses which states that both agricultural capital and recurrent expenditures have no significant impact on agricultural sector output in Nigeria are hereby rejected. The implication of this finding is that if the federal government channels more budgetary allocation to the agriculture sector, there is an expectation of a tremendous increase in agricultural output in the long-run. The speed of the adjustment of agricultural sector output to equilibrium is approximately 3.8%. The speed suggests that agricultural output (AGO) in Nigeria adjusts slowly to the long-run equilibrium changes.

Conclusion

Results from the study on impact of Nigerian agricultural expenditure on agricultural sector output in Nigeria show that both capital and recurrent expenditures have a positive relationship with agricultural sector output. However, agricultural recurrent expenditure was statistically insignificant. Based on the findings of the study, the researchers conclude that increasing government agricultural expenditure has the potentials of boosting the level of agricultural output in Nigeria. This therefore calls for government aggressive and consistent intervention in agricultural sector through effective policies.

Recommendations

1. Since agricultural recurrent expenditure has positive but insignificant impact on agricultural sector output in Nigeria, the study strongly recommends an increase on percentage of the recurrent expenditure allocated to the agricultural sector.
2. Since agricultural capital expenditure has positive and significant impact on agricultural sector output in Nigeria, the study recommends monitoring of such expenditures to achieve desired results in the agricultural sector. Furthermore, infrastructures in rural areas should be developed. This will reduce the rural-urban migration, increase retention of skilled labour in rural areas, and reduce cost of production. The implication of this is that agricultural productivity will be boosted and agro based industries will be established in the rural areas.

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Appendix 1

TABLE: DATA FOR THE STUDY IN BILLION NAIRA

YEAR	AGO (N'bn)	AGREX (N'bn)	AGCEX (N'bn)	AGTEXP (N'bn)
1981	17.05	0.01	3.63	3.64
1982	20.13	0.01	2.54	2.55
1983	23.8	0.01	2.29	2.3
1984	30.37	0.02	0.66	0.68
1985	34.24	0.02	0.89	0.91
1986	35.7	0.02	1.1	1.12
1987	50.29	0.05	2.16	2.21
1988	73.76	0.08	2.13	2.21
1989	88.26	0.15	3.93	4.08
1990	106.63	0.26	3.49	3.75
1991	123.24	0.21	3.15	3.36
1992	184.12	0.46	2.34	2.8
1993	295.32	1.8	18.34	20.14
1994	445.27	1.18	27.1	28.28
1995	790.14	1.51	43.15	44.66
1996	1070.51	1.59	117.83	119.42
1997	1211.46	2.06	169.61	171.67
1998	1341.04	2.89	200.86	203.75
1999	1426.97	59.32	323.58	382.9
2000	1508.41	6.34	111.51	117.85
2001	2015.42	7.06	259.76	266.82
2002	4251.52	9.99	215.33	225.32
2003	4585.93	7.54	97.98	105.52
2004	4935.26	11.26	167.72	178.98
2005	6032.33	16.33	265.03	281.36
2006	7513.3	17.92	262.21	280.13
2007	8551.98	32.48	358.38	390.86
2008	10100.33	65.4	504.29	569.69
2009	11625.44	22.44	506.01	528.45
2010	13048.89	28.22	412.2	440.42
2011	14037.83	41.2	386.4	427.6
2012	15816	33.3	320.9	354.2
2013	16816.55	39.43	505.77	545.2
2014	18018.61	36.7	393.45	430.15
2015	19636.97	41.27	348.75	390.02
2016	21523.51	36.3	278.95	315.25
2017	23952.55	50.26	542.19	592.45
2018	27371.3	53.99	753.49	807.48
2019	31904.14	70.27	994.19	1064.46
2020	37,241.61	69.11	705.8	774.91

Source: Statistical Bulletin of the Central Bank of Nigeria, 2021

Appendix 2

CHART 1: AGRICULTURAL RECURRENT EXPENDITURE (AGREX)

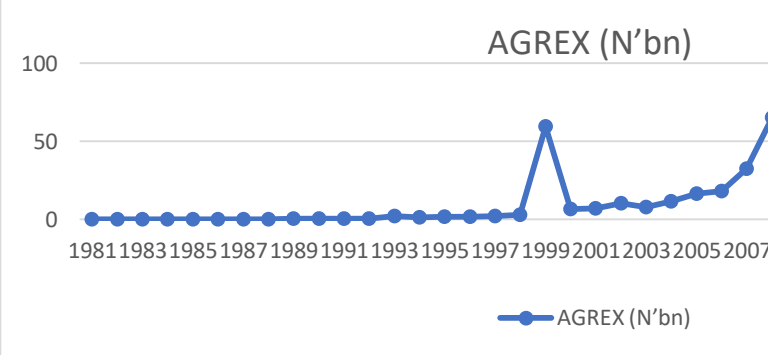


CHART 2: AGRICULTURAL CAPITAL EXPENDITURE (AGCEX)

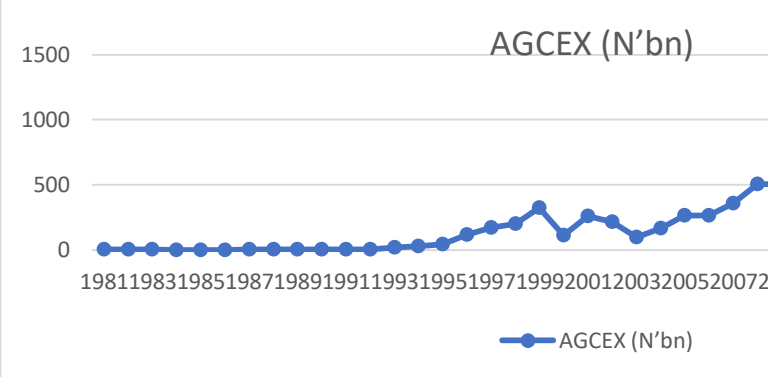
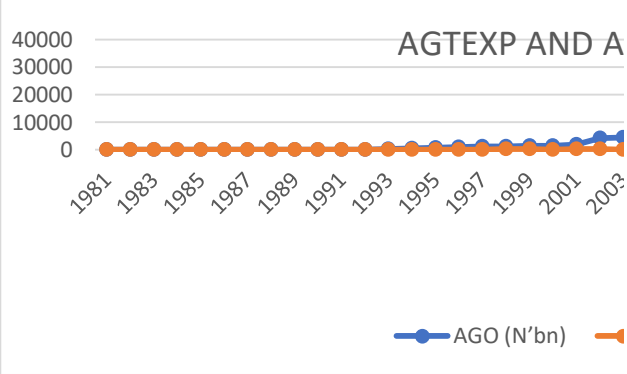


CHART 3: AGRICULTURAL TOTAL EXPENDITURE (AGTEXP) & AGRICULTURAL OUTPUT (AGO)


AGTEXP AND A
40000
30000
20000
10000
0
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
AGO (N'bn)