THE IMPACT OF INSTITUTIONAL CREDIT ON AGRICULTURAL SECTOR OUTPUT IN NIGERIA: AN APPLICATION OF THE BOUND TEST APPROACH

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ABSTRACT

This study examines the impact of institutional credit on agricultural sector output in Nigeria. The investigation utilised time series data from 1986 to 2023, sourced from the Central Bank of Nigeria Statistical Bulletin and National Bureau of Statistics to affirm or reject the assertion that institutional credit can be used as part of concerted efforts aimed at increasing agricultural sector output in Nigeria. It was found that the variables for this study namely, agricultural sector output, commercial bank credit to agriculture, agricultural credit guarantee scheme fund, lending interest rate, and agricultural training expenditure had mixed order of integration, which informed the use of ARDL Bound Test Approach that is suitable for mixed order of integration I(1) and I(0) series. The investigation revealed that institutional credit is not significant to the growth of agricultural sector output (% contribution to GDP) in Nigeria. However, agricultural training expenditure had significant positive impact on agricultural sector output (% contribution to GDP) in Nigeria within the study period. The study therefore recommended the adoption of Agricultural Value Chain Finance (AVCF) that incorporates financial literacy training, savings, budgeting and cash flow management to help minimise default risk and improve the quality of agricultural loan portfolios at affordable rate.

Keywords: commercial bank credit, agricultural credit guarantee scheme fund, agricultural sector output, agricultural training expenditure.

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INTRODUCTION

Institutional credit had been identified as one of the major inputs for the development of agricultural sector output of any society (Egwu, 2016). Access to institutional credit can stimulate output growth of the agricultural sector, making it viable and enabling farmers to venture into new fields of production, employing new technologies, discovering new and improved farm produce to satisfy a large market, empowering farmers to provide utilities for a widening market and supporting its survival.

Nigeria is located in West Africa and it is the largest economy in the region. It has a total population of 140,431,790 as of 2006 population census, but computed as 206,139,587 as of year 2020 (World Development Indicator (WDI, 2021). It is estimated that about 84 million hectares of Nigeria's land area has potential for agriculture; however, only 40% of this is being cultivated (Federal Ministry of Agriculture and Rural Development (FMARD, 2016). Nigeria has huge reserves in several natural resources for growth and development in the availability of labour, arable land and rich vegetation that can support efficient agricultural output and heavily livestock production. It also has potential for irrigation farming with a surface and underground water of about 26.7 billion cubic meters (FMARD, 2016). Therefore, agricultural sector output growth has the potential to be the industrial and economic springboard for a sustainable economic development in Nigeria.

Agriculture was the main driver of the country's economic growth in the first decade after independence. Nigeria's economy was characterised as an agrarian economy. It was responsible for more than 60% of the country's GDP and offered nearly 90% of

the economy's need for food, industrial raw materials, and the country's export earnings among others (Metu, Okeyika & Maduka, 2016). However, the enormous importation of agricultural produce and staple foods replaced agriculture's major position in Nigeria's economy, particularly with regard to guaranteeing food security due to the neglect of the sector as a result of crude oil discovery.

Effort was however made to correct this problem by the government through institutional credit availability, so as to change the inefficient ways of practicing agriculture, generate amongst the farmers the zeal to embark on large scale production by providing the power to unveil abilities, vision, talents and also to acquire modern agricultural technology for greater out put via concessional interest rates to the agricultural sector, credit guidelines that encourage Deposit Money Banks (DMB) to lend to agricultural sector and the establishing of credit institution such as Nigerian Agricultural Cooperative and Rural Development Bank (NACRDB) and Agricultural Credit Guarantee Scheme Fund (ACGSF). As such, Commercial bank loans rose from 41.03 billion naira in 2000 to 128.41 billion naira in 2010 and 1,812.47 billion naira in 2022 (CBN 2022). Likewise, credit guaranteed under the ACGSF increased from 361.450.4 billion naira in 2000 to 7,740,507.6 billion naira in 2010 and 8,481,234.8 billion naira in 2022 (CBN 2022).

However, in spite of these increases in credit schemes in Nigeria to boost agricultural sub-sector output and her enormous human and natural resources endowment that can feed the entire West African sub-region, Nigeria has not made an impressive success, rather the sector has continuously produced below its potentials and relatively becoming a net importer of food and major agricultural products. Statistics

revealed that agricultural product imports, as a percentage of merchant imports, averaged 11.54%, which is substantially far above her exports, as a percentage of merchant exports, that averaged 5.14% between the periods 2000 and 2021 (WDI, 2021). In addition, the contribution of the agricultural sector to Gross Domestic Product (GDP) in the pre-rebasing periods averaged 26.51% between 1993 and 2002 and 25.66% between the period 2003 and 2012 compared to 22.09% in the period 2013-2022, showing a decline in output (CBN, 2022).

Given an increase in institutional credit incentives in the agricultural sub-sector with increasing output as the underlying objective, it is necessary thus to investigate the extent to which this credit objective has been achieved; the study put forward pertinent objectives of evaluating the impact of commercial bank credit on agricultural sector output in Nigeria, examine how agricultural credit guarantees scheme fund impacts agricultural sector output in Nigeria, investigate the impact of institutional lending rate on agricultural sector output in Nigeria and ascertain the impact of agricultural training expenditure on agricultural sector output in Nigeria.

LITERATURE REVIEW

Conceptual Review

Concept of Institutional Credit

Institutional credit had been defined as a repayable loan given by any recognised financial institution that enables the borrower carry out effective operations, such as storage, processing, marketing and production activities in an economy (Aina & Omojola, 2017). Institutional credit involves financial institutions' practice of

obtaining deposits from depositors and extending it to borrowers (Apata, Sanusi, Obaisi, & Ajani, 2016). A broader definition of institutional credit by Osabohien, Mordi and Ogundipe (2020) entails mobilising financial savings and distributing them to debtors via specialised organisations such as banks, leasing companies, credit schemes, micro-credit, and venture capital amongst others. These institutions are licensed to accept deposits from people with surplus and lend them to people, families, and companies for a predetermined amount of time at predetermined interest rates.

Institutional credit encompasses all loans and advances granted by formal financial institutions with the aim of enhancing output and productivity in an economy (Egwu, 2016). The working definition of institutional credit as used in this study is in line with Aina and Omojola's (2017) definition. Thus, it refers to a repayable loan given by any recognised financial institution that enable the borrower carry out effective operations, such as production and storage activities in the whole agricultural sector namely, distribution, wholesaling, processing as well as marketing.

Concept of Agricultural Sector Output

Agrarian segment output had always been seen as an overall monetary value of the entire pastoral produce by farmers to be consumed or used for further production in a given period (Andohol, & Abbah, 2018). Yusuf, Zakari, Alexander, Anthony and Alfa (2022) defined agricultural sector output as all agricultural products that include crops and animals that are grown which could serve as food. Similarly, Friday, Ogbechie, Ikechukwu, and Fredrick (2016) described agricultural sector

output as varieties of food and cash crops produced for consumption and export.

Okpara (2017) defined agricultural sector output as various useful agricultural goods that include crops and animals that are grown in large quantity which could serve as food or use for further production. The working definition of agricultural sector output in this work is synonymous to Andohol, and Abbah's (2018) view. Thus, it is defined as the total monetary value of the entire agricultural product (% contribution to the GDP) produced by farmers to be consumed or used for further production in a given period.

2.3 THEORETICAL REVIEW

Agriculture based development theory of Wiggins (2006) postulated that expansion of credit to farmers is anticipated to have a favourable link with output of farmers. A country can grow its agricultural sector output if it avails the needed credit to farmers at affordable rate. Historical record shows that this was the case with Great Britain in the 17th and 18th centuries and many of the recent East Asian countries that have seen prosperity in their agricultural output, like China, South Korea, Indonesia, and Taiwan. The rise in agricultural output has frequently come through significant expansions in credit (Wiggins, 2006). Quantitative comparisons across countries using regression analysis show a similar result. Irz, Lin, Thirtle and Wiggins (2001) reveal in this study that for Africa and Asia economy to reduce poverty by 7% and 5% respectively and grow their economy; they needed to channel additional credit to their agriculture to grow at 10% rate annually.

In addition, Werner (1993) emphasised the unique importance of credit to spur

output growth in the quantity theory of credit. He postulates that, "it is necessary and sufficient for an economic recovery to boost credit creation, through a number of measures such as; direct lending to companies and the government by the commercial banks, purchases of commercial paper, other debt, and equity instruments". Government could kick-start bank credit creation and thus trigger a rapid output growth by stopping the issuance of bonds and instead entering into loan contract with commercial banks. The central argument of this theory is that neither fiscal expansion, nor reserve expansion, nor structural reforms, will be able to stimulate growth, but the expansion of credit, "give people credit for transaction and production and spur output growth". Banks should be recognised not only as financial intermediaries that lend existing money, but creators of new money through the process of lending.

Solow (1956) and Swan (1956) growth theory further explored the importance of institutional credit for technical efficiency and technology acquisition. The neo-classical growth model is based on understanding that the availability of credit in a nation, as well as how individuals utilised the credit is key for increased output. Furthermore, the way an economy's land, capital, and labour interact impacts its output, and technological efficiency is believed to increase labour productivity in such a way that it increases the output capabilities of labour.

Based on the theoretical review, it is evident that agriculture-based development theory of Wiggins (2006) and Werner (1993) quantity theory of credit emphasise the unique importance of credit to spur output growth. If more farmers are able to access

loans through the various institutional sources and schemes at affordable rates, they would naturally be able to afford the necessary labour and technology to boost their production, thereby leading to increase output. This study is thus anchored on these two theories

Empirical Review

Various studies have been conducted to study the relationship between institutional credit and agricultural sector output. The results of these studies vary from one to the other owing to the difference in methodologies and time frames as well as the variables captured in the models.

A study titled 'the impact of agricultural financing on agricultural output growth and poverty alleviation in Nigeria' by Egwu (2016) postulated that commercial bank credit to agriculture, agricultural credit guarantee scheme fund loan to the agriculture significantly impacted agricultural sector output and in extension alleviated the poverty rate and induced economic growth in Nigeria. Ordinary least squares and co-integration test were employed to analyse the data. However, Friday, Ogbechie, Ikechukwu and Fredrick (2016) revealed a contrary report in their findings in a study titled 'credit supply and agricultural sector output in Nigeria'. Vector autoregressive approach maintained that agricultural credit guarantee scheme fund had no significant impact on agricultural production, but commercial bank credit had a significant impact on agricultural sector output.

Osabohien, Mordi and Ogundipe (2020) empirically analysed access to credit and agricultural sector performance in Nigeria over the period 1998-2018. With

variables such as agricultural credit guarantee scheme fund, commercial bank credit, arable land and agricultural employment and employing Autoregressive Distributive Lag (ARDL) model as a method of data analysis, the study ascertained that agricultural credit guarantee scheme fund and commercial bank credit increased agricultural performance by 10.3% and 17.1% respectively. Furthermore, arable land and agricultural employment also impacted agricultural performance by 65.5% and 12.4% respectively.

Similarly, Toheed and Dabo (2020) investigated the impact of agricultural finance on agricultural output in Nigeria 1983-2018. Their study lends credence to Osabohien, Mordi and Ogundipe (2020) that a positive nexus exists between agricultural credit guarantee scheme fund, commercial bank credit and the agricultural sector output. Vector Autoregressive model (VAR) analysed the result together with Granger Causality test.

Okwuchukwu (2022) examined agricultural financing and agricultural sector output in Nigeria. The result revealed long run relationship between the explained variable and all the explanatory variables such as agricultural sector output, agricultural credit guarantee scheme, commercial bank credit to agriculture, rainfall and interest rate. With the help of Johansen co-integration model, only agricultural credit guarantee scheme exerts a positive and significant effect on agricultural sector output; other explanatory variables such as commercial bank credit to agriculture, rainfall and interest rate were found to have negative but significant effect on agricultural sector output.

Synthesising insights of the empirical literature reviewed, the works of Osabohien, Mordi and Ogundipe (2020), Toheed and Dabo (2019) and Egwu (2016) had at various times estimated the impact of agricultural credit on agricultural sector output in Nigeria. A positive relationship was revealed from both ACGSF and commercial bank credit to the agricultural sector output. However, Okwuchukwu (2022) revealed a contrary report that only ACGSF had a positive impact, but commercial bank credit had a negative impact on agricultural sector output in Nigeria. Friday, Ogbechie, Ikechukwu and Fredrick (2016) further revealed a contrary result in their study that ACGSF had no significant impact on agricultural sector output, but commercial bank credit had a significant impact on agricultural sector output. Thus, this presents conflicting reports of how institutional credit impacted Nigerian agriculture sector output. This controversy thus called for further study in this study area.

METHODOLOGY

The Augmented Dickey-Fuller (ADF) test was applied on the time series secondary data. The results revealed that all the variables are integrated of order one – stationary after first difference– except lending interest rate which is stationary at level. The mixed order of integration informed the use of Auto- Regressive Distributive Lag (ARDL) model where the presence of co-integrating relationship between all the variables was checked. The result of ARDL co-integration established that there existed a long-run co-integration relationship among commercial bank credit to agriculture, agricultural credit guarantee scheme fund, lending interest rate,

agricultural training expenditure and agricultural output (% contribution to GDP) in Nigeria.

Model Specification

The model and choice of variables in the model are specified based on Werner (1993) and Wiggins' (2006) theory and in line with Egwu (2016) thus;

$ASO_t = f(CBC_t, ACGSF_t, LIR_t, ATE_t)$ ---------- (1)

Equation 1 is transformed into its econometric form as follows.

$ASO_t = a_o + a_1CBC_t + a_2ACGSF_t + a_3LIR_t + a_4ATE_t + U_t$ ---------- (2)

Where:

ASO = Agricultural Sector Output (% contribution to GDP)
CBC = Commercial Bank Credit to Agriculture
ACGSF = Agricultural Credit Guarantee Scheme Fund
LIR = Lending Interest Rate
ATE = Agricultural Training Expenditure
t = time
U = Error Term
a_0 = intercept of the model
$a_1, a_2 \ldots a_4$ = are coefficients of the explanatory variables.

Estimation Technique

This study adopted Auto-Regressive Distributed Lag (ARDL) bound testing approach. The main advantage of this approach is the flexibility that can be employed when the variables are of different order of integration. Another advantage is that the model takes sufficient numbers of lags to capture the data generating process in a general-to-specific modeling frame work. The corresponding Unrestricted Error Correction Model (UECM) is as follows:

$$Y_t = \beta_t + \sum_{t=n}^{K} Y_{t-1}\,\delta_t + \sum_{t=n}^{K} X_{t-1}\,\theta_t + \varepsilon_t \quad \text{----------} \quad (3)$$

Where;

Y and X are the variable of choice, β_t vector of intercepts, δ_t and Θ_t represent vector matrices that contain the short-run dynamic and long-run multipliers coefficients of the UECM respectively; it is the error term. In this study, equation (3) can be represented in the form of a linear error correction model (Pesaran, Shin & Smith, 2001) as follows:

$$\Delta \mathrm{ASO}_t \alpha_0 + \sum_{i=1}^{k} \alpha_{1i} \Delta ASO_{t-1} + \sum_{i=1}^{k} \alpha_{2i} \Delta \mathrm{CBC}_{t-1} + \sum_{i=1}^{k} \alpha_{3i} \Delta \mathrm{ACGSF}_{t-1} + \sum_{i=1}^{k} \alpha_{4i} \Delta LIR_{t-1} + \sum_{i=1}^{k} \alpha_{5i} \Delta ATE_{t-1} + \lambda_1 ASO_{t-1} + \lambda_2 CBC_{t-1} + \lambda_3 ACGSF_{t-1} + \lambda_4 LIR_{t-1} + \lambda_5 ATE_{t-1} + \varepsilon_t \quad \ldots\ldots 4$$

Where;

Δ is difference operator, ε_t is assumed to be serially uncorrelated

$\alpha^1, \alpha_2 \ldots \alpha^6$, and $\lambda^1, \lambda_2 \ldots \lambda_6$ represent the long-run and the short-run coefficients, respectively Besides, ASO, CBC, ACGSF, LIR and ATE are variables already defined in equation 1.

Subjecting equation 4 to data will result to testing co-integration relationship of the variables. The testing procedure of the ARDL bounds test is performed in three stages; the first stage is to examine the co-integration relationship among the variables. Once co-integration is established, the second step involves estimating the long-run impact in equation (5).

$$\lambda_i ASO_t = \lambda_1 ASO_{t-1} + \lambda_2 CBC_{t-1} + \lambda_3 ACGSF_{t-1} + \lambda_4 LIR_{t-1} + \lambda_5 ATE_{t-1} + \varepsilon_t \quad \ldots\ldots 5$$

The final step involves estimating an Error Correction Model (ECM) in Equation 6 to obtain the short-run impact as specified below

$$\Delta \mathrm{ASO}_t \alpha_0 + \sum_{i=1}^{k} \alpha_{1i} \Delta ASO_{t-i} + \sum_{i=1}^{k} \alpha_{2i} \Delta \mathrm{CBC}_{t-i} + \sum_{i=1}^{k} \alpha_{3i} \Delta \mathrm{ACGSF}_{t-i} + \sum_{i=1}^{k} \alpha_{4i} \Delta \mathrm{LIR}_{t-i} + \sum_{i=1}^{k} \alpha_{5i} \Delta ATE_{t-i} + \delta ecm_{t-1} + \varepsilon_t \quad \ldots\ldots 6$$

Where:

ASO, CBC, ACGSF, LIR, and ATE are variables previously defined in equation 1.

ecm_{t-1} = the error correction mechanism lagged for one period

δ = the coefficients for measuring speed of adjustment.

Equations 5 and 6 are subjected to data, their estimation addresses the research objective of this study.

RESULTS AND DISCUSSIONS

Table 1: Unit root test result
Augmented Dickey-Fuller (ADF) Statistic

level	T-statistic with intercept	P-value at level	T-statistic with intercept at 1st difference	P-value at 1st difference	Order of integration at
ASO	-1.827828	0.3614	-6.883627**	0.0000	1(1)
LNCBC	6.179440	1.0000	-2.054651**	0.0398	1(1)
LNACGS	-1.155418	0.6827	-4.373374**	0.0014	1(1)
LIR	-3.927346	0.0045	-6.750599**	0.0000	1(0)
LNATE	-2.169045	0.2205	-4.644419**	0.0007	1(1)

Note: ** imply significant at 5% level. Source: Authors' computations from Eviews.
Unit root test

The results revealed that all the variables are integrated of order one; stationary after first difference, except lending interest rate which is stationary at level. This result gives support to the usage of ARDL bounds test approach to determine the long run relationships among the variables

Co-Integration Analysis

The results of the bound test for co-integration are presented in Table 2. The critical values used in this work are extracted from the ARDL result using Eviews 10 software.

Table 2: Bound Test Result for Co-integration

F-statistics	Lag	Alpha level	Lower Bound	Bound Critical value Upper Bound
7.622798	4			
		1%	3.29	4.37
		5%	2.56	3.49
		10%	2.2	3.09

Source: EViews

The F-statistic for the model is 7.622798, which is greater than the upper critical bound value of (3.49) at the 5% significance level. This signifies that there exists a long-run co-integrating relationship among commercial bank credit to agriculture, agricultural credit guarantee scheme fund, lending interest rate, agricultural training expenditure and agricultural sector output (% contribution to GDP) in Nigeria, thus, rejecting the null hypothesis of no long-run relationships amongst the variables. The second step involves estimating the long-run and short-run level relationship between the variables:

Table 3: estimated long-run coefficient using ARDL approach

Regressor	**Coefficient**	**Standard Error**	**T-Ratio**	**[Prob]**
LNCBC	0.229175	0.610586	0.375336	[0.7112]
LNACGSF	-1.062544	0.562800	-1.887958	[0.0729]
LIR	0.312471	0.124868	2.502403	[0.0207]
LNATE	0.983773	0.341204	2.883239	[0.0089]

Source: Authors' computations from Eviews.

Table 3 presented the result of ARDL model. From Table 3, the coefficient of commercial bank credit to agriculture is positive but insignificant (0.711) above 5% significance level. This implied that a unit increase in commercial bank credit to agriculture would lead to 0.229 unit increase in agricultural sector output (% contribution to GDP) in Nigeria in the long run.

Furthermore, the result shows that the probability value of agricultural credit guarantee scheme fund as depicted in Table 3 was above 5% (0.0729) and the coefficient is negative (-1.062). Hence, it is insignificant. This, therefore, implies that agricultural credit guarantee scheme fund is inversely related to agricultural sector output (% contribution to GDP) in Nigeria in the long-run and has not

significantly impacted agricultural sector output (% contribution to GDP) in Nigeria. Lending interest rate exhibits a positive relationship with agricultural sector output (% contribution to GDP) and it has a long run significant impact on agricultural sector output in Nigeria with probability value of (0.0207). The coefficient of 0.312 implies that a unit increase in the total volume of lending interest rate will result to 0.312 unit increase in agricultural output (% contribution to GDP) in Nigeria.

The result of the coefficient of agricultural training expenditure is correctly signed, being positive. Besides, it is statistically significant at 5% level in the long run; given that its probability value (0.0089) is less than 0.05 which implies that, a unit change (increase) in LNATE will lead to 0.983 units increases in agricultural output (% contribution to GDP) in Nigeria.

The results of the short-run dynamics associated with the ARDL (4,0,4,0,0) are reported in Table 4. The coefficient of the lagged error correction term (-0.943571) is negative and statistically significant at 5% level of significance. The negative and significant coefficient is an indication of co-integrating relationship among all the variables. This magnitude (-0.943571) indicates that if there is any distortion, the long-run equilibrium is adjusted quickly where about 94% of the disequilibrium converges back to the equilibrium in the current year.

Table 4: Error Correction Representation for ARDL

Regressor	**Coefficient**	**Standard Error**	**T-Ratio**	**[Prob]**
LNCBC	0.216242	0.566563	0.381674	[0.7065]
LNACGSF	3.749449	1.728918	2.168668	[0.0617]
LIR	0.294838	0.093743	3.145162	[0.0049]
LNATE	0.928260	0.340742	2.724226	[0.0127]
(ECN-1)*	-0.943571	0.125391	-7.525058	[0.0000]
R-Squared	0.816342	R-Bar-Squared	0.766895	
Mean of Dependent Variable	0.165000	S.D. of Dependent Variable	2.949593	
S.E. of Regression	1.424091	Akaike info criterion	3.747269	
Residual Sum of Squares	52.72891	Equation Log-likelihood	-55.70357	
DW-statistic	1.873684			

Source: Authors' computations from EViews

Table 4 shows that the coefficient of commercial bank credit to agricultural sector is correctly signed being positive, but statistically insignificant at 5% level given the probability value of 0.7065. This implies that every unit increase in commercial bank credit to agriculture in the previous year (t-1) leads to 0.216 increases in the current ASO.

From the model, agricultural credit guarantee scheme fund is positively related with agricultural sector output in Nigeria in the short run, but the coefficient is statistically insignificant given the probability value of 0.0617. This implies that, a unit change (increase) in agricultural credit guarantee scheme fund in the previous year leads to 3.749 unit increase in ASO current year.

Also, from the short-run estimates, the coefficient of lending interest rate is positive and statistically significant at 5% level given the probability value of 0.0049. This implies that, a unit change in the total volume of lending interest rate in the previous year leads to a 0.294 unit increase in ASO in the current year.

Furthermore, the short run coefficient of agricultural training expenditure is 0.928, which is correctly signed and statistically significant at 5% level given the probability value of 0.0127. This implies that, a unit change (increase) in the previous year's agricultural training expenditure leads to 0.9282 unit change (increase) in ASO at the current year.

It is obvious from the coefficient of multiple determination (R^2) that the independent variables: commercial bank credit to agriculture, agricultural credit guarantee scheme fund, lending interest rate and agricultural training expenditure were found to jointly explain 82% of the movement (variation) in the dependent variable. The

model and overall significance of all the variables incorporated in the model is further explained with the R^2 adjusted of 77%.

Diagnostic and Stability Tests

Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Recursive Residuals Squares (CUSUMSQ) model suggested that, the blue line must not in any way cross the red line for any of both charts, if it does, there is a problem of recursive residuals in terms of mean (in first CUSUM chart) and in terms of variance (in second CUSUMSQ chart), meaning some variables which are sensitive to structural break might have been added. However, since the model passed these stability tests as shown in Figures 1 and 2, it indicates that all the coefficients of estimated model are stable over the study period as they fall within the critical bounds tests, thus no serial correlation, functional form error and misspecification errors.

Test for Heteroskedasticity and Auto correlation

From Table 6, probability values were 0.4034 and 0.3563 for F-statistic and observed R-squared respectively. This result implied that the study thus, reject the alternative hypothesis and accept the null hypothesis which implies that there was no problem of heteroskedasticity, hence the results and findings analysed in this study were valid and reliable. In addition, the results of auto correlation from Table 7 indicated that the probability values for the serial correlation test were not statistically significant at 5% significance level. Hence, the study thus, rejects the alternative hypothesis and accepts the null hypothesis which implies that errors in different observations were not correlated with each other, and further buttresses that the ARDL models in this study were correctly specified.

Discussion of Findings

The results obtained showed that there exists a positive but in significant impact of commercial bank credit on agricultural sector output (% contribution to GDP) in Nigeria both in the short-run and long-run.This result conforms to the a priori expectation and lends credence to Osabohien, Mordi and Ogundipe (2020); Toheed and Dabo (2019) and Egwu (2016) research who found that commercial bank credit had positive impact on agricultural sector output in Nigeria. However, the insignificant relationship connotes that commercial bank credit to agriculture is not large enough to drive the agricultural sector output to the optimum desire level needed in Nigeria, and this conform with Okwuchukwu's (2022) study.

This study also found that agricultural credit guarantee scheme fund had negative and insignificant impact on agricultural sector output (% contribution to GDP) in Nigeria in the long-run. The short-run result revealed positively but insignificant relationship between agricultural credit guarantee scheme fund and agricultural sector output(% contribution to GDP) in Nigeria. The short-run result conforms to the a priori expectation but the long-runresult disagrees with the a priori expectation. This result comes closer to Friday, Ogbechie, Ikechukwu and Fredrick (2016) research who found that agricultural credit guarantee scheme fund had an insignificant impact on agricultural sector output in Nigeria.

It was found that institutional lending rate had positive and significant impact on agricultural sector output (% contribution to GDP) in Nigeria both in the short-run and in the long-run. In addition, this result disagrees with the a priori expectation. Significant impact revealed by this study comes closer to Okwuchukwu (2022)who

also found in his study that institutional lending rate had significant impact on agricultural sector output in Nigeria.

The novelty of this study is that, it revealed a result different from the literatures reviewed that, agricultural training expenditure had positive and significant impact on agricultural sector output (% contribution to GDP)in Nigeria both in the long-run and the short-run,this result conforms to the a priori expectation. As such, an increase in agricultural training expenditure has the capacity to stimulate farmers to engage in training and re-training and as such modern farm implement and technical know-how are lent and utilised for realisation of optimum output in the agricultural sector in Nigeria.

CONCLUSION AND RECOMMENDATIONS

Based on the findings of this study, it was concluded that institutional credit is not significant to the growth of agricultural sector output (% contribution to GDP) in Nigeria within the study period. However, the study found that agricultural training expenditure had positive and significant impact on agricultural sector output (% contribution to GDP) in Nigeria both in the long-run and the short-run.

Recommendations are made on the basis and strength of the findings in this study to proffer solutions to the identified problems in order to achieve sustainable agricultural sector output growth in Nigeria as follows:

1. It is imperative for the Nigerian government to compel banks and other financial institutions to develop farmer-centred agricultural loan products and services that suit farmers as well as the other actors of the agricultural value chain.

2. The management board of agricultural credit guarantee scheme fund is expected to

relatively ease the condition of granting agricultural credit guarantee scheme fund loan that is devoid of administrative delay, non-insistence on outrageous security or collateral from the farmer, and flexibility should also build into repayment programmes. In addition, most farmers live in rural areas and have no contact with the formal financial institutions, as such, provision of branches or units across all the local government of Nigeria that would create awareness on how to access the credit and its potential benefit to farmers is timely.

3. In order to overcome the retarded nature of agricultural sector experience in Nigeria, there must be conscious and deliberate effort by all stakeholders (both government and private) to avail necessary farm equipment, extension officers in every nuke and cranny of the country. Efforts should be geared toward training of farmers in order to expand and increase production and then move away from subsistence agriculture to a robust agricultural sector output. This can only be achieved through increase in institutional credit for acquisition of training and adequate usage of machinery and technology.

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APPENDIX

Table 6
Result of Heteroskedasticity Test
Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.206422	Prob. F(24,9)	0.4034
Obs*R-squared	25.93764	Prob. Chi-Square(24)	0.3563
Scaled explained SS	1.530119	Prob. Chi-Square(24)	1.0000

Table 7
Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.103098	Prob. F(2,19)	0.9025
Obs*R-squared	0.365021	Prob. Chi-Square(2)	0.8332

Figure 1

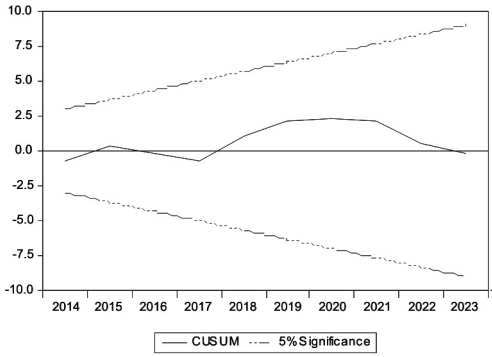

Figure 2