IMPACT OF AGRICULTURAL FINANCING ON AGRICULTURAL PRODUCTIVITY IN NIGERIA

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ABSTRACT

This study examines the impact of agricultural financing on agricultural productivity in Nigeria from 1985 to 2023. Impulse Response from a structural Vector Auto-Regression (SVAR) model were used to determine the effect of structural shocks of agricultural financing on agricultural productivity. Therefore, data were collected from various sources, such as the Central Bank of Nigeria (CBN) statistical bulletin and statements of accounts, World Development Index and FAOSTAT. The results revealed that, that government budgetary expenditure and average annual rainfall have positive and significant impact on agricultural productivity, while total commercial bank loan to agriculture and land area cultivated have positive but insignificant impact on agricultural productivity. As such, it was recommended among others that, government should inject more money to agricultural sector through its budgetary expenditure, by facilitating and coordinating agribusiness investment services, partnership with State Governments to incentivize agribusiness development as well as Policy which may reduce the tax rate to be paid by commercial banks that are situated in rural areas should be made.

Keywords: Agricultural Financing, Agricultural Productivity, SVAR

JEL Codes: Q14

INTRODUCTION

Agriculture in Nigeria has been the main source of gainful employment, it is the backbone of the economy which supports rest other sectors. It has also been an important sector in the Nigerian economy in the past decades and still the sector that can be relied upon to diversify the economy so that the current economic recession can be managed. It is generally believed that agriculture occupies a priority status in Nigeria as it serves as the key driver to growth, provides employment and reduces poverty.

Agriculture is an essential economic sector of all world economies. It is also crucial for both rural and urban sectors of an economy as it generates employment opportunities to the former and provides foods and raw materials to the latter. Besides its crucial importance in the overall development process, the nature of support given to agriculture by various governments in the country varied over the years. Ihugba, Chinedu and Njoku (2013) reported that before

independence, the assistance to the sector was generally aimed at developing the export crops while after independence when the national development plans were prepared, agricultural support took a much more formal form.

Sunny (2014) argues that, over the years, there have been efforts by various government to diversify the economy. Policies have been initiated, committees were set up, but the seemingly good initiatives have been marred by little commitment from government. He further stressed that, for the agricultural sector, successive governments have made serious efforts at making good agricultural policies through schemes, programmes and institutions, however, they have not been able to back them up with adequate budgetary allocation and financing coupled with corruption in the execution of the policies.

In agriculture, finance remains the bedrock for mechanization, the purchase of machinery, the training to use machinery, the transportation of equipment and produce and the marketing of produce. Therefore, there is positive correlation between agricultural finance and actual agricultural production. so it is generally believed that agricultural productivity depends largely to the extent to which the sector is financed (Mbutor, Ochu & Okafor, 2013)

Following the above, the Federal Government begins to rethink the vast potential of agriculture through diversification. Statistically, when observing the trend of agricultural financing and its productivity in Nigeria, it can be seen that, budgetary allocation over the years has gradually grown up. For example, it increased from 1985 to 1990 by 1164%, 1991 to 1995 by 623.7%, 1996 to 2000 by 297.7%, 2001 to 2005 by 131.1%, 2006 to 2010 by 65% and 2011 to 2017 by 139.6% (Central Bank of Nigeria, 2014 & 2018 Statistical Bulletin). On the other hand, this was not in commensurate with agricultural productivity, which increased to 452% from 1985 to 1990, 548.6% from 1991 to 1995, 39.7% from 1996 2000, 192.7% from 2001 to 2005, 63% from 2006 to 2010 and lastly from 2011 to 2018 was only 43.2%. This shows that, over the years, since independence, the Federal Government has been injecting certain amount of money into the sector by implementing different policies schemes and programmes to reviving the sector, but still the door is left ajar. Therefore, diversification through agricultural sector can only be achieved if financing on the sector brings positive results.

As such examining the response of agricultural productivity due to unexpected structural shocks in agricultural financing is crucial in Nigeria for the fact that, the study may reveal how agricultural productivity responds to various shocks from agricultural finance. Therefore, the

objective of this paper is to examine the system of the effects of the structural shocks of agricultural financing on agricultural productivity in Nigeria.

LITERATURE REVIEW

Conceptual Clarification

Agricultural Finance

Mbutor, Ochu and Okafor (2013) believed that, Finance is pivotal in the commercialisation of innovations. Finance is a key component in every business endeavor required for the establishment and running of the business. They defined agricultural finance as the acquisition in agriculture. Mayer, (2011) suggested that agricultural finance involves all financial services, including savings, transfers, insurance and loans, input supply, processing, wholesaling and marketing. Moreover, agricultural finance can be viewed as the necessary funds required to improve agricultural productivity.

Agricultural financing refers to the acquisition and the use of capital in agriculture. It deals basically with the supply of and demand for funds in the agricultural sector of the economy (International Fund for African Development [IFAD], 2010). Therefore, agricultural financing refers to the provision for financial services that improve agricultural productivity**.**

Agricultural Productivity

Productivity is defined as a ratio of the output to inputs used in production (Valero, 2014). He equally believes that the average productivity is in itself a measure of technical efficiency because it measures the average rate at which inputs are transformed into output. Average productivity measures such as output per worker, give the ratio of output to a single factor of production. However, since the amounts of other inputs may vary, increases in output per worker can result from either increase in the use of other inputs or to changes in technology. Agricultural productivity on other hand measures the amount of agricultural output produced for a given amount of inputs such as the amount of a single output per unit of a single input e.g., tons of rice per hectare of land, the availability of rainfall within a particular time or the allocation made by the government to improve agricultural output (Valero, 2014).

Agricultural productivity refers is the term given to the volume of agricultural output produced at a given period of time.

Theoretical Review

In economics, the Cobb-Douglas functional form of production is widely used to represent the relationship of an input (labour and capital) to output (total productivity). Later it was extended by Solow to include other factors such as technological changes (the use of machineries). The Cobb-

Douglas production function represents the relationship between input and output. It was proposed by Knut Wicksell (1851-1926) and tested against statistical evidence by Charles Cobb and Paul Douglas in 1928 (Tan 2008). He stressed that in 1928 Charles Cobb and Paul Douglas published a study in which they modeled the growth of the American economy during the period of 1899-1922. They considered a simplified view of the economy by the amount of labour involved and the amount of capital invested. While there are many other factors affecting economic performance, their model proved to be remarkably accurate.

Solow drew on the Cobb-Douglas production function, his contribution was to extend the Cobb-Douglas production function with a third factor of growth, which is technological progress, Solow believed it as operating autonomously in time. For him, technological progress is an exponential function of time. As a result, he came to a modified version of the Cobb-Douglas production function. From there, scholars and researchers who wanted to model the growth of output of a particular nation did so using the modified version. Like the work of Lewis Spellsman model.

Empirical Review

Empirical works on the impact of agricultural financing on its productivity have been conducted across developing economies, especially in terms of its contribution to economic growth. For instance, Obioma, et al. (2021) Studied the Effect of Agricultural Financing on the Performance of Agricultural Sector in Nigeria, the main objective of the paper is to assess the effects of agricultural financing on the performance of agricultural sector in Nigeria using annual time series data. Johansen cointegration approach was used to check for the long run relationship among the variables. Vector autoregressive was used to examine the speed of adjustment of the variables from the short run dynamics to the long run equilibrium. The study found that there is significant and long run effect of Agricultural Credit Guarantee Scheme on Contributions of agriculture to GDP. Among others. The study concluded that there should be increase in the amount which the agricultural credit guarantee scheme inject into the sector on annual basis and proper supervisory measures should be constituted in order to ensure efficient application and use of the money.

Orji, et.al. (2020) investigate the causal linkage between agricultural financing and agricultural output growth in Nigeria. The objective of the paper is to test whether there is causality between agricultural financing and agricultural output growth in Nigeria The data were mainly sourced from Central Bank of Nigeria statistical bulletins and World Bank Economic Indicators and the study adopted the Pairwise Granger Causality test. The result showed that there was no causal linkage between agricultural financing and agricultural output growth within the period under review. They concluded that There should exist massive education and enlightenment of farmers to know the different sources of agricultural financing available. When such funds are accessed, it

should be properly monitored to ensure efficient utilization in order to increase agricultural output.

Shuaibu and Nchake (2020) studied the relationship between credit market conditions and agriculture output in Sub-Saharan Africa. The main objective of the paper is to empirically analyse relationship between credit market conditions and agriculture output in the study area. The paper uses a two-stage least square instrumental variable and difference generalised method of moments dynamic panel model to analyse the data. The findings show that better credit market conditions, infrastructure and availability of agriculture inputs contribute to agriculture productivity. Finally, the paper concludes that there is a need to strengthen market conditions to boost agriculture productivity within the region.

Ademola (2019) examined the impact of Agricultural Financing on Nigerian Economy. The paper employed secondary data and econometric techniques of Ordinary Least Square (OLS) of multiple regression estimates. The result of the model used suggests that the productivity of investment will be more appropriately financed with resources administered by the commercial and specialized financial institutions. He concluded that, there is the need for conscious and concerted efforts by the governments and every relevant stakeholder to ensure a complete overhaul of the agricultural sector to transform it from this current status, to a fully mechanized one so that it can cater for the industrial and domestic needs of the economy.

Adebayo, et.al. (2017) in their paper, Impact of Agricultural Financing Policy and Deposit Money Bank Loan on Agricultural Sector Productivity in Nigeria. The objective of the paper is to evaluate the relationship between Agricultural Financing Policy and Deposit Money Bank Loan on Agricultural Sector Productivity. The paper used time series linear regression model employing data covering the period of 1981 and 2015. The result revealed that deposit money bank loans (CBF) and agricultural financing policy proxy by Agricultural Credit Guarantee Scheme Fund (ACGSF) have significant positive impact on agricultural productivity in Nigeria while lending rate (LR) shows a significant negative impact on agricultural productivity. It is concluded among others that commercial bank should complement the agricultural financing policy of the government by making agricultural finance accessible, easier and at low rate of interest for farmers.

METHODOLOGY

Sources of Data

Given the nature of the study, this research will use annual time series data for the selected variables. The data were collected from various sources: Agricultural Productivity (AGP) which measures the amount of agricultural output produced for a given amount of inputs, will be measured by the value of agricultural output (#M), it was sourced from FAOSTAT. Agricultural land (LAC) which is typically the land devoted to agriculture will be measured using the land area cultivated per annum (hector per square kilometre) and was sourced from world data Indicators. Government Budget on Agricultural Sector (GBA) will be measured using the value (#M) of the budget to agricultural sector, data was sourced from CBN statistical bulletin. Total Commercial Banks Credit to Agricultural Sector (TCA) will be measured as the loan made by banks to the agricultural sector (#M), the data would be sourced from CBN statistical bulletin. Whilst the volume of annual rainfall will be used as the proxy of Average Annual Rainfall (AAR), and it was sourced from CBN statistical bulletin.

Model Specification

Traditionally agricultural production function represents connection between physical quantities of output and the input like land, labour and capital. Therefore, the standard methodology of productivity models begins with neoclassical production function, as extended by Solow (Iganiga & Unemhilin, 2011). Consider a Cobb-Douglas production function of the form

$$P(LK) = bL^{\alpha} K^{\beta} \quad \text{.....(1)}$$

Where,

P = total production, L = labour input, K = capital input, b = total productivity, α and β represent the output elasticity of labour and capital respectively.

Solow modified the model to include a third factor of growth in productivity, which is level of technology. Therefore, the modified version is the form of

$$Y = A \cdot L^{a} \cdot K^{b} \cdot e^{rt} \quad \text{..... (2)}$$

Where

e^{rt} represents the effect of technological progress (r) in time (t) on growth in productivity.

In order to analyze the impact of agricultural financing on agricultural productivity in Nigeria the above model will be adopted and modified to form the following equation which is in line with the model of Abayomi and Ajoke (2016);

$$lnAGP = \beta_0 + \beta_1 lnGBA + \beta_2 lnTCA + \beta_3 lnLCA + \beta_4 lnAAR + \mu \ldots\ldots\ldots\ldots (3)$$

Where,

AGP = Agricultural productivity.

GBA = Government budget on the agricultural sector.

TCA = Total commercial banks credit on agriculture.

LAC = Land area cultivated per annum.

AAR = Average annual rainfall.

μ = The error term.

β_0 is the constant, β_1 to β_4 are the variables to be estimated with a priori expectation that β_1 and $\beta_2 > 0$, since the parameters estimate the elasticity of investment injection on the productivity level. Equally, β_3 and $\beta_4 > 0$ i.e positive, since usage of land and more rainfall are expected to enhance agricultural productivity.

The five-component structural VAR model can be written in the form of

$$\begin{bmatrix} \Delta \ln AGP_t \\ \Delta \ln GBA_t \\ \Delta \ln TCA_t \\ \Delta \ln LAC_t \\ \Delta \ln AAR_t \end{bmatrix} \begin{bmatrix} \alpha_{11}(L)\alpha_{12}(L) & \alpha_{13}(L) & \alpha_{14}(L) & \alpha_{15}(L) \\ \alpha_{21}(L) & \alpha_{22}(L) & \alpha_{23}(L) & \alpha_{24}(L) & \alpha_{25}(L) \\ \alpha_{31}(L) & \alpha_{32}(L) & \alpha_{33}(L) & \alpha_{34}(L) & \alpha_{35}(L) \\ \alpha_{41}(L) & \alpha_{42}(L) & \alpha_{43}(L) & \alpha_{44}(L) & \alpha_{45}(L) \\ \alpha_{51}(L) & \alpha_{52}(L) & \alpha_{\cdot 53}(L) & \alpha_{54}(L) & \alpha_{55}(L) \end{bmatrix} \begin{bmatrix} e_t^{AGP} \\ e_t^{GBA} \\ e_t^{TAC} \\ e_t^{LAC} \\ e_t^{AAR} \end{bmatrix}$$

Where A_i are matrices in the lag operator, a_{ij}'s are the estimated coefficients and L indicates the lag operator. $\sum_k A_{ijk} L^k$ represents the sum of the moving average, $A_{ij}(L)$ is the optimal lag order of the VAR model and e = e_t^{AGP} e_t^{GBA} e_t^{TAC} e_t^{LAC} e_t^{AAR} are the structural shocks.

Estimation Technique

Unit Root Tests

Many economic and financial time series exhibit trending behavior or non-stationary in the mean. An important economic task, is determining the most appropriate form of the trend in the data. The unit root tests employed in this study include the Augmented Dickey Fuller (ADF), and Phillips-Perron (PP) unit root tests. These tests are used to determine whether the series is stationary at level I(0) or at first difference I(1). The essence for checking this is to avoid having spurious regression.

Structural Vector Autoregressive (SVAR) Model

SVAR analysis is very useful tool in observing unexpected shocks. The model has evolved into one of the most used models in empirical research using time series data (Engle & Granger,

1987). Therefore, this study employs SVAR with sign restrictions on the impulse response functions. The impulse response functions (IRF's) measure the dynamic effect of each variable to shock in its own and that of others in the system (Engle & Granger, 1987).

The structural VAR can be specified using the following equation;

$$B_{yt} = B_0 + \Gamma_{yt-1} + \varepsilon_t \quad \ldots\ldots (4)$$

where yt is a (n x 1) vector of endogenous variables, $yt-1$ represents the exogenous and lagged endogenous variables and ε_t = E(eé) gives the variance-covariance matrix of structural innovations. Moreover, the coefficients in Γ and B are the parameters of interest. However, five structural shocks are considered, namely agricultural productivity shock e_t^{AGP}, shock from Land area cultivated per annum e_t^{LAC} , Government budget shock e_t^{GBA} , commercial banks credit shock e_t^{TCA} and Average annual rainfall shock e_t^{AAR}.

RESULTS AND DISCUSSIONS

Unit Root Test

Augmented Dickey Fuller (ADF) and Phillips Perron (PP)

Table 1 ADF and PP Unit Root Test

	Level		First difference	
variables	ADF test	PP test	ADF test	PP test
lnAGP	1.252190 (0.9999)	1.553490 (1.0000)	-5.003608** (0.0016)	-4.921247** (0.0020)
lnGBA	-2..832609 (0.1964)	-2.615897 (0.2761)	-8.325203** (0.0000)	-14.03384** (0.0000)
lnTCA	-1.216732 (0.8904)	-1.216732 (0.8904)	-6.179212** (0.0001)	-6.616591** (0.0000)
lnLAC	-3.979816* (0.0195)	-3.909376* (0.0229)	-7.271432** (0.0000)	-13.97691** (0.0000)
lnAAR	-1.959826 (0.6009)	-1.849687 (0.6574)	-6.915097** (0.0000)	-7.084254** (0.0000)

Source: Researcher's computation (E-views 9), 2024.

Note: The null hypothesis is that the variable has a unit root for ADF and PP. * and ** denotes Order of integration at 1% and 5% level of significance respectively based on Mackinon's critical value, (values inside parenthesis) is the Makinon p-value.

The results of the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests reported in table 1 tests at level and first difference. Evidence from the table suggests that all the variables are stationary at first difference. Meaning that they are all I(1), except land area cultivated which is stationary at level but only at 1% level of significance.

SVAR Lag Selection Criterion

Table 2 Lag Selection Criterion

Included observations: 32

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-123.2394	NA	0.002082	8.014962	8.243984	8.090876
1	-4.585763	192.8122*	6.11e-06*	2.161610*	3.535738*	2.617095*
2	18.47790	30.27106	7.80e-06	2.282631	4.801865	3.117686

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: Researcher's computation (E-views 9), 2024.

In the Table 2, following the lag selection criterion, the results of the (LR), (FPE), (AIC), (SC) and (HQ) suggest 1 lag as the optimal lag. Therefore, since the model satisfies the stability test and passes the related diagnostic tests, the study adopts 1 lag for the estimate.

Statistical Diagnostic Tests

To check for the consistency and reliability of the model, serial correlation, heteroscedasticity and stability tests must be performed (Luctkepohl, 2011). This is particularly important because if the model is not statistically adequate, no any inference can be drawn from it as the results will be unreliable statistically.

SVAR Residual Serial Correlation Test

Lags	LM-Stat	Prob
1	26.52852	0.3798
2	32.79642	0.1362

Probs from chi-square with 25 df.

Researcher's computation (E-views 9), 2024.

Table 3 Serial Correlation Test

Table 3 is the Lagrange multiplier test, which shows that there is no serial correlation at chosen lag, the LM statistics of 26.52852 and its associated probability value of 0.3798 at lag 1 indicate the non-rejection of the null hypothesis of no serial correlation among the residuals of the estimate. This is line with any post estimation test, that the p-value must be greater than 0.05.

Hetroscedasticity Test

Table 4 White Noise Hetroscedasticity

Joint test:

Chi-sq	df	Prob.
158.5818	150	0.2999

Source: Researcher's computation (E-views 9), 2024.

The result in table 4 indicates that the model passes the residual hetroscedasticity test with the chi-square and its related probability value being 158.5818 (0.2999) indicating that the residuals are homoscedastic.

SVAR Stability Test

Table 5 SVAR Stability

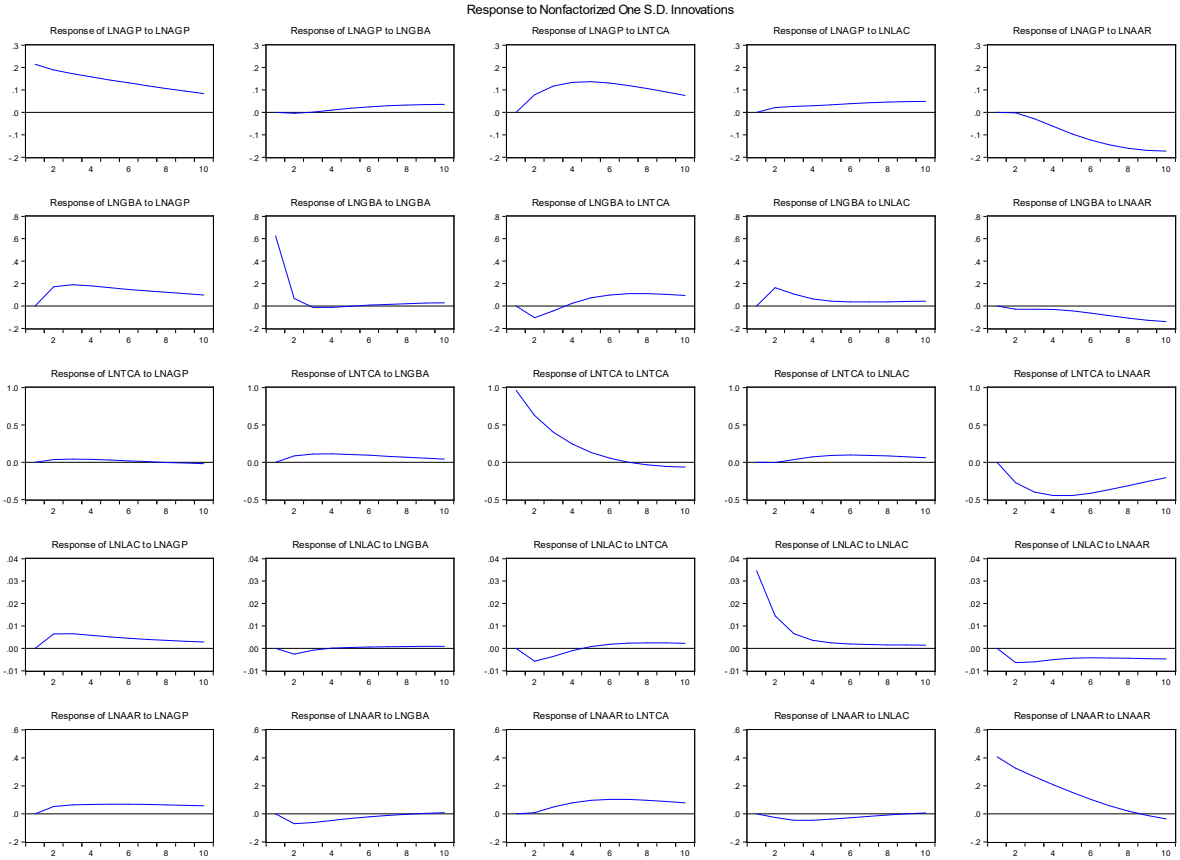
Root	Modulus
0.854615 - 0.097409i	0.860148
0.854615 + 0.097409i	0.860148
0.717334	0.717334
0.214085 - 0.074944i	0.226824
0.214085 + 0.074944i	0.226824

No root lies outside the unit circle.

Table 5 shows that the model satisfies the stability condition, because none of the root lies outside the unit circle. i.e. all the modulus are less than one.

Impulse Response Functions (IRF's) Analysis

The impulse responses show how the dynamic response of each variable to a one-time shock to a series. In other words, it traces how does the path of each variable change when there is shock to one variable. The responses are presented using orthogonalised impulse response functions in figure 1



source: *Researcher's computation (E-views 9), 2024.*

According to the findings from the figures 1, the result showed that the response of agricultural productivity to one shock (change) from government expenditure is positive and significant accounted for about 12% increase. This shows that a one-unit increase in government budgetary allocation to agriculture would result in comparable increases of 12% in agricultural productivity, which is consistent with the findings of Obioma, et. al. (2021)

Equally, response of agricultural productivity to a one shock from total commercial bank loan to agriculture as shown in the third row, indicates that agricultural productivity responded positively but insignificant as it accounted for only 0.4 and 0.6 percent on the variation of agricultural productivity throughout the time of reference and this is in support of the works of Ademola, (2019) and Obioma, et. al. (2021).

In the fourth row, the impulse response of land area cultivated on agricultural productivity is positive accounted for about 0.5% in the short-run which later reduced to 0.3% in the long-run. Meaning that, a unit increase in (hector per square kilometre) causes agricultural productivity to increase only by 5% in the short-run which later reduced to only 3% increase. This shows that land area cultivated had a statistically insignificant positive effect on the performance of agricultural productivity. Which is in line with what Mbutor (2013) found.

Response of agricultural productivity from the shock of average annual rainfall is also positive throughout the time period under study. Which shows that there is positive impact of the volume of annual rainfall on agricultural productivity. Which is in contrary with the work of Obioma, et. al. (2021) who proved that, rain did has a significant negative effect on agricultural performance in the long term.

CONCLUSIONS AND RECOMMENDATIONS

This paper examined the relationship between agricultural financing and agricultural productivity in Nigeria from 1985 to 2023. Using time series data, the test of stationarity of the variables was conducted with the use of Augmented Dickey Fuller (ADF), and Phillips-Perron (PP), followed by the use Structural Vector Autoregressive (SVAR) with sign restrictions to estimate the system of structural shocks among the variables. The study reveals that government expenditure and average annual rainfall have positive and significant impact on agricultural productivity, while total commercial bank loan to agriculture and land area cultivated have positive but insignificant impact on agricultural productivity.

The major conclusion of this study is that there a positive correlation between agricultural financing and agricultural productivity in Nigeria. Increase in agricultural financing will boost agricultural productivity, which will ultimately lead to increase in Nigeria's total gross domestic product.

Based on the findings from the study, the following recommendations were made:

Since government budgetary allocation improves agricultural productivity, government should inject more money to agricultural sector through its budgetary expenditure, by facilitating and coordinating agribusiness investment services, partnership with State Governments to incentivize agribusiness development.

From the results obtained, total commercial bank loan to agriculture has positive but insignificant impact on agricultural productivity and this might be attributed to the fact that commercial banks have rarely entered rural areas due to safer and more profitable business opportunities elsewhere Hence, agricultural sector especially in more remote rural areas continue to be heavily underserved by financial institutions. Therefore, a Policy which may reduce the tax rate to be paid

by commercial banks that are situated in rural areas should be made, and also making a sensitization to farmers on how to collect loan from commercial banks.

Furthermore, since the response of the land area cultivated was below expectation and the fact that land is a vital input for agricultural production. Policies simplifying the process of land allocation and issuance of Certificates of Occupancy should be enhanced.

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