GOVERNMENT AGRICULTURAL EXPENDITURE AND AGRICULTURAL PRODUCTIVITY AND FOOD SECURITY IN NIGERIA: EVIDENCE FROM FINITE DISTRIBUTED-LAGGED MODELS

DADA, M. A.
Department of Economics
College of Entrepreneurship and Development Studies,
Federal University of Agriculture Abeokuta, Nigeria
mattabeyvoice2@yahoo.com**; ORCID ID:** https://orcid.org/0000-0002-2080-6082

POSU, S. M. A
Department of Economics
College of Entrepreneurship and Development Studies
Federal University of Agriculture Abeokuta, Nigeria

OMOARE, O. E.
Department of Business Administration
Ogun State Polytechnic Igbesa, Ogun State, Nigeria

ABALABA, B. P.
Department of Economics
College of Social and Management Sciences
Osun State University Osogbo, Nigeria

OGUNTEGBE, A. A.
Department of Business Administration
The Polytechnic Ibadan, Oyo State, Nigeria

ABSTRACT

This study tested the explanatory power of government agricultural expenditures with particular interest in finding out whether past expenditures matter in explaining agricultural productivity and food security in Nigeria, using finite distributed lagged models. Annual time series data were obtained and tested for unit root to determine the order of integration. Finite distributed lagged models were estimated using OLS method having confirmed the variables to be level stationary. The result shows that past expenditures explain variations in agricultural productivity and food security. The study searched for the best models from zero-lag to nine-lag models, the eight-lag models were found to be the best models in both cases with case 1, having an adjusted R^2 =0.614; F-stat=4.538(0.011) and case 2, having an adjusted R^2 =0.40; F-stat =2.474(0.079). The result shows that past expenditures matter in explaining agricultural productivity and food security in Nigeria. The policy implication is non-exclusion of past fiscal actions while explaining some current events. The study concluded that past fiscal actions matter in predicting agricultural productivity and food security in Nigeria.

Keywords: Agricultural expenditure, agricultural productivity, food security, distributed lagged models

JEL classifications: C52; E62; E22; H5; R38; O47

INTRODUCTION

The world and the entire living creatures in it depend largely on agriculture for food and other life sustaining resources. Agriculture has been the major source of food for human survival on the surface of the earth. According to Ebomuche and Ihugba (2010), agriculture entails land cultivation, raising and rearing of animals purposely to produce food for both upper and lower animals as well as raw materials for industries.

All the countries of the world, including the development ones, were once agrarian before transiting to industrialized and service-based economies. The agricultural sector has been, and is still the chief employer of labour in many countries. According to NEEDS (2004), the highest job opportunity is available in the agricultural sector. Agriculture is the chief income earner, poverty destroyer and wealth creator; it contributes to economic growth and development (Ogen, 2003).

Traditionally, agriculture is practiced using implements and mainly subsistence basis, with shifting cultivation and mono-cropping systems. The productivity resulting from this old practice has been very low, rendered rural farmers poor, and made the sector unattractive to many people especially, youth in most agriculturally endowed developing countries. The role of government in promoting agriculture has therefore become necessary to ensure adequate production of food for the teeming population. Government funding of agriculture is essential to agricultural productivity and successful industrialization.

The use of advanced technology in agriculture requires heavy investment, hence the need for massive government intervention in line with Big-Push theory. Diversifying into agriculture means increased government spending on agriculture through budgetary allocation to the sector. According to CBN (2010), the need for adequate supply and easy access to food for all Nigerians necessitated the need for government to intervene in the agricultural sector. There is always need for adequate supply of food to guarantee availability and affordability and meet demand. Food security is an essential role of government, sustainable food supply is needed at all time for peace and healthy living of the entire populace.

The discovery of oil in commercial quantity removed government attention and funding of agriculture, and led to a decline in agricultural activities (Ijaiya, 2000; Iwayemi, 1994). World Bank (2000) and Abayomi (1997) states that this in turn crippled the sector and triggered rural-urban migration that led to congestion of major cities and posed serious threats to urban living due to accompany social vices such as burglary and theft, robbery, kidnapping, etc. in addition, urban population face high risk of food insecurity.

Literature provide empirical evidence on the link between government expenditure and agricultural output for different countries and economies (Megbowon et al., 2019; Utpal & Dahun, 2018; Zirra & Ezie, 2017; Ewubare & Eyitope, 2015). Oyinbo et al. (2013) investigated effect of budgetary allocation to agriculture on agricultural performance and the growth of the Nigerian economy using time series data from 1980-2010. The result of the econometric analysis shows that there is a positive relationship between budgetary allocation and agricultural output in the long-run but not in the short-run.

In Okezie et al. (2013), cointegration and granger causality procedures were employed to assess fiscal spending on agriculture and how it relates to agricultural output by employing annual time series data running between 1980 and 2011. The result showed that both expenditure and output are cointegrated. The study also reported a very weak causal evidence between expenditure and productivity. Similarly, Ebere et al. (2012) examined impact of government expenditure on agriculture and economic growth in Nigeria using annual data covering a period of 33 years. The result showed that agricultural expenditure has positive significant effect on agricultural productivity and economic growth in Nigeria.

Also, Selvaraj (1993) assessed impact of government expenditure on agricultural output growth for India economy using time-series data over the 1951-52 to 1988-89 period. The results indicate that government expenditure is vital to the growth of the agricultural sector and that reduction in government expenditure adversely affects agricultural sector performance in India. Obi and Obayori (2016) investigated the dynamic effect of government expenditure on agricultural output in Nigeria. The study found that government expenditure contributes positively to agricultural productivity in Nigeria.

In other studies, Adofu and Agama (2012) showed that agricultural sector budget has positive and significant effect on agricultural productivity in Nigeria; Iganiga and Unemhilin (2011) reports a is positive relationship between government expenditure and agricultural output in Nigeria; Utpal and

Dahun (2018) showed that government agricultural expenditure negatively affects agricultural output in the long-run. Muraya and Ruigu (2017) study reports that government expenditure positively impacts long-run agricultural productivity in Kenya.

Furthermore, Zirra and Ezie (2017) reports that aggregated government agricultural recurrent expenditure and VAT has positively significant impact on agricultural output while aggregated government agricultural capital expenditure has negatively insignificant impact on agricultural output in Nigeria. Eneji et al. (2019) showed that agricultural spending significantly impact productivity in Nigerian agricultural sector.

Itodo et al. (2012) shows that government agricultural expenditure has positive insignificant effect on productivity in agricultural sector; Cletus and Sunday (2018) shows that government agricultural expenditure is positively related to economic growth in Nigeria; while Atabukum et al. (2020) showed that public agricultural expenditure has negative and significant effect on food availability and utilization while domestic private agricultural expenditure and human capital foster both dimensions of food security.

The effect of investment today is expected to materialize in the future. On this ground, this study tests whether past agricultural expenditures matter for agricultural productivity and food security. The study tests the explanatory power of agricultural expenditures on agricultural productivity and food security, using distributed lagged models.

THEORETICAL FRAMEWORK

This study hangs on Keynesian and Big-Push theory. The Keynesian theory believe that government expenditure is an exogenous factor that can be used to determine the level of output growth in an economy due to its multiplier effect. On the basis of this, it is plausible to express the output level as a dependable function of government fiscal spending. Government has a role to play in ensuring high growth rate of agricultural output as well as food security.

Spending hike is expected to fill the finance-output gap causing low productivity in the agricultural sector. Provision of enhanced agricultural infrastructure across the country, the use of modern machines and improved seedlings as against are all capital intensive. Government provision in this regard will imply raising government expenditure and allocation to the agricultural sector.

The Big-Push theory on the other hand, suggests that massive investment influence key development variables as low investment may not make any significant impact. It provides the critical level of investment that is required to produce the desirable outcome. Such investment required can only be provided by the government especially in a low income country where the marginal propensity to consume is almost 1.

METHODOLOGY

This study is based on annual time series data spanning from 1990 to 2019, fetched from sources such as Foods and Agricultural Organization (FAO), World Development Indicators (WDI) and Central Bank of Nigeria (CBN) statistical bulletin. Government agricultural expenditures were sourced from CBN and WDI. Agricultural productivity and food security from FAO (Food and Agricultural Organization) official database. Government agricultural expenditure (G) is measured in local currency unit in billions of naira and expressed in real term. Agricultural productivity (Y_a) is measured in millions of metric tonnes. Food security (Y_f) measures total food stock in the economy, per time. It is also measured in millions of metric tonnes. The log transformation of each of the variables was carried out and used in the final estimation.

Model Specification

The study follows a production function of the form

$$Y = K^{\alpha} \quad (1)$$

Y is the output level, K is the capital input, while α is the output elasticity with respect to capital input

But $y = lnY, k = lnK, and\ K = \{K_{1,} K_{2,} K_3\}$

Where K_1 = physical capital, K_2 = human capital, K_3 = natural capital

$\alpha =$ the contribution of physical capital, human capital and natural capital to total output

But, $K_1 = f(g^{ae}),\ K_2 = f(g^{ae}),\ K_3 = f(g^{ae})$

$K_1\ is\ physical\ capital, K_2\ is\ human\ capital, K_3\ is\ natural\ capital,$

$g^{ae} is\ government\ agricultural\ expenditure$, and $f\ is\ a\ functional\ notation$.

An increase or a decrease in government agricultural expenditure will affect the quantity of available physical capital, human capital and natural capital in the agricultural sector. Natural capital in this case include the quantity and quality of available agricultural land. Therefore, government agricultural expenditure will affect agricultural productivity and food security through physical, human and natural capital. So, equation (1) becomes

$$Y = G^{\alpha} \quad (2)$$

Where $Y = output\ level,\ G = level\ of\ government\ agricultural\ expenditures$

Linearizing equation (2), we have

$$InY = \alpha InG \quad (3)$$

But $y = \{y^a,\ y^f\}$, y^a is log transformation of agricultural productivity variable, y^f is the log transformation of food security variable, hence, y is a vector of dependent variables. Also, note that $y = InY$ and $y_t = InY_t$

Econometrically, equation (3) can be expressed as

$$InY_t = \alpha InG_t + \partial_* + \epsilon_t \quad (4)$$

Where, ∂_* and ϵ_t are constant and error terms respectively

If Y_t and G_t are level stationary, equation (4) can be estimated using OLS. In this case, such a regression is a static regression which captures the contemporaneous effect of government agricultural expenditure on agricultural productivity and food security. This static model does not capture the input of past government expenditures on agricultural productivity and food security in the current period. This short-coming necessitates the need to consider a better model known as a distributed lagged model which is a dynamic model which considers past as crucial in the determination of the current period. Given this background, equation 4 can be transformed into a finite distributed lagged model of the form:

$$InY_t = \alpha_0 InG_t + \alpha_1 InG_{t-1} + \alpha_2 InG_{t-2} + \cdots \ldots \ldots . + \alpha_p InG_{t-p} + \partial_* + \epsilon_t \quad (5)$$

Where

InY_t represents the log transformation of each of the dependent variables namely agricultural productivity and food security in the period t, that is, in the current period $\{y_t^a, y_t^f\}$. InG_t is the log transformation of the independent variable which is the total government expenditure on agriculture in the period t, which is also in the current period. InG_{t-1}, $InG_{t-2,} \ldots \ldots \ldots , InG_{t-p}$ are the total government expenditure on agriculture in the previous period, that is, lagged agricultural expenditures which also constitute part of the independent variables.

Equation (5) captures the impact of current and past expenditures on current agricultural productivity and food security. There are three hypotheses to be tested, they are stated in null and alternative format as shown

1. $H_0: \alpha_0 = 0$ as against $H_1: \alpha_0 \neq 0$
2. $H_0: \alpha_1 = \alpha_2 = \cdots \ldots \ldots \ldots = \alpha_p = 0$ as against $H_1: \alpha_1 \neq \alpha_2 \neq \cdots \ldots \ldots \ldots \ldots \neq \alpha_p \neq 0$
3. $H_0: \alpha_0 = \alpha_1 = \alpha_2 = \cdots \ldots \ldots = \alpha_p = 0$ as against $H_1: \alpha_0 = \alpha_1 \neq \alpha_2 \neq \cdots \ldots \ldots \neq \alpha_p \neq 0$

Equation (5) can be expressed in a more compact form as

$$InY_t = \sum_{i=0}^{p} \beta_i InG_{t-i} + \partial_* + \epsilon_t \qquad (6)$$

But $InY_t = \{y_t^a, y_t^f\}$. Variables are as previously defined

RESULTS AND DISCUSSION

Table 1: Descriptive Statistics of Variables

Var/Stat	Mean	Median	Max.	Min.	Std. Dev.	Coeff. of Variation	Skewness	Kurtosis
AGRICPROGR	2.8871	3.5177	13.3831	-12.5944	5.8187	201.541	-0.7298	3.6657
AGRICEXPGR	10.5419	5.0000	94.4056	-33.1593	23.3517	221.513	1.4867	6.9757
FOODSECGR	0.7308	0.6849	4.0816	-6.9444	2.2757	311.398	-1.5759	6.2651

Source: Author's Computation (2023).

Table 1 presents the result of the descriptive analysis in tabular form. The descriptive statistics such as the mean, median, minimum, maximum, standard deviation, co-efficient of variation, skewness and kurtosis are given as shown in the table. The average annual growth rate of agricultural productivity is about (2.9%), food security is about (0.73%) while that of agricultural expenditure is about (10.5%).

Both agricultural productivity are found to be negatively skewed while government agricultural expenditure are said to be positively skewed. The Kurtosis for each of the variables are found to exceed the threshold of 3 and hence are said to be leptokurtic. The coefficient of variation is computed as the ratio of standard deviation to mean multiplied by 100.

The higher the coefficient of variation, the higher the level of dispersion of such variable around its mean. The result in the table shows that food security growth rate with coefficient of variation of about (311.4%) is more dispersed around its mean than agricultural p[roductivity growth rate of about (201.5%) and agricultural expenditure growth rate whose coefficient of variation is about (221.5%).

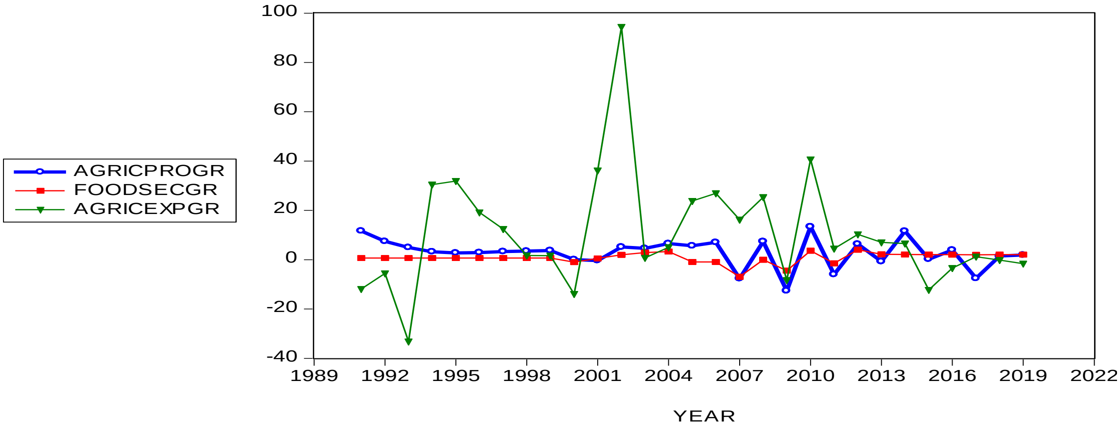


Fig. 1: Trend in growth rate of agricultural expenditure, agricultural productivity and food security in Nigeria

The study proceeded with descriptive analysis by graphically demonstrating the trend in the growth rate of agricultural expenditure, agricultural productivity and food security over the period under investigation. As shown in Fig. 1, there is a spike in growth rate of agricultural expenditure around 1999 and 2003. This might not be unconnected with the inception of the fourth republic and the beginning of the new democratic experiment in Nigeria after the exit of the military government which dominated since independence in 1960. The new fiscal regime would have definitely been that of spending more to boost productivity in the agricultural sector.

The growth path of food security appears smoother than the other two variables which are characterized with upward and downward trend. A close look at fig. 1 reveals that the growth path of agricultural productivity and food security was smoother in the early period especially between 1991 and 2006. Towards the end of the period, it is observed that both agricultural expenditure and productivity fall below food security while food security was almost flattened out. The nation is on the cross road of food shortages and the loss of welfare due to high cost of living as we move towards the end of the period under investigation.

Table 2: Result of unit root test

Variable	ADF at level				PP at level			
	ADF-stat	5% Critical Value	Order of Integration	Break Date	PP-stat	5% Critical Value	Order of Integration	Break Date
Unit root test without structural break								
AGRICEXPGR	-4.506*	-3.581	I(0)	-	-4.465*	-3.581	I(0)	-
AGRICPROGR	-9.515*	-3.581	I(0)	-	-13.065*	-3.581	I(0)	-
FOODSECGR	- 2.969***	-2.629	I(0)	-	-4.581*	-3.581	I(0)	-
Unit root test with structural break								
AGRICEXPGR	-8.659*	-4.444	I(0)	**2001**	-6.721*	-4.444	I(0)	**2001**
AGRICPROGR	-9.677*	-4.444	I(0)	**2001**	-9.448*	-4.444	I(0)	**2001**
FOODSECGR	-4.334**	-4.194	I(0)	**2004**	-4.334**	-4.194	I(0)	**2004**

***, ** and *** indicate significant at 1%, 5% and 10% respectively**
Source: Author's Computation (2023).

The unit root test was conducted to formally test for the stationarity property of our variables since time series modelling require formal test of unit root to find out the order of integration of the variables in order to determine the suitability of the proposed methodology to avoid spurious and misleading result. The study adopted Augmented Dickey-Fuller and Phillips-Perron unit root test. The unit root test was conducted with and without structural break. The null hypothesis of unit root was tested against the alternative hypothesis of no unit root. The result in Table 2 show that all the variables are stationary in situation of no structural break as well as in situation of structural break. Thus the null hypothesis of no unit root is rejected. The absence of unit root implies that the variables could be treated as level stationary and have a zero order of integration, that is, I(0).

Table 3: Result of regression of agricultural productivity on agicultural expenditure

No of lag	Model Type	Coefficient	t-stat	p-value	R^2	Adj R^2	F-stat	p-value	DW-stat
0	Zero-lagged	0.0449	0.929	0.349	0.032	-0.003	0.907	0.349	2.63
1	One-lagged	-0.0467	-1.018	0.318	0.099	0.027	1.377	0.271	2.76
2	Two-lagged	0.0716	1.583	0.127	0.192	0.087	1.827	0.170	2.84
3	Three-lagged	-0.0116	-0.257	0.800	0.267	0.128	1.914	0.146	2.81
4	Four-lagged	0.0617	1.351	0.192	0.335	0.168	1.911	0.140	2.55
5	Five-lagged	-0.0848	-1.947	0.068	0.487	0.306	2.691	0.051*	2.61
6	Six-lagged	0.0087	0.186	0.855	0.504	0.273	2.178	0.097*	2.53
7	Seven-lagged	-1.1081	-2.678	0.019	0.685	0.491	3.533	0.021**	2.01
8	Eight-lagged	0.0450	1.213	0.251	0.788	0.614	4.538	0.011**	2.11
9	Nine-lagged	0.0164	0.392	0.704	0.804	0.587	3.696	0.031**	2.02

*, **imply the model is significant at 10% and 5% respectively
Source: Author's Computation (2023).

Table 3 shows the result of both the static and dynamic models. The zero-lagged model is a static model. In this model, the coefficient is positive, the t-stat is not significant, R^2 is 0.032, and the adjusted_R^2 is -0.003 while the F-stat is not significant. Going through all, the model type, tagged 'the eight-lagged model' appears to be the best model having its coefficient to be positive, the t-stat is significant, R^2 is 0.788, adjusted R^2 is 0.614 with significant F-stat. In this model both current and past agricultural expenditure positively and significantly explain agricultural productivity in Nigeria. With the nine-lagged model, the coefficient is positive but the t-stat is not significant, R^2 is 0.804 but adjusted_R^2 is 0.587, F-stat. is significant.

Comparing the eight-lagged and nine-lagged models, it could be seen that despite the significant F-stat in the nine-lagged model, the R^2 is higher but the adjusted R^2 is lower. This implies that the explanatory power of the nine-lagged model is lower than that of the eight-lagged model with significant t-stat, significant F-stat and higher adjusted_R^2. With this result, it can be concluded that both the past and current agricultural expenditure matter in explaining agricultural productivity in Nigeria

Table 4: Result of regression of food security on agricultural expenditure

No of lag	Model Type	Coefficient	t-stat	p-value	R^2	Adj R^2	F-stat	p-value	DW-stat
0	Zero-lagged	0.0066	0.352	0.728	0.005	-0.032	0.124	0.728	1.71
1	One-lagged	-0.0167	-0.862	0.397	0.033	-0.044	0.431	0.654	1.61
2	Two-lagged	0.0200	1.008	0.324	0.075	-0.046	0.620	0.609	1.47
3	Three-lagged	-0.0233	-1.139	0.267	0.132	-0.034	0.796	0.541	1.46
4	Four-lagged	-0.0130	-0.604	0.553	0.167	-0.052	0.761	0.589	1.56
5	Five-lagged	-0.0496	-2.516	0.022	0.394	0.180	1.841	0.151	1.53
6	Six-lagged	-0.0200	-1.037	0.316	0.512	0.284	2.247	0.089*	1.74
7	Seven-lagged	-0.0173	-0.886	0.392	0.575	0.314	2.202	0.099*	1.78
8	Eight-lagged	0.0096	0.499	0.628	0.669	0.399	2.474	0.079*	2.05
9	Nine-lagged	0.0182	0.828	0.429	0.693	0.352	2.031	0.151	2.07

* implies the model is significant at 10%

Source: Author's Computation (2023).

Table 4 shows the result of both the static and dynamic models. The zero-lagged model is a static model. In this model, the coefficient is positive, the t-stat is not significant, R^2 is 0.005, and the adjusted_R2 is -0.032 while the F-stat is not significant. Going through all, the model type, tagged 'the eight-lagged model' appears to be the best model having its coefficient to be positive, though the t-stat is not significant, R^2 is 0.669, adjusted_R^2 is 0.399 with significant F-stat., though at 10% level of significant. In this model both current and past agricultural expenditure have positive but not significant impact on food security in Nigeria. With the nine-lagged model, the coefficient is positive, the t-stat is not significant, R^2 is 0.693, adjusted_R^2 is 0.392, F-stat. is not significant even at 10% level. Comparing the eight-lagged and nine-lagged models, it could be seeing from the table that, the eight-lagged model has a significant F-stat., at 10% .

The F-statistic in the nine-lagged model is not significant. Also, the R^2 is higher but the adjusted_R^2 is lower. This implies that the explanatory power of the nine-lagged model is lower than that of the eight-lagged model which has a significant F-stat and higher adjusted_R^2. With this result, it can be concluded that both past and current agricultural expenditure also matter in explaining food security in Nigeria. The poor performance of the static model is revealed from the table, the t-stat is not significant likewise the F-stat., the R^2 as well as the adjusted_R^2. The dynamic models perform better in revealing the explanatory power of agricultural expenditure in relation to food security in Nigeria.

Table 5: Result of Models Diagnostic

	Partial Autocorrelation Q-stat	Normality Test JB-stat	LM-Serial Correlation Test	Heteroscedasticy Test (ARCH)	Linearity Test
Model 1	-11.54(0.173)	1.319 (0.517)	F=0.153(0.860) χ^2=0.694(0.707)	F=0.169(0.686) χ^2=0.186(0.666)	F=0.185(0.904)
Model 2	7.708(0.462)	0.238 (0.888)	F=0.024(0.879) χ^2=0.051(0.821)	F=0.290(0.597) χ^2=0.317(0.574)	F=3.002(0.095)
Note: all tests are conducted using 0.05 level of significance					

Source: Author's Computation (2023).

The estimated models were diagnosed for autocorrelation, normality and heteroscedasticity. The functional form of the models was equally verified. The result in Table 5 shows that in both model 1 and 2, there is absence of serial correlation since the null hypothesis of no serial correlation cannot be rejected at 0.05 level. Similarly, Table 5 shows the hypothesis of residual normality and homoscedasticity cannot be rejected, which implies that the residuals of the models are normal and homoscedastic. This is the case in respect of the obtained F and $\chi2$ statistics in each of the models. The low level of significant associated with model two is apparently in comformity with low adjusted_R2. The F-stat is significant at 10% while the adjusted_R2 is about 40%.

Regarding whether there are issues with the assumption of linearity in the models, the obtained F-statistic as shown in the table reveal that there is no apparent non-linearity in each of the two models since the null hypothesis of no linearity cannot be rejected at 5% in each case, hence, it can be concluded that the linear model of agricultural productivity and its explanatory variable; government agricultural expenditure is said to be appropriate. In similar manner, the linear model of food security and its explanatory variable; government agricultural expenditure is equally said to be appropriate.

DISCUSSION OF FINDINGS

In each of the two models estimated for this study, the coefficient is positive. This implies that government agricultural expenditures have positive impact on agricultural productivity and food security in Nigeria. This positive coefficient, especially in relation to government agricultural expenditure and agricultural productivity is in line with prior studies such as Selvaraj (1993) in India, Muraya and Ruigu (2017) in Kenya, Wangusi and Muturi (2015) in Pakistan. It also agrees with the findings of Itodo et al. (2012), Iganiga and Unemhilin (2011), Adoful and Agama (2012), Obi and Obayori (2016), Eneji et al. (2019) in Nigeria. However, our contrasts from the findings of Utpal and Dahun (2017) in Meghalaya where negative and significant relationship were reported between the two variables.

It is also important to note that, among studies that report positive relationship between government agricultural expenditure and agricultural productivity, particularly in Nigeria, only a few are significant. Most studies report insignificant relationship between government agricultural expenditures and agricultural productivity even at 10 per cent level. This may be as a result of methodological errors or problem of model mispecifications. It could also be as a result of data insufficiency on various platforms where government expenditures are made available to agricultural sector.

More importantly, finite distributed lag models are rarely used in most cases. This is revealed in literature on this subject matter as few prior studies used finite distributed lag models to capture the impact of past budgetary allocation to the agricultural sector as static regression based on OLS method of estimation were mostly used and this approach does not capture the past but only the current commitments making such studies inappropriate as important variable are excluded from their analysis.

The use of dynamic model of this type is unique and proper for this type of investigation since budget is done on yearly basis and is a continuous process. The explanatory power of government agricultural expenditure on agricultural productivity and food security can only be determined by considering both past and current period, to avoid specification error in our estimation. The findings of this study are interesting and unique since they show that adequate funding of agricultural sector from year-on-year increase in budgetary allocations is required to boost agricultural productivity and food production rate in the country.

The result of distributed lag models estimate provide sufficient evidence of the explanatory power of both past and present financial commitment to the agricultural sector on productivity and food security. It is evidenced here that commitment of adequate financial resources yearly basis will raise agricultural productivity and food security in Nigeria. Funding of the agricultural sector should be consistent and sustainable for rapid industrial growth as well as food sustainability for the growing population.

The findings of the study align with the Big-Push theory of economic development which suggest massive investment spending to boost economic growth and development. It also aligns with the proposition of Keynes and the Keynesian school of thought that injection of government expenditure affects the economy through multiplier principle. Raising sectoral allocation to agriculture will produce a significant multiplier effect which will influence all the other sectors of the economy.

CONCLUSION AND POLICY RECOMMENDATIONS

This study tested the explanatory power of past and current agricultural expenditures on agricultural productivity and food security in Nigeria using finite distributed lagged models. The result shows that eight-lag models are the best models to unfold the explanatory power of agricultural expenditures on productivity in the agricultural sector as well as food security in Nigeria. The result also shows that the observed variations in growth rate of productivity in the agricultural sector and supply of food security in Nigeria are jointly and significantly accounted for, by both past and current agricultural expenditures.

It is thus important to consider past actions and inactions in any current events. In view of this, government agricultural expenditure commitment of today matters for tomorrow's agricultural productivity and food security. The policy implication is that there is need for sustained funding of the agricultural sector to boost rate of agricultural investment. Considering the rate of unemployment as well as population growth in the country, expanding investment in the agricultural sector through funding will open many job opportunities and solve the problem of hunger the results from insufficient food supply.

Nigeria is naturally endowed in agriculture, hence our growth should be driven by this sector. For agriculture to make significant contribution to the growth process in Nigeria, it is necessary to mechanize agriculture and this requires huge financial resources that should be provided in a sustainable manner over the years. The sector needs to be well developed to enable it operate at full capacity. Fiscal policy should be repositioned in such a way that a certain percentage of total government expenditure can be legislated as allocation to agricultural sector for each state of the federation as well as the federal government.

The growth rate of such fiscal allocation can also be set, and backed by the law for each state and the federal government. Government should not relent in her effort to diversify the Nigerian economy for sustainability and stability. Each regional government should build up the synergy to boost food production through massive agricultural investment. There is need to reap from the economy resulting from backward and forward linkages between agriculture and industrial sector which has great implication on job creation and income enhancements for the unemployed youth who are trained as engineers and scientists in different specialized areas.

Agricultural infrastructure once provided, will encourage new food processing companies, while the existing ones will expand their scope of operation. The economy will generate new investments yearly, the rate of agricultural productivity and food security will grow and then, sustainable food supply can be achieved, and effort to return the economy to a sustainable growth path can be success.

Government budgetary process should guard against the idea of negative multiplier cost by allocating resources to sectors having significant positive multiplier effect on the general economy. Any attempt to boost agricultural activities through sustainable government funding will generally have strong implication for employment and income generation, food price stability, industrial progress and overall economic performance of Nigeria. Thus, the study conclude that there is significant lag effect of agricultural expenditure since both past and current agricultural expenditures matter in unfolding the explanatory power of government agricultural expenditures in relation to agricultural productivity and food security in Nigeria.

REFERENCES

Adofu I., Abula, M., & Agama J. E. (2012). The effects of government budgetary allocation to agricultural output in Nigeria, *Sky Journal of Agricultural Research,* 1(1), 1-5.

Atabukum, F. D., Luc, N. N & Toukam, C. K. (2020). Agricultural expenditures and food security: Evidence from Sub-Saharan African Countries. *Journal of Economics, Management and Trade, 26*(5), 11-23.

Benin S, Mogues T, Cudjoe, G, J., & Randriamamonjy J. (2009). Public expenditures and agricultural productivity growth in Ghana. *Contributed Paper*, IAAE, Beijing, International Food Policy Research Institute, Beijing, China.

CBN (2010). Annual Report & Statements of Accounts.

Cletus, U. I., & Sunday, M. J. (2018). Government expenditure on agriculture and economic growth in Nigeria (1985-2015). *International Journal of Academic Research and Reflection*, 6(4), 24-39.

Ebere, C., & Osundina, K. C. (2012). Government Expenditure on Agriculture and Economic Growth in Nigeria. *International Journal of Science and Research, 23,* 19-24.

Ebomuche, N. C., & Ihugba, A. O. (2010). *Structure of the Nigerian economy*. Peacewise Systems.

Eneji, M. A, Habila, H., & Haruna, F. D. (2019). Impact of government expenditure on agricultural productivity in Nigeria. *Sumerianz Journal of Economics and Finance, 2*(9), 106-114.

Ewubare, D. B., & Eyitope, J. A. (2015). The effects of public expenditure on agricultural production output in Nigeria. *Journal of Research in Humanities and Social Science, 3*(11), 7-23.

Iganiga, B. O., & Unemhilin D. O (2011). The impact of federal government agricultural expenditure on agricultural output in Nigeria. *Journal of Economics, 2*(2), 81-88.

Itodo, A. I, Apeh, S., & Adeshina, S (2012). Government expenditure on agriculture and agricultural output in Nigeria (1975-2010). *Journal of Agricultural Sciences and* Policy *Research*, *2*(2), 28-44.

Muraya B. W., & Ruigu G., (2017). Determinants of agricultural productivity in Kenya. *International Journal of Economics, Commerce and Management*, *5*(4), 159-179.

Megbowon, E., Ngarava, S., Etim, N. A., & Popoola, O. (2019). Impact of government expenditure on agricultural productivity in South Africa. *The Journal of Social Sciences Research,* 5(12), 1734-1742. https//doi.org/10.32861/jssr.512.1734.1742

NEEDS (2004). National Economic Empowerment and Development Strategy

Obi, K. O., & Obayori, J. B. (2016). Dynamic effect of government spending on agricultural output in Nigeria". *The International Journal of Social Sciences and Humanities Invention*, 3(2), 1880-1886.

Ogen, O. (2003). Pattern of economic growth and development in Nigeria since 1960. In S.O Aritalo and G. Ajayi (Eds.). Essay in Nigerian contemporary history. *First Academic Publishers.*

Okezie A. I., Nwosu, C., & Njoku, A. C. (2013). An assessment of Nigeria expenditure on the agricultural sector: Its relationship with agricultural output (1980-2011). *Journal of Economics and International Finance* 5(5), 177-186.

Oyinbo, O., Zakari, A., & Rekwot, G. Z. (2013). Agricultural budgetary allocation and economic growth in Nigeria: Implications for agricultural transformation in Nigeria. *Consilience*, 10. Retrieved from https://doi.org/10.7916/consilience.v0i10.3918

Selvaraj K. N (1993). Impact of government expenditure on agriculture and performance of agricultural sector in India. *Bangladesh Journal of Agricultural Economics*, *16*(2), 37-49.

Utpal K. D & Dahun S. D (2018). Public expenditure and agricultural production in Meghalaya, India: An application of bounds testing approach to co-integration and error correction model. *International Journal of Environmental Sciences and Natural Resources*, *8*(2), 71-78.

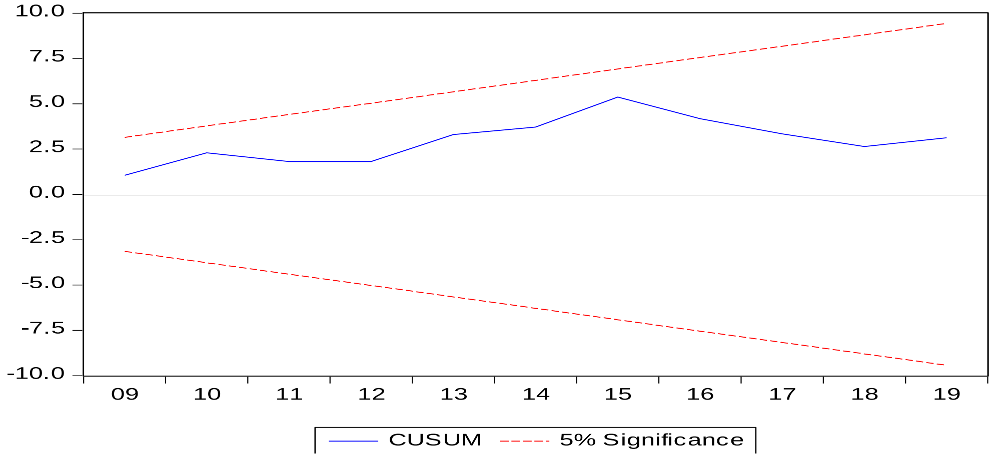
Wangusi, C., & Muturi, W. (2015). Impact of agricultural public spending on agricultural productivity: Case study of Kenya. *International Journal of Sciences: Basic and Applied Research, 24*(4), 180-187.

Zirra C. T. O., & Ezie, O. (2017). Government fiscal policy and agricultural sector outputs in Nigeria: Evidence from Fully Modified Ordinary Least Square (FMOLS). *Journal of Research in Business, Economics and Management, 8*(3), 1434-1443.

APPENDIX

Model Diagnostic test for Stability

Model 1: The linear model of agricultural productivity using government agricultural expenditure as explanatory variable



Model 2: The linear model of food security using government agricultural expenditure as explanatory variable