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Agricultural Financing and Agricultural Output in Nigeria

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Abstract. This article's goal was to investigate the connection between agricultural financing and Nigeria's agricultural production. We replaced agricultural finance with the agricultural credit guarantee scheme fund (ACGSF), commercial bank loans to agriculture (CBLA), and government spending on agriculture (GOVXA). Agricultural output was substituted with the agricultural GDP. The Autoregressive Distributed Lag (ARDL) estimate technique was used to specify the ARDL model, which was created to examine the relationship between agricultural financing variables and agricultural production using quarterly data from 2009Q1 to 2023Q4. An econometric analysis program called E-view 9.0 was utilized. The results show that while government spending on agriculture (GOVXA) and the agricultural credit guarantee scheme fund (ACGSF) have no effect on agricultural output in Nigeria, commercial bank loans to agriculture (CBLA) do. Furthermore, the control variable, yearly rainfall, significantly raises agricultural productivity. According to the study's findings, agricultural financing has a major impact on Nigeria's agricultural production. This is demonstrated by the fact that commercial bank loans to agriculture (CBLA) significantly increase agricultural output. The study's conclusions suggest that farmers who obtain program loans should be properly monitored to ensure that they are being used for agricultural objectives. Nigeria's agriculture industry also need more loans from commercial or deposit money banks in order to boost agricultural output.

Keywords: Financial: Agricultural credit guarantees scheme fund, Agricultural financing, Agricultural output, Commercial bank loans to agriculture.

1. Introduction

Agriculture, as the largest industry in terms of employment, remains the recipe for any economic progression (Philip, Nkonya, Pender & Oni, 2009). The government's approach is predicated on the idea that promoting agriculture will accelerate economic expansion. As a result, financing is an essential tool for obtaining all of the industry-wide equipment needed for automated manufacturing. By producing essential raw materials, feeding the populace, generating foreign exchange, and creating a significant number of jobs, the agriculture sector supports the economy. In addition to supplying markets for industrial raw materials, agriculture guarantees economic stability and security. Agriculture contributes significantly to Nigeria's GDP as observed by Anyanwu (1997), and Rahji and Fakayode (2009). Nevertheless, their contribution is insubstantial due to limited credit facilities in fundraising (Odoemenem & Boinne 2010) while Duong and Izumida (2002) opined that agricultural financing and agricultural output exhibit a complex situation.

Agriculture is the primary source of income for a sizable section of Nigeria's population, who reside in rural areas. In this industry, financial obstacles are still prevalent. Because agriculture finance is still costly and unequally distributed, small-scale farmers are unable to raise their output. According to Nyoro (2002), lack of working capital and low liquidity limit the farmer's ability to purchase productivity enhancing input like seeds, fertilisers and pesticide. This was supported by Awudu and Huffman (2000) and Kimbaara (2005) stating that the average production efficiency levels are higher among producers who have access to formal credit.

As a result, agricultural finance increases output and improves living standards while ending the cycle of poverty among farmers. Numerous studies have examined the connection between financing and agricultural productivity. Nevertheless, previous research examining the relationship between agricultural financing and agricultural output has shown contradictory results. For instance researches like – Lawal (20101), Mbutor, Ochu and Okafor (2013), Egwu (2016), Aina and Omojola (2017), Tiamiyu, Bwala and Ben Alawode, (2017), Olatunji, Ezenekwe and Uzonwanne (2018), Medugui, Musa & Abalis (2019), Abbas (2021), Toheeb and Dabo (2022)

and James and Uduak (2022), all found that agricultural financing exerts significant positive effect on agricultural output, but other studies also came up with contrary findings that agricultural financing exerts significant negative affect on agricultural output (Matthew & Modecai, 2016; Ali, Jatau & Ekpe, 2016; and Odili, 2022). Other empirical studies such as that by Ademola, (2013) and Uger (2013) also revealed that agricultural financing does not affect agricultural output. These disparate results may be explained by variations in the variables used, the technique used to measure the variables, the scope used, and the estimation methods used in their respective investigations. The mixed results could have been caused by all of them. The contradictory and unclear nature of these empirical investigations allows for more study in this field.

Furthermore, since earlier study relied on annual data—which are low frequency data—the effect of agricultural funding on Nigerian agricultural production has to be re-estimated using quarterly data and the auto regressive distributed lag (ARDL) approach. Because of this, this study uses quarterly data instead of annual data to investigate how agricultural funding affects Nigerian agricultural production. Examining the connection between agricultural funding and Nigerian agricultural output is the main goal of this research. Specific objectives are to:

- Analyze how the Agricultural Credit Guarantee Scheme Fund affects Nigerian agricultural production;
- Find out how commercial bank loans to Nigerian agriculture effect Nigerian agricultural output; and
- Determine how Nigerian agricultural output is affected by government spending on agriculture.

2. Literature Review

2.1 Conceptual Review

2.1.1 Agricultural Output

Agricultural output comprises several components, including sales of agricultural products (including trade between agricultural entities), changes in inventory, products for self- consumption, output intended for further processing by agricultural producers, and internal consumption of livestock feed products (Eburajolo & Aisien, 2019). Agricultural output, given in monetary terms, is the total value of agricultural produce less the value of intermediate inputs from the agricultural sector. This total is referred to as "final output" and encompasses both monetary and non-monetary exchanges (e.g., barter, commerce, and self-consumption). The value of non-agricultural inputs is not subtracted, which sets it apart from agricultural GDP (Nomor & Udele, 2024). The primary indicator of the productivity of certain crops and livestock is agricultural output. The quantity and quality of agricultural products and goods generated by a nation, area, or farm over a certain time period is referred to in this research as agricultural output. Economic growth, food security, and general well-being are all dependent on the output and performance of the agricultural sector, which is reflected in this production. The value of agricultural goods and associated activities, as well as the proportion of a nation's overall GDP that originates from agriculture, are taken into consideration while calculating it.

2.1.2 Agricultural Financing

The phrase "agriculture finance" describes a range of funds given to Nigerian farmers in an effort to advance the socioeconomic standing of the country's citizens. It includes both government money and non-governmental groups working toward sector growth, economic empowerment, and social empowerment (Mbelu & Ifionu, 2022). In the same vein, Adejumo and Bolarinwa (2017) hypothesized agricultural financing programs as part of financial arrangements set up by the government at all levels to assist farmers' access to finance and invariably boost agricultural productivity. The agricultural financing schemes considered in this study are discussed below.

Decree No. 20 established the ACGSF, in 1987, and it started to function in April 1978. It started out with N85.6 million in paid-up capital and N100 million in share capital. 40% of the stock is owned by the Central Bank of Nigeria, and 60% is owned by the Federal Ministry of Finance (CBN 2019). According to the Agricultural Credit Guarantee Scheme Amendment Act, the scheme's capital base was N3 billion in March 2001 and N50 billion in March 2019. The Fund guarantees up to 75% of the default amount on bank credit facilities given to farmers, net of any realized security. The daily operations and money management of the Scheme are overseen by the Central Bank of Nigeria (CBN, 2019).

Commercial Bank Loan to Agricultural Sector: The entire amount of money that financial institutions lend to an individual or firm is known as bank credit. Although the agricultural industry's share of the nation's GDP is still relatively small, Ijaiya (2003) found that commercial bank lending to the sector have been increasing since 1981. In line with Efobi and Osabuohien (2011), commercial bank loans to the

agricultural sector had little impact when compared to the number of funds accessible to commercial banks. The creation of the Nigerian Agricultural Cooperative and Rural Development Bank, rural banking, river basin authorities, agricultural development projects in every state of the federation between 1972 and 1980, crop loans, loans secured by warehouse receipts, agricultural term loans, land development schemes, capital stock loans, farm mechanization schemes, minor irrigation schemes, and land purchase are some of the other schemes disclosed by Oguoma, Nwosu, Benchendo, and Henri-Ukoha (2010).

Government Spending on Agriculture: Government spending on agriculture refers to the money that the government gives to the agricultural sector in an attempt to boost output and productivity and encourage economic growth. Furthermore, government's spending on agriculture consists of all the expenses made by the government to the sector which include; expenses on policies and programmes, provision of grants and subsidies to farmers, pest control services, inspection services, irrigation and drainage system, crops inspection services, agriculture extension service, etc. (FMARD, 2003). Investing in agriculture by the government via increasing her expenditure is one of the most effective ways of promoting agricultural productivity thereby raising incomes, reducing poverty and food insecurity, as well as environment sustainability (FAO, 2020). Government agricultural expenditure encompasses the financial resources allocated and spent by governments on various agricultural projects, programs, and initiatives (Ukpong, Uduak, Ekere & Akpan, 2022).

2.2 Theoretical Review

Structural Change Theory: Since Lewis Arthur's 1954 description of the Structural Change Theory, the phrase "development with an unending supply of labor" has been in usage. Two distinct sectors comprise an economy, according to the relevant economic theory. The modern sector (capitalist, industrial, or manufacturing) and the traditional sector (agricultural or subsistence) are two different business categories. The two-sector model was created as a result of this. This study argues that while both sectors must grow in order for an economy to prosper, economic growth also requires the development of both sectors. The equation is Y = f (AGRIC, IND), where Y is the measurement of economic development, AGRIC refers to agriculture, and IND refers to industry. Because industry and agriculture are so closely related, it is hard to think about one without thinking about the other. While the industrial sector exports labor and completed items to the agriculture sector, the agricultural sector provides capital inputs and purchases goods from the industrial sector. Since no money can be earned without a hypothesis, the goal of this study is crucial to the expansion of the agriculture sector. Support is required for agricultural initiatives to be carried out effectively. Increased agricultural output will support economic growth if these projects are adequately funded. In the absence of corresponding structural adjustments that boost output, additional tactics or adjustments are likely to be ineffectual or even harmful.

Keynesian Theory of Public Spending: John Maynard Keynes proposed the Keynesian theory of public spending in 1936. It is believed that government spending encourages sectoral growth, particularly in the agricultural sector (Keynes, 1936). Therefore, it is anticipated that through multiplier effects on aggregate demand, an increase in government spending will improve investment, production, employment, and profitability. According to Ewubare and Eyitope (2015), who cited Keynes (1936), public spending is an exogenous component that can be used as a tool for policy to boost production growth.

Schumpeter Theory of Finance and Growth: According to Schumpeter's (1911) theory of finance and growth, the financial system promotes output growth by distributing savings, fostering innovation, and providing capital for profitable economic ventures. It further asserts that funds from the credit market are essential in supporting output development by encouraging specialization in entrepreneurship and the adoption of new technology (Greenwood & Smith, 1997). Consequently, a nation's output rises in tandem with the expansion of its credit and stock markets. The idea that there is a direct relationship between the growth of agricultural output and credit markets is well supported by the theoretical models based on the theories that have been examined.

2.3 Empirical Review

Vector auto regression was used by Lawal (2011) to analyze the federal government's agricultural spending from 1979 to 2007. The findings showed that government assistance for the agriculture sector is directly tied to the sector's GDP contribution and that government expenditure does not exhibit a consistent pattern. Additionally, Ademola (2013) used time series data from 1981 to 2010 to examine the connection between government spending on agriculture and Nigeria's economic development. The study used the OLS technique, unit root test, and cointegration test to assess if agricultural production

was significant. Agricultural output and bank deposits did, however, have a slight but positive link.

Mbutor, Ochu, and Okafor (2013) investigate how agricultural finance affected Nigeria's overall agricultural output from 1980 to 2011. Considering the properties of the data, the vector error correction technique was applied. The data demonstrated that money has a favorable effect on agricultural output. However, variance decomposition revealed that the business was too reliant on the weather and that agricultural finance was in bad shape. Uger (2013) used annual time series data from 1991 to 2010 to examine how government investment affected the agriculture sector. The results of the OLS model showed a weak but positive correlation between Nigerian output and agricultural support (expenditure).

Egwu (2016) assessed Nigeria's agricultural production, economic expansion, and poverty reduction in connection to agricultural finance. The results of the regression showed that loans from the Commercial Bank Credit to the Agricultural Sector (CBCA) and the Agricultural Credit Guarantee Scheme Fund to Nigeria's Agricultural Sector (ACGSF) significantly increased agricultural sector production as a percentage of GDP. Matthew and Modecai (2016) investigated how Nigerian agricultural output was affected by public agricultural investment from 1981 to 2014. The study employed the Granger causality test, the ADF unit root test, the ECM, and the Johansen Co-integration test. The results of the parsimonious ECM model show that public agriculture investment has a significant and adverse effect on agricultural production. According to the research, there may have been a negative impact from the discrepancy between the amount allocated to the agricultural sector and the actual amount spent on the sector in the economy.

Using deposit money banks, Ali, Jatau, and Ekpe (2016) tried to calculate the relationship between agricultural growth and financial intermediation from 1981 to 2014. Even though the DMBLR's findings indicated a negligible and adverse impact on agricultural production, the study did highlight the significance of deposit money bank credit for raising agricultural output. Using the ordinary least squares method, the data was analyzed.

Using the econometric techniques of OLS and ECM, Aina and Omojola (2017) investigated the impact of government spending on the performance of Nigeria's agricultural industry from 1980 to 2013. The findings established a high and direct link between government spending on agriculture and the output of agricultural products. For the years 1992Q1–2015Q4, Olorunsola, Adeyemi, Valli, Kufre, and Ochoche (2017) examined the short- and long-term relationship between bank lending and agricultural output in Nigeria. This study examined data from the private sector on agricultural finance and actual agricultural output growth on a quarterly basis. The agriculture industry showed no signs of either short-term or long-term conflict between loans and production lumps.

Tiamiyu, Bwala, and Alawode, (2017) evaluated the role of the Agricultural Credit Guarantee Scheme Fund, commercial bank loans to agriculture, and agriculture's percentage of GDP from 1981-2017. The statistical methods that were employed were ordinary least square regression and the correlation matrix. The empirical results show that the impact of agricultural loans, interest rates, and currency rates on Nigerian output is the same. Between 1996Q1 and 2017Q4, Olatunji, Ezenekwe, and Uzonwanne (2018) examined the restructuring of Nigeria's rural finance sector to support agricultural expansion. The study estimated the relevant connection using the ARDL technique. According to the long-term estimate's findings, Nigerian agricultural growth is positively correlated with agricultural credit, money markets, capital markets, and exchange rates; nevertheless, inflation has a long-term negative effect.

In studying Agricultural Financing and Performance of the Agricultural Sector in Nigeria, 1981-2015, Udeorah and Vincent (2018), investigated the relative effect of government and deposit money banks financing in the Nigeria's agricultural sector performance adopted quasi experimental design where multivariate Johansen co-integration Test was used to analyze the presence of the long run equilibrium relationships between time series variables, using estimated error correction regression model. The results of the study showed that crop yield and overall agricultural output were significantly decreased by government assistance provided through the agricultural loan guarantee plan fund.

In another study, Medugui, Musa and Abalis (2019) employed the ordinary least square method to assess the role of Commercial Banks' credit on Agricultural output in Nigeria, covering the period 1980 to 2018. The findings showed that government investment on agricultural and commercial bank lending both predicts Nigeria's output level. The findings were entirely in line with a priori predictions, showing an inverse relationship between interest rates and agricultural output.

Using yearly time series data, Obioma Ihemeje, Ogbonna, Amadi, and Hanson (2021) investigated how agricultural funding affected the performance of Nigeria's agricultural sector. Even if rainfall, government expenditure on agriculture, interest rates, and commercial bank loans to agriculture were explanatory variables, the agricultural sector's GDP contribution served as a stand-in for the industry's performance. Using a vector autoregressive estimate and vector correction mechanism, the study looked at how quickly the variables changed from short-term dynamics to long-term equilibrium and found a long-term association between them. Particularly, the Agriculture Credit Guarantee Scheme has a significant and enduring impact on the farm sector's GDP contributions. Commercial bank agricultural loans significantly and favorably impacted the sector's GDP contributions throughout the reference period.

Using the Granger causality test and the Autoregressive Distributed Lagged (ARDL) model, Abbas (2021) examined the impact of agricultural funding on the productivity nexus in Nigeria between 1981 and 2019. Inputs for the model were government investment in agriculture, bank loans to the agricultural sector, the agricultural credit guarantee program fund, inflation rate, interest rate, and agriculture as a percentage of GDP. The results demonstrated that, aside from financial assistance from agricultural credit guarantee programs and bank private sector loans to agriculture, which had a significant long-term impact, other factors had a significant short-term impact on agricultural production.

In more recent studies, Toheeb and Dabo (2022) examine the impact of agricultural loan on agricultural output in Nigeria using yearly time series data from 1983 to 2018. While commercial bank lending to the agricultural industry is an independent variable, government support is represented by the government Agricultural Lending Guarantee Scheme Fund. The dependent variable is the total amount produced by the agriculture industry. Granger Causality is used to identify causal correlations between variables, whereas the Vector Autoregressive Model (VAR) is used to assess long-term relationships. According to the study's findings, agricultural loans from both commercial and government banks have a major causal influence on Nigerian agricultural output and gradually raise it.

Additionally, Odili (2022) used a vector error correction model (VECM) and a co-integration test to examine how agricultural sector financing affected Nigeria's agricultural sector production from 1981 to 2018. The agricultural sector's percentage of GDP, lending interest rates, government investment in agriculture, yearly rainfall, the agricultural credit guarantee program fund, and commercial banks' loans to the agricultural sector were all factors included in the study. The results demonstrated that the agricultural loan guarantee program had a large and positive influence on the GDP ratio for the agricultural sector. The findings also demonstrated that government farm expenditures, commercial banks' lending interest rates, and agricultural sector credit all had a substantial and adverse effect on Nigeria's agricultural sector to GDP ratio.

James and Uduak (2022) looked at how government expenditure affected Nigerian agriculture between 1980 and 2018. The investigation employed the ARDL bound testing methodology. The study's findings demonstrated a high and positive correlation between government capital, continuous agricultural spending, and agricultural production over the examined period.

The impact of agricultural finance on Nigeria's agricultural sector production between 1981 and 2021 was examined by Nnachi, Nwobia, and Ubaka in 2023. The ARDL model was used for time series data analysis. It was found that the production of animals, grains, roots, and tubers had a positive and considerable influence on agricultural output. Oil palm, poultry, and cocoa, however, had no appreciable effect on agricultural production. Considering that financing for cattle rearing, cereals, roots, and tubers that is guaranteed by agricultural credit has had a significant and positive impact on agricultural output.

3. Methodology

This inquiry used the ex-post research design. The working population of the study is the whole Nigerian agricultural industry. Q1 of 2009 through Q4 of 2023 is the sample period. The Central Bank of Nigeria's (CBN) Statistical Bulletin, 2023, was one secondary source of data the researcher looked at for this study. Because of the linearity of the model created to investigate the effect of agricultural financing on agricultural output in Nigeria, numerical estimates of the parameters in the models were provided using descriptive statistics, correlation matrices, co-integration, and the Autoregressive Distributed Lagged (ARDL) method of estimation technique. Using E-views 9.0 econometric software, the Autoregressive Distributed Lag (ARDL) estimation approach was used to analyze the models and achieve the study's goals.

3.1 Theoretical Framework

This study's theoretical foundation is the theory of structural transformation; the expression "development with an endless supply of labor" has been used since Lewis Arthur created the Structural Change Theory in 1954. This essay makes the case that the growth of the two industries affects economic growth. The equation is Y = f (AGRIC, IND), where Y is the measure of economic development, AGRIC stands for agriculture, and IND for industry. Because industry and agriculture are so closely intertwined, it is impossible to consider one without taking the other into account. The agricultural sector provides capital inputs and consumes goods from the industrial sector, while the industrial sector exports labor and finished goods to the farm sector.The purpose of this study is essential to the growth of the agriculture industry since no money can be made without a hypothesis. For agricultural projects to be implemented successfully, support is necessary. Increased agricultural output will support economic growth if these projects are adequately funded. In the absence of corresponding structural adjustments that boost output, additional tactics or adjustments are likely to be ineffectual or even harmful.

3.2 Model Specification

In order to investigate the link between agricultural financing and agricultural output, a modified version of the model used by Obioma, et al., (2021), was specied. Obioma et al., (2021), model included interest rate as control variable in their model but in this study only annual rainfall was included as the control variable. The functional form of our model is specified as:

AGRO = f(ACGSF, CBLA, GOVXA, ARF……(1)

In stochastic form, the functional model mentioned above is further expressed as follows:

$$AGROt = \beta_0 + \beta_1 ACGSF_t + \beta_2 CBCLA_t + \beta_3 GOVXA + \beta_4 ARF + \mu_t \dots\dots\dots\dots\dots\dots\dots\dots (2)$$

The equation is specified in implicit form using Autoregressive Distributed Lag (ARDL) Model as follows:

The equation can be specified explicitly in the short-run as follows:

$$AGRO_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta AGRO_{t-1} + \sum_{i=1}^{q} \beta_2 \Delta ACGSF_{t-1} + \sum_{i=1}^{q} \beta_3 \Delta CBLA_{t-1} + \sum_{i=1}^{q} \beta_4 \Delta GOVXAC_{t-1} + \sum_{i=1}^{q} \beta_5 \Delta ARF_{t-1} + \varepsilon_t \dots\dots\dots\dots (3)$$

The error correcting mechanism (ECM), which restores economic equilibrium in the case of a shock, is incorporated into the long-term equilibrium impact of agricultural finance on agricultural production. As a result, equation 3 re-specifies the shock effect, which is captured by ECM, as follows:

$$\Delta AGRO_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta AGRO_{t-1} + \sum_{i=1}^{q} \beta_2 \Delta ACGSF_{t-1} + \sum_{i=1}^{q} \beta_3 \Delta CBLA_{t-1} + \sum_{i=1}^{q} \beta_4 \Delta GOVXA_{t-1} + \sum_{i=1}^{q} \beta_5 \Delta ARF_{t-1} + \phi ECM_{t-1} + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (4)$$

Where:

ARF stands for annual rainfall, ACGSF for agricultural credit guarantee scheme fund, CBLA for commercial banks' credit to the agricultural sector, GOVXA for government spending on agriculture, and μ_t for the stochastic disturbance term, which serves as a stand-in for other variables not included in the model. The dependent variable is agricultural production, or AGRO for short. The error correlation term, ECM = (AGROt-1 -θxt), the constant or slope, β0, and the negative-sign speed of adjustment parameter, $\boldsymbol{\phi}$, are the recovered residuals from the regression of the long-run equation.

Regarding the behavior of their coefficients to be estimated in the model, the explanatory variables' a priori expectation trends are β_1> 0, β_2> 0, β_3>, and β_4>0. Theoretically, every independent element ought to positively affect the agriculture sector's (AGRO) output.

3.1 Variable Measurement

The variables used, together with the a priori expectation and the name of the previous researcher that used the variable in their study, are listed in Table 1.

Table 1: Variable Measurements

Variables	Variable Type	Measurement	*A-priori* Expectation	Previous Study that Utilized the Variable
Agricultural Output (AGRO)	Dependent	agriculture production is determined by the agriculture sector's contribution to the gross domestic product.		Nnachi et al., (2023)
Agricultural Credit Guarantee Scheme Fund (ACGSF)	Independent	calculated as the total amount of loans made to Nigerian farmers through the Credit Guarantee Scheme Fund	(+)	Odili, (2022)
Commercial Bank Loans to Agricultural Sector (CBLA)	Independent	calculated as the total amount of loans given to Nigeria's agriculture industry by commercial and deposit money banks.	(+)	Obioma et al., (2021)
Government Spending on Agriculture (GOVXA)	Independent`	measured as the total amount of money Nigerian governments spend on the agricultural industry.	(+)	Ibekwe (2021)
Annual Rainfall (ARF)	Independent`	Rainfall is measured in millimeters per year.	(+)	Abbas, (2021)

Source: *Author's compilation* (2025)

4. Presentation and Discussion of Results

4.1 Descriptive Statistics

Descriptive statistics are used to do the fundamental characterization of the datasets in order to summarize the data. The annualized summary data for every variable in the study from 2000Q1 to 2023Q4 is displayed in Table 1.

Table 4.1: Descriptive Statistics

	AGRO	ACGSF	CBLA	GOVXA	ARF
Mean	18290.13	5981.242	474.8746	39.27833	1424.296
Median	14926.01	5778.250	293.5553	36.58500	1427.563
Maximum	49724.78	13283.33	1908.047	84.62156	1584.750
Minimum	1409.684	214.1494	33.10563	6.222813	1139.613
Std. Dev.	14049.89	3547.771	544.5273	24.87053	62.00391
Skewness	0.870107	0.091930	1.514353	0.360242	-0.827075
Kurtosis	2.712666	2.029447	4.209517	1.933626	7.617343
Jarque-Bera	12.44362	3.903107	42.54397	6.625001	96.22426
Probability	0.001986	0.142053	0.000000	0.036425	0.000000
Sum	1755853.	574199.2	45587.96	3770.720	136732.4
Sum Sq. Dev.	1.88E+10	1.20E+09	28168443	58761.60	365226.0
Observations	96	96	96	96	96

Source: *Author's computations, (2025) using Eviews 9.0*

The average agricultural output (AGRO) was N18290.13 billion, the average agricultural credit guarantee scheme fund (ACGSF) was N5981.242 billion, the average commercial bank loans to agriculture (CBLA) was 474.8746, the average government expenditure on agriculture (GOVXA) was N39.27833 billion, and the average annual rainfall (ARF) was 1424.296, as indicated by the descriptive statistics in Table 4.1. The range of values found in each series is indicated by the minimum and maximum values, which show the lowest and highest values obtained for each series. The standard deviation indicates that the variables are widely distributed from their respective mean values. This suggests that each series of the variables' values varies greatly. This suggests that each series of the variables' values varies greatly. All of the variables were positively skewed, according to the skewness values, with the exception of ARF, which was negatively skewed. The Kurtosis values for both CBLA and ARF above the permissible threshold of 3, suggesting that the series for both are leptokurtic, or strongly peaked, meaning that they contain a greater number of values than the sample mean. On the other hand, AGRO, ACGSF, and GOVXA have flat (plytokurtic) Kurtosis values. For AGRO, CBLA, GOVXA, and ARF, the Jarque-Bera test probability values were less than 0.05, suggesting that the null hypothesis—that the series are not normally distributed—should be accepted; but, for ACGSF, it should be rejected.

4.2 Analysis of Correlation

Examining the strength and direction of the relationship between the study's variables is crucial. Correlation analysis is used to conduct these studies. The correlation test results are displayed in Table 4.2.

Table 4.2: Results of the Correlation

Correlation Probability	AGRO	ACGSF	CBLA	GOVXA	ARF
AGRO	1.000000				

ACGSF	0.400123	1.000000			
	0.0001	-----			
CBLA	0.868490	0.320414	1.000000		
	0.0000	0.0015	-----		
GOVXA	0.814345	0.426134	0.848134	1.000000	
	0.0000	0.0000	0.0000	-----	
ARF	0.504532	0.262290	0.397861	0.578711	1.000000
	0.0000	0.0098	0.0001	0.0000	-----

Source: *Author's computations, (2025) using Eviews 9.0*

The correlation finding in Table 4.2 indicates that there is a significant positive relationship between agricultural production (AGRO) and each of the independent variables (ACGSF, CBLA, GOVXA, and ARF). Raising these variables will increase agricultural GDP, which serves as a proxy for agricultural production throughout the analysis, according to their correspondingly positive coefficients. Important factors that increase agricultural production include ARF, CBLA, GOVXA, and ACGSF, based on their relative probability values. The link between the independent variables has a similar pattern, suggesting a strong and favorable relationship. Furthermore, Table 3 also revealed the absence of multi co-linearity problem among explanatory variables since no correlation coefficient between explanatory variables is > 0.90 as suggested by Gujarati (2008).

4.3 Testing at the Unit Root

The Augmented Dickey Fuller (ADF) test is used to examine unit roots. Since the ARDL limits test cannot be used for co-integration, the study used the traditional ADF unit root test to determine whether the data was stationary and to ensure that none of them were I (2) or above. To determine the stationary variables, Table 4.3 displays the ADF test results for the series at level and first differences.

Table 4.3: Unit Root Test Outcome

	Augmented Dickey–Fuller (ADF) Test		
Variables	At level	1st Difference	Order of Integration
AGRO	0.1373	-3.0255**	I[1]
ACGSF	-2.3025	-6.5284*	I[1]
CBLA	-1.0629	-6.5294*	I[1]
GOVXA	-0.4027	-3.4367*	I[1]
ARF	-2.1703	-4.6053*	I[1]

Source: *Researcher's Computation (2025) Using E-views 9.0 Software.*
Note: * & ** indicate significance at 1 and 5 percent levels.

To capture the stationary variables, the ADF test results for the series at level and first differences are shown in Table 4.3. The results demonstrate that all variables become stable at the first difference at the 1% and 5% levels of significance. After the test result indicated that the variables were integrated of I(1) and that none of the variables were integrated of I(2) or higher, we moved forward with the ARDL co-integration approach since it can handle whether all the variables are I(0), I(1), or a combination of both. To proceed with the co-integration test, this suggests using the ARDL technique (bounds test approach of co-integration), developed by Pesaran, Shin, and Smith (2001).

Co-integration Bounds Tests

To determine if the explained variable AGRO and the explanatory variables in the ARDL model had a long-term equilibrium link, a robust ARDL bound testing approach for cointegration was used after the order of integration. You may see this in Table 4.4.

Table 4.4: Selected Model ARDL Bounds Test for Co-integration [ARDL (2, 1, 1, 0, 2)]

Test Statistic	Value	K
F-statistic	1.201302	4

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Source: *Researcher's Computation (2025) Using E-views 9.0 Software*

At the 5% level of significance, Table 4.4 demonstrates that the F-statistic value of 1.20 is below the upper bound critical value of 4.01. It would appear from this that the null hypothesis—that there is no long-term relationship—is accepted and the alternative—that there is a long-term relationship—is rejected. AGRO and the explanatory variables ARF, GOVXA, CBLA, and ACGSF do not, therefore, have a long-term equilibrium relationship. The short- and long-term associations between these factors cannot thus be estimated.

4.3 Analysis of Regression

The findings of the study on the connection between Nigerian agricultural production and agricultural finance are compiled in Table 4.5. The ARDL 2, 1, 1, 0, 2 was the last model selected for the study, as indicated in Table 4.4. The Akaike Information Criterion (AIC) was utilized for automatic lag selection in order to determine the ideal lag duration.

Table 4.5: for ARDL Regression
Dependent Variable: AGRO: The model that was chosen is ARDL (2, 1, 1, 0, 2).

Variable	Coefficient	t-Statistic	Prob.
AGRO(-1)	1.625140	19.54814	0.0000*
AGRO(-2)	-0.630925	-7.502681	0.0000*
ACGSF	-0.121289	-1.716421	0.0898
ACGSF(-1)	0.115394	1.597773	0.1139
CBLA	5.862969	4.160862	0.0001*
CBLA(-1)	-5.985207	-4.513742	0.0000*
GOVXA	3.720239	1.156207	0.2509
ARF	6.932296	4.577527	0.0000*
ARF(-1)	-11.33298	-5.173208	0.0000*
ARF(-2)	4.609179	3.691445	0.0004*

C	-172.5648	-0.171894	0.8639
R^2	0.999705		
Adjusted R^2	0.999670		
F-statistic	28161.32		
Prob. (F-stat.)	0.000000		
D.W stat	2.170886		

Source: *Researcher's Computation (2025) Using E-views 9.0 Software. Note: * = 1% significant level*

The ARDL in result Table 4.4 indicates that the explanatory factors (ACGSF, CBLA, GOVXA, and ARF) explain almost 99% of the variation in the dependent variable (AGRO), as indicated by the OLS result, which shows an R2 value of 0.999705. The corrected R2 value of 0.999670, or around 99%, shows that the conclusion is still strong even after taking the degrees of freedom (df) into consideration. Consequently, the data is well-matched by the ARDL regression. When assessing the explanatory capability of the model at the 1% level of statistical significance, the F-statistic yields a result of 28161.32 with a corresponding probability value of 0.0000. This implies that the four explanatory factors—ACGSF, CBLA, GOVXA, and ARF—have a major influence on Nigerian produce. Autocorrelation is ruled out completely by the Durbin-Watson score of 2.170886. Every explanatory factor, with the exception of ACGSF and GOVXA, passed the significance test at the 1 and 5 percent levels, according to a detailed analysis of each individual model coefficient. This suggests that AGRO (-1), AGRO (-2), CBLA, CBLA (-1), ARF, ARF (-1) and ARF (-2) have a major influence on agricultural output in Nigeria, whilst ACGSF and GOVXA have no discernible effect. While AGRO (-2), CBLA (-1), and ACGSF displayed negative indicators, AGRO (-1), CBLA, ARF, ARF (-2), and GOVXA also displayed direct signs.

Diagnostic Test

The validity, robustness, and reliability of the ARDL results obtained from the empirical investigation were confirmed using the Ramsey RESET stability test, the Breusch–Godfrey Serial Correlation LM test, and the Breusch-Pagan-Godfrey heteroskedasticity test. Table 4.6 displays the test results.

Table 4.10: Result of the diagnostic test for ARDL model (2, 1, 1, 0, 2)

Diagnostic Tests (Test Statistics)	Test	Coefficient	P-value	Decision
Breusch-Pagan-Godfrey	Heteroskedasticity	1.736842	0.5058	No Heteroskedasticity problem
Breusch-Godfrey LM (F-Stat.)	Serial Correlation	0.707326	0.4960	No Serial correlation
Ramsey RESET Test	Model Specification Error: t-stat. F-Stat.	 1.549108 1.529617	 0.4306 0.3206	Equation is correctly specified

Source: *Author's computation, (2025) using Eviews 9.0*

The null hypothesis, according to Table 4.6's results of the Breusch-Pagan-Godfrey heteroskedasticity test, cannot be rejected since the probability values (0.5058) above the 0.05 (p. > 0.05) threshold of significance. Accepting the null hypothesis is crucial in order to determine that the models do not have a heteroskedasticity problem. Table 4.6 displays the results of the Breusch-Godfrey Serial Correlation LM test, which likewise show that the probability values (0.4960) are more than the 0.05 (p. > 0.05) threshold of significance, indicating that the null hypothesis—that there is no serial correlation—cannot be rejected. The conclusion that the model does not have a serial correlation problem—that is, that there is no serial correlation between the independent variables and the disturbance term—follows from the acceptance of the null hypothesis. Additionally, there are no specification errors in the models, as shown by the probability of the t-statistic and F-statistic of the Ramsey RESET test in Tables 4.6 being both larger than 0.05 ($p > 0.05$). This implies that the linear form of the model was provided precisely, that the functional form of the model is accurate, or that pertinent variables were included.

4.4 Discussion of Findings

According to the study, both one-year delayed agricultural production [AGRO (-1)] and two-year lagged agricultural output [AGRO (-2)] have a substantial impact on current year agricultural output (AGRO). Additionally, whereas current year agricultural output (AGRO) had a positive correlation with two-year lagged agricultural output [AGRO (-2)], it had a negative correlation with one-year lagged agricultural production [AGRO (-1). This leads to a

tendency for agricultural output that is one year lagged [AGRO (-1)] to rise, and for agricultural output that is two years lagged [AGRO (-2)] to fall. As a result, a unit increase in agricultural output that is one year behind schedule [AGRO (-1)] will raise agricultural output by 1.62 units, whereas a unit increase in agricultural output that is two years behind schedule [AGRO (-2)] will cause agricultural output to decline by 0.63 units. According to this conclusion, two-year lagged agricultural output [AGRO (-2)] and one-year lagged agricultural production [AGRO (-1)] had a substantial impact on Nigeria's current year agricultural output during the studied period.

The empirical results indicate that the coefficient of agricultural credit guarantee scheme fund (ACGSF) has a negligible negative impact on agricultural output (AGRO) and that ACGSF is not a critical agricultural finance variable that influences Nigeria's agricultural output during the reference period. Consequently, for every unit rise in ACGSF, agricultural output will decrease by an insignificant 0.12 units. The negligible adverse effect may be the result of the loans not being used for agricultural purposes but rather for other purposes. The result of this study agrees with Udeora and Vincent (2018), who found a negative relationship between agricultural credit guarantee scheme fund (ACGSF) and agricultural output(AGRO), but contradict those of Egwu (2016), Abbas (2021), Odili (2022) and Nnachi et al., (2023) who found a significant positive relationship between agricultural credit guarantee scheme fund (ACGSF) and agricultural output.

Furthermore, the ARDL result indicates that the coefficient of current year commercial bank loans to agriculture (CBLA) and one year lagged commercial bank loans to agriculture [CBLA (-)] have a substantial impact on agricultural production (AGRO). There is a negative correlation between commercial bank loans to agriculture [CBLA (-)] and AGRO one year behind, but there is a positive correlation between CBLA and AGRO. This suggests that CBLA and agricultural loans from commercial banks that are one year behind schedule [CBLA (-1)] are significant determinants of Nigeria's agricultural production. Agricultural output will therefore grow by 5.86 units for every unit increase in CBLA, while CBLA (-1) tends to decrease agricultural output. Consequently, for every unit increase in CBLA, agricultural output will drop by 5.98 units (-1). This finding aligns with the submission of Egwu, (2016), Matthew and Modecai (2016), Medugui et al., (2019), Obioma et al., (2021) and Toheeb and Dabo (2022) who concluded that commercial bank loans to agriculture has significant positive effect on agricultural output; but disagreed with that of Odili (2022) who found significant negative relationship between CBLA and agricultural output in their studies.

Moreover, government expenditure on agriculture (GOVXA) does not much increase Nigeria's agricultural output (AGRO). Nigeria's AGRO increases by 3.72 units for every unit increase in government spending on agriculture, according to this study. Consequently, government expenditure on agriculture does not significantly affect Nigerian agricultural output.This result is consistent with that of Ademola (2013), who found that government spending had a negligible positive impact on agriculture and agricultural productivity. This finding is contrary to the result of Lawal, (2011), Aina and Omojola (2017), Medugui et al., (2019), Toheeb and Dabo, (2022) and James and Uduak (2022) who reported a significant positive link between government expenditure on agriculture (GOVXA) and agricultural output.

Last but not least, the control variables, annual rainfall (ARF), one year lagged annual rainfall [ARF (-1)], and two years lagged annual rainfall [ARF (-2)] are positively and negatively correlated with agricultural output (AGRO), respectively. This suggests that increases in present annual rainfall (ARF) and two-year-lag annual rainfall [ARF (-2)] considerably boost agricultural output by 6.93 and 4.60 units, respectively, whereas increases in one-year-lag annual rainfall [ARF (-1)] decrease agricultural output by 11.33 units. The substantial influence of yearly rainfall suggests that it is essential to raising Nigeria's agricultural productivity. The finding is in consonance with the result of Obioma et al., (2021) which indicated that annual rainfall significantly influences agricultural output.

5. Conclusion and Recommendations

5.1 Conclusion

Examining the connection between Nigeria's agricultural output and agricultural funding was the aim of this study. The variables used as stand-ins for agricultural funding were government spending on agriculture (GOVXA), commercial bank loans to agriculture (CBLA), and the agricultural credit guarantee scheme fund (ACGSF). The agricultural GDP served as a proxy for agricultural output. The ARDL model, which was intended to examine the influence of agricultural financing factors on agricultural output, was specified using the Autoregressive Distributed Lag (ARDL) estimate approach using quarterly data from 2009Q1 to

2023Q4. The econometric analysis program E-view 9.0 was utilized. The results show that while government spending on agriculture (GOVXA) and the agricultural credit guarantee scheme fund (ACGSF) has no effect on agricultural output in Nigeria, commercial bank loans to agriculture (CBLA) do. Furthermore, the control variable, annual rainfall, significantly boosts agricultural productivity. According to the study's findings, agricultural finance has a major impact on Nigeria's agricultural output. This is demonstrated by the fact that commercial bank loans to agriculture (CBLA) significantly increase agricultural output.

5.2 Recommendations

The following policy recommendations are derived from the study's findings:

Given the study's findings that the Agricultural Credit Guarantee Scheme Fund (ACGSF) has a slight detrimental effect on agricultural output, we advise keeping a careful eye on farmers who receive loans under the fund to ensure they use them for agricultural purposes. The initiative should finance farmers who are ready and willing to begin medium- or large-scale farming in order to boost production for both domestic and foreign markets and create jobs. Nigeria would be able to gain foreign exchange as a result.

To further boost agricultural output, Nigerian deposit money banks ought to provide more loans to the country's agricultural industry.

If the government wants to greatly enhance Nigeria's agricultural output, it must likewise raise its spending in this area. It is also necessary to have a fiscal policy that is incongruous with the ongoing expenditures in the agricultural sector.

Finally, farmers should plan their crops to take advantage of Nigeria's rainy season.

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