



Agricultural Financing and Agricultural Sector Output in a Developing Economy: The Nigerian Experience

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Abstract

The study carried out an examination of the effects of agricultural sector funding on the productivity of agricultural sector in Nigeria using time series data from 1981 to 2018. This study extracted data from the statistical bulletin of Central Bank of Nigeria, and from the National Bureau of Statistics and the IMF data base. AGDP was adopted as proxy for the agricultural sector output, while, ACGS, CBCA, GEXA and INTR were used as proxies for the explanatory variables. Rainfall was introduced into the model as a control variable. Long-run relationships among the variables were verified using Johansen co-integration model. Vector error correction mechanism (VECM) was employed in the examination of the speed of adjustment of the variables from the short run dynamics to the long run equilibrium position. The empirical results revealed that ACGS has positive and significant long run effect on AGDP. CBCA; GEXA and INTR were found to have negative but significant effect on AGDP within the reference period. The study recommends that policies to diversify the Nigerian economy should be put in place and investment in the agricultural sector should be prioritized by the government by ensuring that certain per cent of total loans and advances of commercial banks are directed to the agricultural sector. Disbursement of credit facilities should be strictly monitored. Water supply through river basins and irrigation facilities should be provided to avoid disruption of farming seasons due to irregular natural water supply. Agricultural financing policies and programmes should be modeled towards ensuring financial inclusiveness of the smallholder farmers and reduce the growing risk aversion of agricultural finance suppliers in Nigeria.

Keywords: Agricultural Finance, Agricultural Output, Commercial Banks, Public Expenditure, Economic Growth

JEL Classification: G21, H16, O11, Q14, Q18

Paper Classification: Research Paper

Introduction

The agricultural sector is mainstay of the Nigerian economy, engaging about 36.5 per cent of the total labour force of the country, thereby contributing meaningfully to the livelihood of a large proportion of the entire population of Nigeria. According to CBN, (2017) report, agriculture contributes nearly 25 per cent of Nigeria's GDP, provides income to approximately two-third of the population of Nigeria, employs about 62 per cent of the nation's workforce and supplies

raw materials to the agro-based industry in Nigeria. Regardless of the income from oil exports and the economic contraction in recent years, the value addition and revenue from the agricultural output remains relatively high with about 21 per cent contribution to GDP. Nigeria's farmers are predominantly smallholder farmers who depend on a diverse range of crops, livestock and fishes for their livelihood. The economic activities of these smallholder farmers is very important to the domestic economy of Nigeria but the agricultural sector's productivity limitations has made it impossible for them to expand the scale of their farm holdings, more than 72 per cent of Nigeria's smallholder farmers live below 1.9 US dollar a day, FAO (2018). According to Ejiogu and Palaniappan, (2016) the smallholder farmers in Nigeria live mainly in the rural areas and a significant proportion of them are poor. They are also financially excluded with little or no access to financial institutions, financial products and services.

Studies in recent times have shown that increased access to investible funds and innovation in farming methods are the two major ways to reduce poverty and ensure improvement and growth in domestic productivity (Ewubare and Mefo, 2018). The demand for financial resources and sustainable financial products and services in the rural areas where the smallholder farmers dwell is high, while their availability and supply in order to stem up agricultural activities necessary for growth and food security is abysmally low. The smallholder farmers and micro businesses in Nigeria lack access to investment fund and financial services to propel their farming and business activities, thereby resulting in low agricultural productivity, low income and high losses.

Agricultural finance should therefore include the provision of different types of financial products and services that will provide funds to support agricultural activities including purchase of farm input, processing and marketing costs and the cost of distributing agricultural output.

Statement of the Problem

The market demand for smallholder farmer finance needs is unmet and this has restricted them to peasant farming system that resulted in low levels of output. Different types of formal financial institutions have evolved and some now have branches in rural areas in Nigeria but most smallholder farmers are still unbanked and financially excluded. This is due to the fact that agricultural business is risky and the returns are low, making the sector unattractive to financial service providers. The smallholder farmers have not been able to meet the conditions for loans and advances from commercial banks or other financial institutions. In addition, the smallholder farmer's financial needs are usually small in amount and the cost of servicing them is high. Farmers, in most cases are either women or young people, without formal ownership of title to lands, to be used as collateral. The services of money lenders which the poor farmer has to pay for are high and this contributes in addition to high cost of fund, to high rate of loan default, leading to excessive bad debt. Unfortunately few farmers that were granted credit complained that disbursement of loans by the financial institutions and government agencies are often carried out after the planting season and the sum actually disbursed falls short of loan applied for, and approved by the credit officers (CBN, 2010). In view of the foregoing, the output from the agricultural sector over the years remained at the subsistence level.

Agricultural policies of government over the years have been designed towards making adequate provision for financial inclusiveness of farmers to ensure that farmers that are unbanked have access to credit facilities at the right time and at affordable cost. Some of the policies put in place and implemented over the years include Agricultural Credit Guarantee Scheme Fund (ACGSF), Small and Medium Enterprises Equity Investment Scheme (SMEEIS), establishment of Nigeria Agricultural Cooperative and Rural Development Bank (NACRDB) now 'Bank of

Agriculture', and the establishment of Microfinance Banks. There are also social intervention programmes or social safety net programmes tailored towards ensuring that farmers have access to funds. These programmes include Operation Feed the Nation (OFN), Green Revolution (GR) otherwise known as 'Back to Land', Directorate for Food, Roads, and Rural Infrastructure (DFRRI), Directorate of Employment, Better life Programme for Rural Women, National Economic Empowerment and Development Strategy (NEEDS), SURE-P, YOU WIN, and National Poverty Eradication Programme (NAPEP). All these policies and programmes are aimed at ensuring adequate funding of the priority sectors of the economy especially the agricultural sector to improve output, ensure food security and reduce poverty. Despite the policies and Programmes, agricultural sector seems not have fared well in Nigeria thereby leaving the agricultural sector perpetually at the subsistence level. There are conflicting results by various researchers on the effects agricultural financing have had on the productivity of the agricultural sector in Nigeria. Ikpesu and Okpe (2019) examined the effect of financing agriculture and the impact of exchange rate on agricultural production in Nigeria from 1981 to 2016 and found that in the short run and long run, financing agriculture positively influenced agricultural productivity in Nigeria. Exchange rate depreciation was found to cause decline in agricultural output in the short and long run. Emmanuel *et al.*, (2017) investigated the effects of agricultural seed financing on output performance and export revenue in Nigeria. The study revealed that, seed financing has significant effect on seed production and there is significant relationship between seed production and increased export revenue in Nigeria. Ajayi, Nageri and Akolo (2017) evaluated the impact of agricultural financing policy and deposit money bank loans and advances on agricultural sector productivity. The study found that deposit money bank loans 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 significant negative impact on agricultural productivity. In contrast Enilolobo and Ode-Omenka (2018) investigated the effect of deposit money bank credit on agricultural sector output in Nigeria from 1978 to 2016 and found that deposit money bank credit to the agriculture sector in Nigeria has no long-run relationship with agricultural sector output. Ijaiya, Abdulraheem, Ijaiya and Abdullahi (2017) carried out an empirical investigation on the effect of Agricultural Credit Guarantee Scheme (ACGS) Funds on food security in Nigeria. Findings from this study revealed that ACGS funds influenced food security only in the short run. The conflicting results by various researchers necessitated this study which is aimed at investigating the impact of agricultural financing on agricultural sector output in Nigeria.

Literature Review

Conceptual Framework

Agricultural financing involves a complex and overlapping blend of financial intermediaries and rural households, smallholder farmers, agribusinesses, and off-farm business entities. These can best be grouped into: Off farm microbusinesses and rural household dwellers not directly involved in agriculture and agriculture related business activities; Farm and agro-based businesses directly involved in the supply of input, farmers, producers, traders and processors; Agro-based industries relying on raw materials from farmers and their production processes; and finally distributors and exporters. The financial intermediaries are entities that engage in financial services such as banks and non-bank financial institutions work directly with rural farmers such as credit unions and agricultural cooperative societies.

One of the basic concept of this study is that farmers need for financial products and services

are varied ranging from working capital requirement such as short term credit to purchase inputs and provision for cash flow management, income smoothing to term credit for the purchase of fixed assets such as land, machineries and other farm assets, making arrangement for leasing and inventory build-up and deposit and transfer services which may include local payment services and remittances such as risk mitigation, asset-building and insurance policies. This study therefore sees working capital financing as very important in agricultural financing and should be readily available to rural farmers to meet their seasonal needs for inputs, labor, and operational production activities. When properly timed and supplied, working capital allows the use of inputs such as seed, fertilizer, labor and other implements that may assist the farmers to increase their output and earn more revenue. The short-term nature of working capital financing makes it difficult for financial institutions to provide them for immediate needs of farmers. This is due to the short repayment period which does not match the production cycle of agricultural products.

Secondly, this study conceptualized that loans and advances for farmers and agribusiness stakeholders along the value chain may be obtained from value chain actors such as exporters, wholesalers, processors, traders, producers, input suppliers and entities that engage in financial services such as banks and non-banking financial institutions that work directly with rural farmers such as credit unions and agricultural cooperative societies. The third concept of this research is that the sources of repayment of loan borrowed by the farmer is through crop harvest or sale of animals, sale of processed product, salaries and other earned incomes of household members, remittances or domestic money transfers and sale of own assets.

Increase in agricultural sector output is therefore a function of how funds flow from the investors in the economy to the business units that need funds through the agencies and instrumentalities of agricultural finance institutions, markets, credit unions and cooperative societies. The suppliers of agricultural finance must understand the characteristics of smallholder farmers and the peculiar nature of the agricultural sector in Nigeria. This is to ensure that the farmers financial needs, the risky nature of the agricultural sector and the scale of operation of a typical Nigerian farmer is taken into consideration in modeling the financial services and financial products for the farmers.

Theoretical Framework

This study relies on the theoretical underpinning of Structural Change Theory for its economic implication and usefulness in financing – output relationship. It was developed by Lewis Arthur (1954) in which he referred to the theory as 'Development with Unlimited Supply of Labour'. Structural change theory assumes that, there are only two sectors in an economy. These two sectors comprise of the traditional (agricultural or subsistence) sector and the modern (capitalist, industrial or manufacturing) sector. This led to the development of two-sector model in which the development of an economy is dependent on the growth of the two sectors. The Structural Change Theory was presented in a functional form thus:

$$Y = f(\text{AGRIC}, \text{IND}) \dots \dots \dots 2.1$$

Where; Y = Economic development, AGRIC =Agricultural sector and IND = Industrial sector. Traditional and modern sectors are interrelated and rely on each other to function efficiently and effectively. The agricultural sector makes use of factors of production (land, finance and expertise) to produce the materials needed by the industrial sector for its operation and the agricultural sector acts as a receptacle of products from the industrial sector.

Economic implication of this theory is that agricultural development and hence increased

output can only be achieved if agricultural sector is properly funded. Funding of agricultural investments by the federal government, financial institutions, development partners and private investors will have multiplier effect on the economy through its effects on increase in economic activities and agricultural output which in the long run will ensure food security, reduce poverty, improve income and welfare of farmers and enhance economic development.

Review of Related Empirical Literature

Kenny (2019) examined the impact of agricultural sector performance on economic growth in Nigeria. The research findings revealed that there is a significant long run relationship between agricultural output and Agricultural Credit Guarantee Scheme Fund, federal government current expenditure on agriculture, total employment and trade liberalization. The VECM result indicated that 35 per cent speed of adjustment of the endogenous growth model which includes Agricultural Credit Guarantee Scheme Fund, Federal Government current expenditure, total employment and trade liberalization on agricultural domestic production implies that interventions in agriculture will take a while for its effect to be significant on agricultural output in Nigeria.

Ikpesu and Okpe (2019) employed ARDL model in examining the effect of capital inflows and exchange rate on agricultural productivity in Nigeria from 1981 to 2016. The study used agricultural output as proxy for agricultural productivity, and private capital inflow, public capital inflow, investment, labor and real effective exchange rate as explanatory variables. The study found that the variables were co-integrated. It further indicates that in the short run and long run, private capital inflow and public capital inflow positively influenced Nigeria's agricultural performance. In addition, it was discovered that exchange rate depreciation caused a reduction in yield of agricultural produce in the short and long run.

Ademola (2019) empirically assessed agricultural finance and its effect on Nigeria's economic growth process. The research used ordinary least squares (OLS) regression model to analyze the data. The study discovered that investment in agricultural production contributed significantly to its output and economic growth in Nigeria and this suggests the need to increase loans and advances for farming activities to improve output and develop the sector.

Okunlola *et al.* (2019) studied the guaranteed agricultural financing of crops, animals and fishery units on real gross domestic product in Nigeria using data set from 1981 to 2017. Time series data were sourced from the Central Bank of Nigeria statistical bulletin, various issues. Autoregressive Distributed Lag (ARDL) model was employed in the determination of the effect of explanatory variables on real gross domestic product in Nigeria. The inferential results revealed that guaranteed agricultural finance used in the production of crops, animals and fishery units was not statistically significant in influencing real gross domestic product.

Emenuga (2019) examined the effect of deposit money banks' loans to the agricultural sector on the development of agricultural sector in Nigeria from 1981 to 2017. Data on deposit money banks' loans to agricultural sector, interest rate, Agricultural Credit Guarantee Scheme and agricultural contribution to GDP were obtained from statistical bulletin of Central Bank of Nigeria, various issues. ADF unit root test, Johansen co-integration test and error correction model were used as analytical tools. The study discovered long-run relationship between bank loans and agricultural development in Nigeria. The study also found that Agricultural Credit Guarantee Scheme fund has positive relationship with agricultural development while interest rate was found to be negatively related to agricultural development in Nigeria.

Enilolobo and Ode-Omenka (2018) investigated the impact of deposit money banks' credit on

agricultural output in Nigeria from 1978 to 2016. Time series data were sourced from statistical bulletin of Central Bank of Nigeria. Ordinary least squares regression models were used in analyzing data. The findings of the study indicated that there was no long-run relationship between deposit money banks' credit to the agricultural sector and agriculture sector output in Nigeria.

Oguwuike (2018) assessed the effect of agricultural output on economic growth in Nigeria from 1981 to 2016. Secondary data on GDP, crop production, livestock, fishery and forestry were obtained from the CBN statistical bulletin. The econometric methods of ordinary least squares regression analysis, co-integration test, error correction mechanism were used for the analysis. The co-integration result showed that there exists co-integration amongst the variables in the model. From the results, the first and third lags of GDP were positively and significantly related to current level of economic growth. The coefficients of crop and livestock production were positively signed and statistically significant in influencing GDP. The coefficient of fishery was positively signed but statistically not significant in influencing GDP. The coefficient of forestry was negatively signed but statistically significant in influencing GDP.

Adesoye *et al.* (2018) carried out an analysis to ascertain the effect of agricultural value chain financing on agricultural productivity and economic growth in Nigeria from of 1981 to 2015. Autoregressive distributed lag (ARDL) model was used to analyze the data. The inferential statistics revealed that expenditure on agricultural value chain had positive and significant impact on agricultural sector output in Nigeria. The study revealed that farm lands, agricultural inputs and machinery have significant influence on agricultural productivity in Nigeria. The study further showed that capital, labour and agricultural output had positive and significant impact on the economy of Nigeria.

Shobande *et al.* (2018) researched on the relationship between financial sector performance and agricultural growth in Nigeria between first quarter of 1996 and the fourth quarter of 2017. Autoregressive Distributed Lag (ARDL) model was used to analyze the time series data collected. The study found that agricultural financing, money market, capital market and exchange rate have positive relationship with agricultural growth in Nigeria, while, inflation has negative effect on agricultural growth.

Emmanuel *et al.*, (2017) examined the impact of financing agricultural seed production on yield of seed plants and export revenue in Nigeria. The study used secondary data covering 16 years period from 2000 to 2015. Data on expenditure on seed financing, agricultural productivity and export revenue were used in the analysis. The research found that improvement in seed financing has positive and significant impact on yield of seed plants and that there is positive relationship between yield of seed plants and increased export revenue in Nigeria.

Ajayi, Nageri and Akolo (2017) evaluated the impact of agricultural financing policy and deposit money bank loans to agricultural sector on agricultural productivity. The study used time series linear regression model employing data set from 1981 and 2015. The research results recorded that deposit money bank loans and policy on agricultural financing have significant and positive effect on agricultural sector productivity, while lending rate (LR) had significant but inverse effect on agricultural output in Nigeria.

Egwu (2016) empirically studied the effect of funding agricultural activities on agricultural output, economic growth and poverty reduction in Nigeria. The study made use of ordinary least squares regression model and other test statistics such as T-test, R-Squared, Standard Error Test and Durbin Watson test, ADF and PP unit root tests, and Johansen co-integration test to improve

robustness of analysis. The research discovered that commercial bank credit to agricultural sector and Agricultural Credit Guarantee Scheme Fund financing of the agricultural sector had positive and significant effect on the output of agricultural sector in Nigeria.

Dori (2016) investigated effects of Agricultural Credit Guarantee Scheme Fund on agricultural productivity and economic development of Nigeria. The study found that Agricultural Credit Guarantee Scheme Fund increased the inflow of credit to the Nigerian farmers which further expanded their acquisition and adoption of modern farming techniques and innovations thereby improving their revenue and general wellbeing.

Mathew and Mordecai (2016) examined the impact of public expenditure in the agricultural sector on agricultural output in Nigeria from 1981 to 2014 using time series data sourced from the CBN Statistical Bulletin and Annual Reports, various issues. The results of the multiple regression analysis carried out revealed that government expenditure on agriculture has significant but negative impact on agricultural output. In contrast, commercial banks credit to the agricultural sector and interest rate has insignificant positive impact on agricultural output in Nigeria.

Ewubare and Eytipe (2015) evaluated the effects of government expenditure on the agricultural sector output in Nigeria. The study made use of time series data to ascertain the effects of government expenditure (GEA), deposit money banks loan (DBA) and gross capital formation (GCF) on agricultural production output in Nigeria using data generated from the statistical bulletin of Central Bank of Nigeria and National Bureau of Statistics data base, various issues. Ordinary least squares multiple regression model was adopted in analyzing the data. The study found that GEA was positive and statistically significant in influencing agricultural output in Nigeria.

Okulegu *et al.* (2014) empirically assessed effect of commercial banks' loans and advances on agricultural sector output in Nigeria. Time series data from 1981 to 2011 were sourced from CBN statistical bulletin. The empirical analysis carried out used econometric tests such as unit root, co-integration, error correction model and Granger causality test, in which changes in agricultural contribution to GDP was regressed on commercial banks' loans and advances to the agricultural sector, Agricultural Credit Guarantee Scheme Fund and total government expenditure on agriculture production. Result of the analysis provides evidence that government expenditure on agriculture in Nigeria was not statistically significant. The study further recorded that commercial banks' credit to agriculture granger caused agricultural sector contribution to gross domestic product in Nigeria.

Methodology

Model Specification

This study relied on the empirical research model used by Agunuwa, *et al.*, (2015) in which they investigated commercial banks' credit to the agricultural sector in Nigeria and how it influenced output in agricultural sector. In their model, the variables were estimated using the following equation:

$$AGP = \beta_0 + \beta_1 CBCA + \beta_2 INTR + \beta_3 GSA + U_t \dots\dots\dots (3.1)$$

$$\beta_1 > 0, \beta_2 < 0, \beta_3 > 0$$

Where,

AGP = Agricultural productivity

CBCA = Commercial banks’ credit to the agricultural sector

INTR = Interest rate on loans

GSA = Government spending on the agricultural sector, and

U_t =Error term

This study modified their model and included Agricultural Credit Guarantee Scheme Fund (ACGS) as a major component of the sources of fund to farmers. It also included rainfall as a control variable since rainfall affects every farming activity. The functional notation that describes the linkage between explained and explanatory variables in equation 3.2, is thus:

$$AGDP = f(ACGS, CBCA, ANRF, GEXA, INTR) \dots\dots\dots (3.2)$$

The econometric form of the model employed in this study is specified as follows:

$$\text{LogAGDP}_t = \beta_0 + \beta_1 \text{LogACGS}_t + \beta_2 \text{LogCBCA}_t + \beta_3 \text{LogANRF}_t + \beta_4 \text{LogGEXA}_t + \beta_5 \text{Log INTR}_t + \mu_t \dots\dots\dots (3.3)$$

Where:

AGDP = Contributions of agricultural sector to GDP

ACGS = Agricultural credit guarantee scheme fund

CBCA = Commercial banks’ credit to agricultural sector

ANRF = Annual rainfall (measured in millimeter)

GEXA = Government expenditure on agriculture

INTR = Lending interest rate

Log = Natural logarithm

β_0 = Constant

While; $\beta_1, \beta_2 \dots \beta_5$ are parameter or the coefficients to be estimated; μ = error term, and t = time variable.

The time series data used in the model for analyzing the variables in this study were sourced from the statistical bulletin of Central Bank of Nigeria, and from the National Bureau of Statistics and IMF data base.

The *a priori* expectations: ACGS, CBCA, ANRF and GNXA are expected to have positive impact, while INTR is expected to have inverse relationship in line with the economic theory.

Techniques of Data Analysis

In investigating the effect of agricultural financing on agricultural sector output in Nigeria, the following estimation techniques were employed: Unit root test using Augmented Dickey – Fuller (ADF) and Phillips Perron (PP) unit root tests; Johansen co-integration test; and the vector error correction mechanism (VECM). The co-integration test determines number of co-integration equations while the VECM helps to ascertain the possibility of error being corrected as the model approaches its long run equilibrium position.

Analysis of Data and Discussion of Research Findings

Descriptive Statistics

This study presents the descriptive statistics in order to observe and analyze the statistical and economic attributes of the variables studied.

Table 4.1 Descriptive Statistics

| Variable | Agricultural GDP β 'm | Agricultural Credit Guarantee Scheme β ' m | Commercial Banks Credit to Agriculture β 'm | Annual rain fall 'mm' | Government Expenditure on Agriculture β 'm | Interest Rate Per cent |
|--------------|-----------------------------|--|---|-----------------------|--|------------------------|
| Mean | 5740.705 | 2394174. | 3428.797 | 4658.501 | 15316.38 | 21.64053 |
| Median | 1467.690 | 301738.7 | 446.9500 | 4733.430 | 6685.670 | 21.44500 |
| Maximum | 19636.97 | 10028989 | 14243.50 | 5501.130 | 85400.00 | 36.09000 |
| Minimum | 17.05000 | 5102.550 | 8.600000 | 3121.690 | 12.77000 | 10.00000 |
| Std. Dev. | 6878.184 | 3352920. | 4811.871 | 518.0229 | 19666.08 | 5.816453 |
| Skewness | 0.832024 | 1.214911 | 1.122705 | -0.829810 | 1.571747 | -0.093457 |
| Kurtosis | 2.082727 | 2.937946 | 2.728880 | 3.485924 | 5.585240 | 3.053475 |
| Jarque-Bera | 5.716535 | 9.354153 | 8.099345 | 4.734894 | 26.22795 | 0.059844 |
| Probability | 0.057368 | 0.009306 | 0.017428 | 0.093720 | 0.000002 | 0.970521 |
| Sum | 218146.8 | 90978613 | 130294.3 | 177023.0 | 582022.5 | 822.3400 |
| Sum Sq. Dev. | 1.75E+09 | 4.16E+14 | 8.57E+08 | 9928865. | 1.43E+10 | 1251.752 |
| Observations | 38 | 38 | 38 | 38 | 38 | 38 |

Sources: Author's Computations, 2020

Cumulative values of agricultural sector contribution to GDP (AGDP), Agricultural Credit Guarantee Scheme Fund (ACGS), commercial banks' and advances to agricultural sector (CBCA), government expenditure on agricultural production (GEXA), annual rainfall (ANRF) and lending interest rate (INTR) between the period of 1981 and 2018 were ₦218146.88 million, ₦ 90978613 million, ₦130294.3 million, 177023.0 millimeter, ₦582022.5million and 822.3 per cent respectively. The average values of AGDP, ACGS, CBCA, GEXA, ANRF and INTR in Nigeria within the period under study varied from ₦5740.705 million, ₦2394174. million, ₦ 3428.797 million, 4658.501 millimeter, ₦15316.38 and 21.64053 per cent respectively while the minimum values ranged from ₦17.05000 million, ₦5102.550million, ₦8.600000 million, 3121.690millimeter, ₦12.77000 and 10 per cent respectively to the maximum of about ₦19636.97 million, ₦10028989 million, ₦14243.50 million, 5501.130millimeter, ₦85400.00 million and 36.09000 per cent respectively for AGDP, ACGS, CBCA, GEXA, ANRF and INTR within the sampled period.

The standard deviation values (6878.184, 3348578, 4811.871 and 5.816453) of Agricultural GDP, Agricultural credit guarantee scheme fund, commercial banks' loans and advances to Agricultural sector, government expenditure on agricultural production, Annual rainfall and interest rate in Nigeria within the period under study (1981 to 2018) is an indication of high degree of co-movement of the variables used. While Agricultural GDP, ACGS, CBCA, and GEXA skewed positively to the right, ANRF and INTR skewed negatively to the left. This is an indication of disparity in co-movement among the variables and the possibility of low or insufficient contribution of the variables to the output of agricultural sector.

Unit Root Tests

Unit root tests were carried out using the Augmented Dickey Fuller (ADF) test and the Phillips Perron (PP) test. ADF and PP test results show that all the variables Agricultural GDP, ACGS, CBCA, GEXA, ANRF AND INTR are integrated series of order I(1). This is presented in Table 4.2 :

Table 4.2 Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) unit root tests

| Variables | Augmented Dickey Fuller (ADF) | | | Phillips Perron (PP) | | |
|-----------------------|-------------------------------|--------------------------|------|----------------------|--------------------------|------|
| | At Level | At 1 st Diff. | OI | At Level | At 1 st Diff. | |
| AGDP | -1.418157 | -4.691036** | I(1) | -1.024165 | -4.862289** | I(1) |
| ACGS | -2.343551 | -7.512540** | I(1) | -2.185458 | -8.866598** | I(1) |
| CBCA | 1.672373 | -3.500676** | I(1) | 1.797566 | -3.783945** | I(1) |
| ANRF | -2.427334 | -10.34271** | I(1) | -2.427334 | -12.60189** | I(1) |
| GEXA | -3.123423 | -9.346835** | I(1) | -3.002690 | -20.27406** | I(1) |
| INTR | -3.026997 | -6.789002** | I(1) | -2.917101 | -8.410107** | I(1) |
| Test critical values: | -3.621023 | -3.626784 | | -3.621023 | -3.626784 | |
| | -2.943427 | -2.945842 | | -2.943427 | -2.945842 | |
| | -2.610263 | -2.611531 | | -2.610263 | -2.611531 | |

Source: Author's Computations, 2020

*** indicates statistical significance of the test results at 5 per cent, levels. OI represents order of integration.

The Augmented Dickey Fuller and Phillips Perron tests presented in Table 4.2 revealed that all the variables are not stationary at levels. This is evident from the observed absolute values of ADF and PP tests statistics in comparison with their corresponding critical values in absolute terms and at 5 per cent significance level. Contrary to levels results, all the variables became stationary when tests were carried out at first difference. This implies that the variables are integrated of the order I (1). The result therefore implies that the co-integration analysis is applicable in this research.

Johansen Maximum Likelihood Test

Johansen maximum likelihood test was used to ascertain the existence of long-run relationship among variables by applying it to vector Autoregressive (VAR) version of VAR equation for order K expressed as:

$$\Delta y_t = \pi y_{t-1} + \Delta y_{t-1} + \beta x_t + \varepsilon_t$$

Where: Δ is the difference operator; Y_t is vector of non-stationary variables (k). Johansen maximum likelihood test results are presented in Table 4.3 :

Table 4.3: Johansen Maximum Likelihood Test Results

| No. of co-integrating equation | Trace statistic 0.05 | | Maxi-Eigen 0.05 | |
|--------------------------------|----------------------|----------------|-----------------|----------------|
| | | Critical Value | Statistic | Critical Value |
| None * | 123.9687 | 95.75366** | 49.09599 | 40.07757** |
| At most 1 * | 74.87270 | 69.81889** | 36.00901 | 33.87687** |
| At most 2 | 45.86369 | 47.85613 | 23.19072 | 27.58434 |
| At most 3 | 22.67296 | 29.79707 | 12.82561 | 21.13162 |
| At most 4 | 9.847356 | 15.49471 | 8.145797 | 14.26460 |
| At most 5 | 1.701559 | 3.841466 | 1.701559 | 3.841466 |

Source: Author's Computations, 2020

Note: *** indicates significant at 5 per cent level of significance.

From the result of both Max-Eigen value and Trace statistic tests presented in Table 4.3, the study rejected the null hypothesis (Ho) that there is no co-integrating relationship between the variables. The result provides evidence supporting at least one co-integrating equation at the 5 per cent level of significance. The co-integration results revealed that Agricultural GDP, Agricultural Credit Guarantee Scheme, agricultural loans and advances, annual rainfall, government expenditure on agriculture and interest rate respectively maintain equilibrium condition in the long run which keeps them in proportionate relationship to each other within the period.

Long run Analysis

The model variables for this study were expressed in logarithm form. The co-efficient of the variables are thus, best interpreted in terms of their long run elasticity. This makes it possible for the t-statistic and probability values to be used in making valid inferences about the statistical significance of each variable. The decision rule adopted in this study is based on the rule of thumb, which says that a variable is statistically significant if the t-statistic is approximately 2 or more in absolute terms. This also holds true when the Probability value is 0.05 or less. The long run analysis result is presented in Table 4.4 :

Table 4.4: Long run Analysis Results

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|-------------------------|-------------|---------------------|-------------|----------|
| AGDP(-1) | 0.680837 | 0.230464 | 2.954202 | 0.0071** |
| AGDP(-2) | 0.432462 | 0.261202 | 1.655663 | 0.1114 |
| ACGS(-1) | 0.030121 | 7.18E-05 | 3.679932 | 0.0065** |
| ACGS(-2) | 9.08E-05 | 8.53E-05 | 1.064729 | 0.2980 |
| ANRF(-1) | 0.438255 | 0.484329 | 0.904869 | 0.3749 |
| ANRF(-2) | -0.254371 | 0.479967 | -0.529976 | 0.6012 |
| CBCA(-1) | -0.205415 | 0.271275 | -2.357220 | 0.0166** |
| CBCA(-2) | -0.511598 | 0.259518 | -1.971343 | 0.0608 |
| GEXA(-1) | 0.000889 | 0.011277 | 0.078854 | 0.9378 |
| GEXA(-2) | 0.011766 | 0.010944 | 1.075115 | 0.2935 |
| INTR(-1) | -0.919051 | 36.71564 | -0.025032 | 0.9802 |
| INTR(-2) | -1.279436 | 36.44390 | -0.035107 | 0.9723 |
| C(-1) | -613.9126 | 2013.481 | -0.304901 | 0.7632 |
| R-squared | 0.891712 | Mean dependent var. | | 6058.600 |
| Adjusted R ² | 0.787388 | S.D. dependent var. | | 6930.935 |
| F-statistic | 229.3480** | Durbin-Watson stat. | | 2.354660 |
| Prob. | 0.000000 | | | |

Source: Author's Computations, 2020

Note: ** indicates significant at 5 per cent level of significance.

The long run Vector Auto regression result presented in Table 4.4 showed that agricultural GDP indicated positive and significant changes in the previous period than in the recent years. This is an indication that in the earlier years, agricultural sector output was better than in the later years. Agricultural credit guarantee scheme was equally statistically significant and elastic in relation to agricultural sector output. The coefficient value 0.030121 of agricultural credit guarantee scheme at 5 per cent level implies that unit change in Agricultural Credit Guarantee

Scheme fund will lead to 3 per cent decrease in agricultural sector output in Nigeria within the reference period. This indicates that in the long run, change in Agricultural Credit Guarantee Scheme Fund will cause proportionate change in agricultural sector's output. Commercial banks loan to agriculture was equally statistically significant but negative in the long run.

The coefficient of -0.205415 at 5 per cent significance level implies that unit decrease in commercial banks loan to agriculture will lead to 20.54 per cent decrease in agricultural sector output in Nigeria. Rainfall had negative but statistically significant effect on the performance of agricultural GDP in the long run. Interest rate does not significantly contribute to changes in agricultural GDP in this study. The coefficient of determination ($R^2 = 0.8917$) and adjusted R^2 value of 78.74 per cent explained the total variation in the dependent variable that is jointly caused by the explanatory variables included in the model. The Durbin-Watson statistic value of 2.354 is an indication of the absence of serial autocorrelation in the model. It can be deduced from the result that agricultural financing has the capacity to influence the output level of the agricultural sector in Nigeria in the long run.

Vector Error Correction Model (VECM)

The coefficient of the Error Correction Mechanism otherwise called the speed of adjustment factor, explains how long it takes the system to correct any error within the system and adjust itself to the original equilibrium condition. In analyzing VECM, three conditions need to be fulfilled: The VECM should lie between 0 and 1; it has to be negative; and the t-statistic should be significant. The results of the vector error correction model (VECM) are presented in Table 4.5:

Table 4.5: Vector Error Correction Model Results

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|-------------------------|-------------|---------------------|-------------|----------|
| ECM(-1) | -0.186237 | 0.026564 | -7.010825 | 0.0000** |
| D(AGDP(-1)) | -0.654380 | 0.165094 | -3.963688 | 0.0007** |
| D(AGDP(-2)) | -0.474878 | 0.174713 | -2.718052 | 0.0129** |
| D(ACGS(-1)) | 0.020249 | 5.60E-05 | 4.442866 | 0.0002** |
| D(ACGS(-2)) | 0.010199 | 5.96E-05 | 3.337409 | 0.0031** |
| D(ANRF(-1)) | -0.124046 | 0.276896 | -0.447986 | 0.6588 |
| D(ANRF(-2)) | -0.754052 | 0.294877 | -2.557170 | 0.0184** |
| D(CBCA(-1)) | -0.522954 | -0.192152 | 2.721566 | 0.0128** |
| D(CBCA(-2)) | -0.376676 | -0.192322 | 1.958569 | 0.0636 |
| D(GEXA(-1)) | -0.028804 | 0.006363 | -4.526833 | 0.0002** |
| D(GEXA(-2)) | -0.018589 | 0.006146 | -3.024594 | 0.0064** |
| D(INTR(-1)) | -18.09514 | 20.02492 | -0.903631 | 0.3764 |
| D(INTR(-2)) | -14.65940 | 19.07672 | -0.768445 | 0.4508 |
| C(-1) | 898.7139 | 135.6780 | 6.623872 | 0.0000** |
| R-squared | 0.811127 | Mean dependent var. | | 513.2589 |
| Adjusted R ² | 0.694206 | S.D. dependent var. | | 862.6659 |
| F-statistic | 6.937384** | Durbin-Watson stat. | | 2.084126 |
| Prob. | 0.000054 | | | |

Source: Author's Computations, 2020

Note: '**' indicates significant at 5 per cent level of significance.

The result in Table 4.5 presents the coefficient of error correction mechanism ECM (-1) -0.186237. The VECM is correctly signed with the coefficient lying between 0 and 1. This satisfied the criterion that the model has the potential to correct any errors that occur within the period as the system approaches its long run equilibrium position. The implication of the result is that about 18.62 per cent of errors that occurred within the period are corrected in subsequent periods. This means that errors are short lived in the system. Thus the result is reliable and long run relationship obtained can be sustained.

The result indicated that the model estimated is significant, as confirmed by the F-statistic value of 6.9373 at 5 per cent level of significance. The coefficient of determination $R^2 = 0.811127$, describes the total variation in the dependent variable that was explained by the independent variables. It equally explained the adequacy of the variables included in the model. The contribution of agriculture to GDP was statistically significant implying that agricultural financing generates economic activities that produces output and has the potential to contribute positively to GDP in Nigeria. Agricultural Credit Guarantee Scheme Fund was statistically significant but negatively relates to agricultural GDP in the short-run at 5 per cent level of significance. This implies that unit decrease in Agricultural Credit Guarantee Scheme Fund will lead to 20 per cent and 10 per cent proportionate decrease in agricultural sector output.

The result showed that commercial banks loan to agriculture was negative and statistically significant at 5 per cent level of significance in the short run. This implies that unit decrease in commercial banks loan to the agricultural sector will lead to 57 per cent and 37 per cent proportionate decrease in agricultural sector's output. On the other, annual rainfall showed negative but statistically significant effect on agricultural sector output.

The coefficient of ANRF was -0.7540 at 5 per cent level of significance implying that a unit decrease in rainfall will cause agricultural sector output to decrease by 75 per cent within the reference period. Government expenditure on agriculture had negative impact on agricultural output. The coefficient of GEXA, -0.2880 and -0.018589 at 5 per cent level of significance respectively implies that low level of government expenditure on agriculture, significantly but inversely contributed to the level of output from the agricultural sector in the country within the reference period. Virtually all the variables except lending interest rate were significant in explaining changes in the contribution of the agricultural sector to GDP in the short run. This means that the variables are capable of making reasonable impact on the output of the sector if properly funded and improved upon.

Discussion of Research Findings

Empirical evidence from this study revealed that agricultural sector's contribution to GDP was statistically significant which implies that agricultural financing generates economic activities that produce output and contribute positively to GDP in Nigeria. This is in line with the findings of Ajayi, Nageri and Akolo (2017) who stated that deposit money bank loans and agricultural financing policy increased significantly agricultural productivity in Nigeria. While Okulegu *et al.* (2014) found conflicting result and provided evidence that government expenditure on agricultural production in Nigeria has not contributed meaningfully in increasing agricultural output.

Agricultural credit guarantee scheme was statistically significant and positively relates to agricultural output in the short-run at 5 per cent level of significance. This agrees with the findings of Kenny (2019); Ijaiya, Abdulraheem, Ijaiya and Abdullahi (2017), and Egwu (2016) whose results reported that loans and advances from Agricultural Credit Guarantee Scheme Funds to

the agricultural sector significantly improved agricultural sector output in Nigeria. On the other hand, Okunlola *et al.* (2019) disagree with the results in an investigation on the effect of guaranteed agricultural financing of crops, animals and fishery units on real gross domestic product in Nigeria. Okunlola *et al.* (2019) revealed from the study that ACGSF did not significantly influence the productivity of the agricultural sector in Nigeria.

The study showed that commercial banks loans and advances to agriculture were negative and statistically significant. This implies that there was decrease in loans and advances to the agricultural sector by the commercial banks and this led to proportionate decrease in the contribution of agricultural sector to GDP. This finding agrees with the results of Enilolobo and Ode-Omenka (2018), and Toby and Peterside (2014) whose empirical research results revealed weak correlation between commercial banks' loans and advances to farmers and the total output from agricultural sector of the economy. This result is also not in line with the findings of Emenuga (2019), Shobande *et al.* (2018), and Ajayi, Nageri and Akolo (2017) that found commercial banks loans and advances to farmers have positive and significant effect on productivity of agricultural sector in Nigeria. Mathew and Mordecai (2016) however presented inconsistent result and reported that commercial banks' loans and advances to farmers and interest charged on the loans and advances have positive effect on agricultural production but the effect was not insignificant.

Public expenditure on agricultural productivity had negative effect on the contribution of the agricultural sector to GDP. The coefficient of GEXA -0.2880 at 5 per cent level of significance implies that low level of government investment and participation in agriculture significantly but negatively contributed to the low level of output recorded by the farmers in the country within the reference period. The result is in agreement with the findings of Mathew and Mordecai (2016) in which it was reported that, public expenditure on agriculture negatively but significantly influenced productivity in the agricultural sector. Kenny (2019), Ikpesu and Okpe (2019), Adesoye *et al.* (2018), and Ewubare and Evitope (2015) found conflicting results and reported that federal government expenditure on agricultural production positively influenced agricultural output in Nigeria. It is also in contrast with the findings of Okulegu *et al.* (2014) whose research report revealed that federal government expenditure on agricultural production in Nigeria did not influence significantly the level of farmers output.

Conclusion and Recommendations

Long run result of the study showed that agricultural GDP was elastic and this means that the sector can improve its output if more funds are made available to the farmers. The study further provided evidence that investment in the agricultural sector is important and should be coordinated, implemented and monitored from the point of credit facilities disbursement. Looking at the negative but statistically significant effect rainfall had on agricultural sector output from the findings, there is need to supplement rainfall with irrigation facilities to avoid disruption of farming seasons due to irregular natural water supply.

The growing risk aversion of agricultural finance suppliers in Nigeria is indication of the peculiar characteristics of the farmers and the nature of the sector. This should be taken into consideration by the policy makers to ensure that rural and smallholder farmers have access to adequate funds for farming.

Agricultural Financing has the potential to expand the farmers' farm holdings and make a shift from subsistence farming to improved modern farming system. This will lead to increase in food production, high income generation for the farmers and improvement in the contribution of the

agricultural sector to gross domestic product in Nigeria. The findings from this research, provides evidence that most of the farmers in Nigeria reside in rural areas with small farm holdings and without access to formal agricultural financing institutions, instruments and programmes. Agricultural financing policies and programmes in Nigeria should therefore be modeled to ensure financial inclusiveness of the smallholder farmers.

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