Sustainable Economies (2023) Volume 1 Issue 1
doi: 10.62617/se.v1i1.27

ORIGINAL RESEARCH ARTICLE

The effect of bank credits on agricultural output in Nigeria: 1981–2019

Andrew Ugbede Junior*, Odi Nwankwo

Department of Banking and Finance, Prince Abubakar Audu University, 1008 Anyigba, Kogi State, Nigeria

*** Corresponding author:** Andrew Ugbede Junior, andrewugbedejnr@gmail.com

ABSTRACT

The agriculture sector of the Nigerian economy has suffered a severe setback, particularly after the advent of oil in mass production. The government shifted attention completely to the oil sector at the detriment of the agriculture sector, resulting in a practice of mono-economy. However, in recent times, the government has seen the need to diversify the economy to reduce its overdependence on the oil sector. Thus, both the bank and the government have been channeling resources to the sector to boast its productive capacity. Thus, this study seeks to investigate the impact of bank credit on the agriculture sector from 1981 to 2019. The data was subjected to a preliminary test—a unit root test—to ascertain the order of integration and subsequently the method of estimation. The unit root outcome shows a mixed order, which informed the adoption of the dynamic ARDL method. The finding from the estimation proved that the impact of bank credit on agriculture productivity in the long run is positive but weak. This suggests that bank credit to agriculture could not explain the variation in the performance of sectoral output. In contrast, the impact of government expenditure on the agriculture sector is strong and positive. This validates the significant contribution of government involvement to the revival of the sector. Thus, a recommendation is made of the need for banks to increase their credit and loan advances to the agriculture sector by lowering the interest charged on loans to the sector. Secondly, banks should give close monitoring to the funds loaned out to the agriculture sector to ensure the funds are truly channeled to the sector and not diverted. Moreso, the government can still do more for the sector to fully revive. More productivity-enhancing strategies, such as subsidizing modern farm equipment, seeds, and so on, can still be put in place by the government to help the sector regain its lost glory.

Keywords: bank credit; agriculture output; government expenditure; interest rate

ARTICLE INFO

Received: 17 September 2023
Accepted: 28 October 2023
Available online: 24 November 2023

1. Introduction

Agriculture consists of the rearing of animals and the cultivation of land to produce food, biofuel, and other products used for life sustenance. Agriculture was mainly the essence of the development and rise of sedentary human civilization, such that the cultivation of domesticated species created food surpluses that nurtured the development of civilization. The Central Bank of Nigeria[1] asserts that Nigeria is blessed with a huge expanse of fertile land, rivers, streams, lakes, forests, and grasslands, in addition to a large human resource capable of sustaining an expanded productive and profitable agricultural sector, thereby leading to self-sufficiency in food and raw materials used by the industrial sector while providing gainful employment for the teeming population. All these are also accompanied by the generation of foreign exchange to boost the domestic economy. Unfortunately, agricultural contributions to economic growth have been declining since the advent

of oil. Several factors account for the poor performance of the agricultural sector in Nigeria.

According to Okafor[2], agriculture provides means of sustenance for both men and animals in the form of food for consumption as well as raw materials for domestic and foreign industries. Okafor[2] further asserts that the sector enhances the course of economic expansion of the national economy, serves as the largest employer of labour for the large population, and plays a significant role in the quest to eradicate poverty. In essence, a revolution in the agricultural sector and increased value-added activities in the downstream agro-processing sub-sector orchestrate a potential platform for effective wealth generation and, consequently, sustainable poverty eradication. The basic need—food—is obtained only from agrarian activities, both in developed and emerging economies. The sector serves as an important connector to other productive sectors of the national economy through the provision of essential raw materials as inputs. Thus, the agricultural sector plays a critical role in the overall wellbeing of the economy because of its direct impact on the economy and its influence on other sectors.

Generally, agriculture plays a significant role in human development through the multiplier effect in the economy. For instance, the basic need of man, which is food, is provided by the agriculture sector, in addition to providing the highest number of job opportunities for the working population. This is more evidenced in the agrarian economy, where the sector determines the culture and the customs that guide the existence of such nation[3]. The majority of households in Nigeria are dependent on agriculture for survival[4]. According to Ogbonna and Osondu[5], the benefits of the agriculture sector to the population cannot be overemphasized. These benefits include food supply, the contribution of the sector to the national output, a high level of job creation, providing raw materials for both foreign and local industries, and, more importantly, earning from the exportation of agriculture products. In fact, not until the early 1970s was the agriculture sector the main source of foreign exchange earnings for the Nigerian government.

As noted by Ita et al.[6], this key role played by the agriculture sector keeps eroding in the face of the discovery of oil and subsequent exploitation of oil in commercial quantities, especially beginning in 1970. The discovery of oil has been one major factor retarding the development of agriculture in Nigeria. However, in spite of its enormous role, the agricultural sector in Nigeria has been engulfed by so many problems, including inadequate finance to carry out various development projects in the sector for the overall development of the country. Commercial banks are reluctant to lend to farmers, citing the risky nature of activities in the sector. Statistical evidence has shown that commercial bank credit to the agricultural sector in Nigeria has remained very low. According to Udih[7], bank credit is expected to impact the real sectors of the economy positively through improved agricultural production of goods and services. He opined that sufficient financing of agricultural projects will not only promote food security but will also enhance the entrepreneurial performance of our young investors.

Commercial banks credit to agriculture in Nigeria was 2.0%. In 1980, it stood at 7.3%, while in 1990 and 2000, commercial bank credits to the agriculture sector were 16.2% and 8.2%, respectively. By 2010, commercial bank credit to agriculture in Nigeria fell drastically to 1.5%, and in 2012, commercial bank credit to agriculture in Nigeria increased moderately to 3.9%[8]. Money deposit banks are engaged in giving out loans and advances to their numerous customers that are due and are guided by the three principles of their operation, which are profitability, liquidity, and solvency. Other factors that influence the decision of the money deposit bank to loan out money to their customers include the prevailing interest rate, volume of deposits, the level of their domestic and foreign investment, the bank's liquidity ratio, prestige, and public recognition, to name a few[9]. All the effort put forth by the deposit money bank to provide loans and advances to the agriculture sector is aimed at promoting economic growth in the country. Unfortunately, the performance of the sector has yet to yield the desired result. This has raised a lot of concerns for the stakeholder and policy as to whether or not the loans and advances by the money deposit bank are a key factor that can influence the output

performance of the sector. This spurred the need to review the supposed impact of the loans and advances of the money deposit bank on agriculture and its productivity.

Objectives of the study

In view of the above, this study seeks to investigate the effect bank credit on agricultural output exerts on agricultural output in Nigeria from 1990 to 2020. The specific objectives will be to:

1) Examine the effect of commercial bank credit to the agricultural sector on agricultural output in Nigeria.
2) Investigate the effect of government expenditure on agriculture on agricultural output in Nigeria.
3) Ascertain the relationship that exists between deposit money banks credit to the agricultural sector and agricultural output in Nigeria.

2. Review of related theory

This session deals with the key concept used in this study and the review of related empirical work to find a ground on which this study would be conducted.

The supply-leading theory

Patrick[10] submits that supply-leading theory can best be defined as the finance-lead hypothesis. This hypothesis posits that the existence of financial organizations and the availability of their financial assets, liabilities, and related financial services in advance of demand for them. This will orchestrate the efficient allocation of available resources from surplus units to deficit units, thereby leading to the expansion of other economic. The supply-leading hypothesis operates in two distinct ways. Firstly, it facilitates the free flow of resources from traditional (non-growth) sectors to growth-driven modern sectors. Secondly, it induces entrepreneurial growth in the modern sector. Supply-lending financial intermediation can be termed "innovative financing"[11]. One of the most important effects of the supply-leading approach is that, as entrepreneurs have new access to supply-lending funds, their expectations increase and new horizons as to possible alternatives are opened, thereby making the entrepreneur "think big". A number of studies have argued in favor of a finance-led growth approach[12,13]. It should, however, be emphasized that the rationale for the supply-leading approach to the development of a country's financial system, and hence overall economic development, lies in its potential benefits to the economy in stimulating real economic growth and development; otherwise, managerial skills in supply-leading finance generate more costs than benefits to the economy.

3. Empirical review

Okuneye and Ajayi[14] study re-investigated the influence of commercial banks' credit to agriculture and government spending on the agricultural sector in Nigeria between 1980 and 2018. The finding revealed that the different financial incentives channeled and allocated to the agricultural sector could not translate into reasonable and sustainable productivity in the agricultural sector in Nigeria. Similarly, the works of Agunuwa et al.[15] and Uremadu et al.[16] studied the impact of commercial bank credit and government spending on the productivity of the agriculture sector in Nigeria. The findings of the ARDL co-integration test revealed that there is a long-term co-movement between agricultural government spending, interest rates, and agricultural production in Nigeria. Afolabi et al.[17] investigate the influence of agricultural credit on Nigeria's economic advancement for the period 1981–2017. The dynamic ARDL was adopted, and the results established proved that, in the long run, DMBCA exhibits a strong impact on the sector only in the immediate term. While the ACGSF demonstrates a weak effect on agriculture in the long run, Osabohien et al.[18] studied the relationship between bank credit to the agriculture sector and the output performance of the sector. The finding revealed

that agricultural credit proxied by ACGSF and bank credit to agriculture strongly induced the performance of sector output.

Egwu et al.[19] investigate the influence of credit rationing by deposit money banks on the productivity of the agriculture sector in Nigeria between 1981 and 2016. The result from the Vector Error Correction Model (VECM) revealed that credit provided to the fishery exerts a strong short-run impact on agricultural output, while credit channeled to cash crops, food crops, and livestock exhibits a tangible influence on agricultural output only in the short run.

Okafor[2] investigates the effect of bank credit on agricultural development in Nigeria. The key specific objectives include: investigating the influence of bank credit on agricultural productivity in Nigeria; assessing the effect of government expenditure on agricultural output in Nigeria; examining the impact of the Agricultural Credit Guarantee Scheme Fund on agricultural output in Nigeria, and examining the effect of the interest rate on agricultural output in Nigeria using secondary data collected from the Central Bank of Nigeria Annual Reports and Statement of Account. The data were analyzed using econometric techniques. Augmented Dickey Fuller and Philip Perron tests for unit roots and the ordinary least squares (OLS) technique. The study shows that credit to the agricultural sector, government spending on the agricultural sector, and the agricultural credit guarantee scheme fund have positive and significant effects on agricultural output, while the interest rate has a negative and insignificant effect on agricultural output. The study, therefore, concludes that commercial bank credit has a positive effect on agricultural output in Nigeria and has increased agricultural production in Nigeria.

Asukwo et al.[6] examined the effect of commercial bank lending on the growth of the agricultural sector in Nigeria. The objectives were to examine the impact of total loans and advances on agricultural sector output, examine the influence of lending rates on agricultural sector output, and establish the relationship between commercial bank liquidity and agricultural sector output. The findings found a strong connection between loans and advances, interest rates, liquidity, bank assets, and agricultural output. The study recommended that banks should make efforts to grant agricultural loans at the appropriate time.

Megudu et al.[20] investigate the relationship between bank loans and agriculture performance in Nigeria, covering the period 1980 to 2018. The finding from the OLS estimation found evidence of a positive and strong impact of bank credit on agriculture productivity.

Oyelade[21] examines the influence of bank credits on agricultural productivity in Nigeria, spanning from 1980 to 2015. Adopting the FMOLS approach, the result revealed that the interest rate on commercial banks' credit to agriculture and deposit money banks' assets exerts a strong influence on agricultural performance. Also, it was found that bank loans on agriculture and deposit money banks' assets are the key determinants of crop productivity in Nigeria.

Awotide et al.[22] investigate the influence of access to credit on agricultural productivity in Nigeria by adopting the Endogenous Switching Regression Model (ESRM). The first stage of the ESRM proved that total livestock units and farm size strongly determine farmers' access to credit. The second stage reveals that total livestock unit and farm size strongly and negatively explain the variations in cassava productivity among the farmers that have access to credit, while household size, farm size, and access to information assets demonstrate a strong inverse impact on cassava productivity among the farmers without access to credit.

The work of Ogbonna and Osondu[5] investigates the effectiveness of formal credit sources as measured by the amount of loan disbursed to agriculture in 1992. The finding indicates that the level of funds made available to the agricultural sector from organized sources was influenced in a positive way by the interest rate and banks' liquidity ratio. This agreed with the work of Filli et al.[23] in Adamawa State, Nigeria.

Chisasa and Makina[24] examine the influence of bank credit on agricultural productivity in South Africa from 1970 to 2011. Credit and capital formation demonstrate a strong positive influence on agricultural performance in Nigeria.

Obilor[25] examines the influence of banks' credit to the agricultural sector under the Agricultural Credit Guarantee Scheme Fund in Nigeria. The result revealed that the lead independent variable exerts a strong positive effect on agricultural output, while the other variables indicate a strong negative effect on agriculture performance.

Ololade and Olagunju[3] investigate the determinants of credit access by rural farmers in Oyo State, Nigeria. Data were collected with the aid of structured questionnaires administered to 210 respondents using a multistage sampling procedure. The binomial logic model revealed that significant relationships existed between sex (–2.0187), marital status (–1.9786), lack of guarantor (2.1517), high interest rate (6.8263), and access to credit. The variables were significant at 10%, aligning with the work of Kolapo et al.[26] and Tawose[27] in Nigeria.

4. Method of analysis

This study seeks to examine the influence of the money deposit banks' credit on the agricultural sector in Nigeria and its effect on the productivity of the sector. Secondary data will be obtained and used for estimation given the aim of the study; thus, the research design of this study would be *expo facto* because it is more suitable since the situation for the study already exists and data are available.

4.1. Model specification

$$AGX = f(CBCR, GEXPA, INR) - \text{functional relationship} \quad (1)$$

Employing Cobb Douglas production function, $X = \beta_0 L\beta_1 K\beta_2$, the above functional relationship can be expressed as:

$$AGO = \beta_0 + \beta_1 BCA + \beta_2 GEA + \beta_3 INTR + \mu \quad (2)$$

Taking the natural log of both sides,

$$\ln(AGO) = \beta_0 + \beta_1 \ln(BCA) + \beta_2 \ln(GEA) + \beta_3 \ln(INR) \quad (3)$$

Therefore, the econometric model can be specified as:

$$\ln(AGO)t = \beta_0 + \beta_1 \ln(BCA)_t + \beta_2 \ln(GEA)_t + \beta_3 \ln(INTR)_t + \mu_t \quad (4)$$

where, AGO = agricultural output; BCA = commercial banks credit to agriculture; GEA = government expenditure on agriculture, and INTR = interest rate, using lending rate as a proxy, β_0 = intercept β_1, β_2, and β_3 are parameter estimates of the explanatory variables, and μ_t = is the error term, while ln is the natural log.

The a priori expectation is that β_1 and $\beta_2 > 0$, $\beta_3 < 0$.

4.2. Auto-regression distribution lag (ARDL)

Generally, it is believed that most macro-economic variables are not stationary at level[28,29]. Thus, the choice of autoregressive distributed lags (ARDL) is informed by the mixed order of integration obtained from the unit root test.

Besides, the advantage of autoregressive distributed lags (ARDL) over the traditional method is that ARDL is flexible and dynamic in nature. Therefore, this study adopts autoregressive distributed lags (ARDL) to estimate the relationship between government expenditure and agricultural output. The formula to estimate the functional model is stated as follows:

$$\text{AOUTP} = \beta_0 + \beta_1 \text{BCA} + \beta_2 \text{GEA} + \beta_3 \text{INR} + \varepsilon \quad (5)$$

$$\text{AOUTP} = \beta_0 + \beta_1 \text{BCA} + \beta_2 \text{GEA}_{t-i} + \beta_3 \text{INR} + ECT_{-1} \quad (6)$$

where, ε—stochastic or random error term (with usual properties of zero mean and non-serial correlation).

where:

AGO = agricultural output

BCA = bank loan to agriculture

GEA = government expenditure on agriculture

INTR = interest rate

A priori specification: The expected signs of the coefficients of the explanatory variables are: b1 > 0, b2 > 0, b3 > 0.

However, since time series data is used, the stationarity of the variables and co-integration among the variables are tested prior to estimation using ADRL. According to Pesaran[30] and Pesaran and Shin[31], ARDL can be written as:

$$\Delta LAGO = \beta_0 + \sum_{l=i}^{P} \beta_1 \Delta AGO_{t-i} + \sum_{l=i}^{Q} \beta_2 \Delta BCA_{t-i} + \sum_{l=i}^{R} \beta_3 \Delta LGEA_{t-i} + \sum_{l=i}^{S} \beta_4 \Delta LINTR_{t-i} + \varphi_1 \Delta LAGO_{t-i} + \varphi_2 \Delta LBCA_{t-i} + \varphi_3 \Delta LGEA_{t-i} + \varphi_4 \Delta LINTR_{t-i} \quad (7)$$

where:

β_0 = intercept (or regression constant)

β_x = short-term coefficients

φ_x = long-run coefficients

5. Data presentation and interpretation

This session will present the results of the estimation of the model of this study from different procedures used. This will start with the preliminary tests, which include the summary statistics, the correlation matrix, and the unit root tests.

5.1. Descriptive statistics

The revelation from the findings of the descriptive statistics proved that average agriculture output (AGO) in the period under review stood at 3.10, with minimum and maximum values of 2.50 and 3.60, respectively. Similar to this, the outcome shows that the average value of bank credit to agriculture stood at 3.39, as the minimum and maximum values present were –0.53 and 6.52 in the period under study. Government expenditure witnessed a very low average, which stood at 0.90, while its minimum and maximum values were –4.61 and 4.25, respectively. In a related development, the average value of the interest rate is 1.35, while its minimum and maximum values are –65.56 and 17.46, respectively. Of all the variables incorporated in this study, bank credit to agriculture demonstrates the highest value of average. Also, it is generally accepted that skewness is an estimation adopted to ascertain the degree of asymmetry in how the series are distributed around their mean. Positive skewness entails an exhibition of a long right tail by the variables, while negative skewness explains the opposite, implying that the distribution demonstrates a long left tail. The finding presented in **Table 1** shows that all variables are negatively skewed. This suggests that all the series incorporated in this study exhibit long left tails with lower values below the sample average. Kurtosis seeks to explain the flatness or peakness of the distribution of the series under consideration. The result indicates that AGO and INTR

variables have a Kurtosis value greater than three, which indicates that they are leptokurtic, that is, the curve is peak height, while that of BCA and GEA is platykurtic in nature.

Testing the normal distribution of series involved the use of Jargue-Bera and its probability[32]. If the probability value of the Jargue-Bera is greater than 5%, we reject the null hypothesis and conclude that the series are normally distributed. The revelation from the finding of the estimation proved that the Jaque-Bera *P*-value of AGO (0.069) is greater than 5% degree of freedom; thus, we reject the null hypothesis. By doing so, we concluded that the AGO series is normally distributed. This outcome is applicable to BCA and GEA. In contrast, INTR demonstrates through its probability value (0.0000) that the variable is not normally distributed. This is proved by the significance value of its probability value. Thus, the overall outcome of the normality test shows that the series incorporated in the model are normally distributed, given that most of the series are normally distributed.

Table 1. Summary statistics estimation.

	LNAGO	LNBCA	LNGEA	INTR
Mean	3.107150	3.399777	0.901246	1.347964
Median	3.086774	3.714277	1.954445	4.340000
Maximum	3.609974	6.522133	4.252345	17.46620
Minimum	2.504743	–0.526616	–4.605170	–65.86000
Std. Dev.	0.212158	2.135226	2.984353	15.13544
Skewness	–0.533804	–0.273581	–0.638677	–2.513358
Kurtosis	4.407157	1.925814	1.997992	11.34880
Jarque-Bera	5.069801	2.361553	4.282936	154.3267
Probability	0.079270	0.307040	0.117482	0.000000
Sum	121.1788	132.5913	35.14858	52.57058
Sum Sq. Dev.	1.710414	173.2492	338.4417	8705.094
Observations	39	39	39	39

Source: Author's computation.

Generally, most macroeconomics drift in an unpredicted way due to the uncertainty associated with modern market economies. Thus, it is important to check the trends of the variables incorporated in this study to ascertain their trend movement. The result of the trend analysis is presented in **Figure 1**, which shows all the variables exhibit draft characteristics, most especially the interest rate (INTR) and agriculture output (AGO). Within the period under review, the interest rate and the agriculture output keep fluctuating significantly compared to other variables. Generally, it can be deduced from the graph that all other variables were fluctuating during the periods under study. However, the interest rate (INTR) experienced a sharp fall in 1995, which did not last the test of time. Finally, agriculture output experienced a sharp rise in 2002 but did not last, and it was the lowest in 1981.

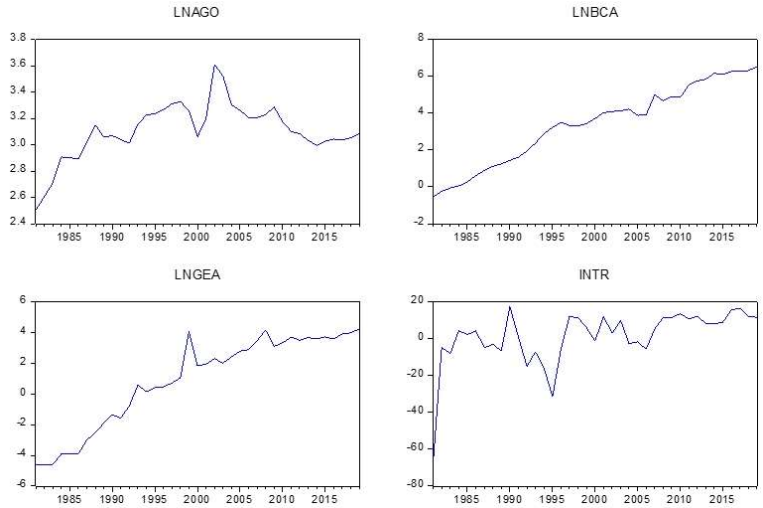

Figure 1. Trend movements of specified variables.

5.2. Correlation matrix

A correlation matrix is an econometric procedure used to determine whether or not there is a relationship among the variables of interest[33]. The result, as presented in **Table 2**, indicated that there is a strong correlation between agriculture output (AGO) and bank credit to agriculture (BCA). This shows that the two variables exert influence on each other. Similarly, the finding proved that government expenditure (GEA) is significantly correlated with agriculture output (AGO), while interest rate (INTR) also demonstrates a strong relationship with agriculture output (AGO). In essence, all the independent variables are strongly correlated with the target variables of the model. The overall result of the estimation indicates that all the variables exhibit a strong relationship with each other, as proved by their probability values, which are all significant.

Table 2. Correlation matrix.

Observations	LNAGO	LNBCA	LNGEA	INTR
LNAGO	1.000000			
t-statistic				
Probability				
Observation	39			
LNBCA	0.475231	1.000000		
t-statistic	3.285425			
Probability	0.0022			
Observation	39	39		
LNGEA	0.584078	0.958461	1.000000	
t-statistic	4.377014	20.44029		
Probability	0.0001	0.0000		
Observation	39	39	39	
INTR	0.391433	0.538875	0.513681	1.000000
t-statistic	2.587453	3.891144	3.641800	
Probability	0.0137	0.0004	0.0008	
Observation	39	39	39	39

Source: Author's computation.

5.3. Unit root stationarity test

Generally, it is difficult to obtain data on macroeconomic variables that are stable and do not drift because of the uncertainty faced by virtually every modern economy[34]. As such, macroeconomic series need to be subjected to stationarity tests to ascertain the level of integration, which in turn helps determine the method to be employed for estimation[35]. The series incorporated in this study were subjected to a unit root test through Augmented-Dickey Fuller (ADF) and Phillips-Perron (PP) techniques in an attempt to detect the presence or otherwise of a unit root, as shown in **Table 3**. Evidence from the finding indicates that the probabilities of agricultural output (AGO) and interest rate (INTR) have no evidence of unit roots at level I (0), which is less than the 5% degree of freedom. Thus, we reject the null hypothesis and conclude that the series are free from unit roots. On the other hand, the unit root was detected in government expenditure on agriculture (GEA) and bank credit to agriculture (BCA); thus, they were subjected to the first differential. The current result shows that there is no evidence of a unit root, as indicated by the probability value of the variables. In general, AGO and INTR achieve I (0) order of integration, while BCA and BCA turn out to be stationary at I (1). This proved evidence of a mixed order of integration. As a result, the best method for analysis is the dynamic ARDL model.

Table 3. Unit root test.

Variables	Level, I (0)		First difference, I (1)		Decision
Series	**ADF**	**PP**	**ADF**	**PP**	
LNAGO	–3.0728 (0.0377)	–3.2613 (0.0240)	–6.2466 (0.0000)	–4.9434 (0.0000)	I (0)
LNBCA	–1.2726 (0.6323)	–2.3518 (0.1618)	–4.7611 (0.0000)	–4.8651 (0.0000)	I (1)
LNGEA	–2.3338 (0.1673)	–1.7644 (0.3919)	–7.6237 (0.0000)	–7.5459 (0.0000)	I (1)
LNINTR	–6.6978 (0.0000)	–6.3377 (0.0000)	–9.7851 (0.0000)	–19.1911 (0.0000)	I (1)

Source: Researcher's computation.

5.4. ARDL cointegration test

This study employed the ARDL approach as the most suitable method to ascertain the presence of a co-integrating (long-run) relationship among the variables adopted in this study. The outcome is presented in **Table 4**, given 5% degrees of freedom, which revealed that the *F*-statistic (7.179505) is greater than all the 10%, 5%, 2.5%, and 1% lower bounds (2.97), (3.38), (3.8), and (3.4) and their respective upper bounds (3.74), (4.23), (4.68), and (5.23). This validates the assertion that there is a co-integrating (long-run) relationship among the variables.

Table 4. Bounds tests.

Test statistic	Value	Signif.	I (0)	I (1)
F-statistic	7.179505	10%	2.97	3.74
K	3	5%	3.38	4.23
		2.5%	3.8	4.68
		1%	4.3	5.23

Source: Researcher's computation 2021 E-view 10.

5.5. Short run effects and ECM estimation

The long-run relationship was established among the series; thus, the short-run relationship among the variables was also estimated, and the result is presented in **Table 5**. According to R^2, about 88% of the variation in agriculture output is explained by the independent variables incorporated in the model of this study. The result reveals that bank credit to agriculture in the short run exhibits a weak negative impact on agriculture output in the period under review. In essence, a 1% increase in bank credit to agriculture will degenerate into a –0.046 (prob—0.4008) decrease in the level of agriculture output. This disagreed with most studies, such as Adeyinka et al.[36]. Government expenditures on agriculture also demonstrate an impact on agriculture output in the short run. A 1% increase in government expenditure will produce a weak increase in the productivity of the agriculture sector by 0.035 (*p*-0.139), this confirms the work of Nosike[37] in Nigeria. The impact of the interest rate on the productivity of the agriculture sector is weak, indicating that the interest rate is not a determinant of the agriculture sector in the short run. A 1% increase in the interest rate will result in a positive but weak. A 1% increase in the interest rate will improve the performance of the sectoral output by 0.000766 (prob—0.5787) in Nigeria. The result of the error correction term (ECM) shows that the speed of adjustment stood at 66%. The implication of this result is that the speed of adjustment in the economy will take place speedily[38]. That is, any disequilibrium in the short run can be easily corrected in the long run at a speed of 66%.

Table 5. ARDL error correction regression.

Short-run estimation: Explained variable: GDP					
Explanatory variables	**Co-efficient**	**Std. error**	***t*-Stat**	**Prob-value**	**Decision rule**
C	2.570601	0.480133	5.353941	0.0001	Signif.
ΔBCA	–0.046053	0.053146	–0.866532	0.4008	Insignif.
ΔGEA	0.035424	0.022620	1.566051	0.1397	Insignif.
ΔINTR	0.000766	0.001348	0.568551	0.5787	Insignif.
ECT_{t-1}*	–0.667672	0.098279	6.793670	0.0000	Signif.
R-Squared	0.882730			**Mean dependent var**	0.005407
Adjusted R-Sq.	0.785005			**S.D. dependent var**	0.109231
Durbin Watson	1.903557			**Akaike info criterion**	–2.822664
***F*-statistic**	9.032819			**Schwarz criterion**	–2.104377
Prob (*F*-statistic)	0.000016			**Hannan-Quinn criter.**	–2.577708

Note: *** indicates 1%, ** indicates 5% and * means 10% significance level. Significance level = 5%.
Source: Researcher's computation, 2022 from E-view 10.

5.6. Long-run coefficients of the estimated model

The outcome of the long-run relationship between the variables is presented in **Table 6**, along with the coefficients of each variable in the estimated model. Bank credit to agriculture exhibits a weak positive influence on the output performance of the sector. Every 1% increase in bank credit to the agriculture sector will bring about an approximately 0.11% increase in agriculture output. The implication of this result is that bank credit to agriculture is not a strong determining factor for the increase in sectoral output.

Government expenditure on agriculture exerts a positive and tangible impact on agricultural output. In clearer terms, a 1% increase in government expenditure will induce agricultural output by 0.10% in the long run, which cements the work of Idoko and Jatto[39].

Finally, the impact of the interest rate on agriculture output is weak, though positive and elastic in nature. This suggests that a change in interest rate will induce a quick response from the agriculture sector and its actors. However, this response does not yield a meaningful result as regards output performance. In particular, a 1% increase in the interest rate will enhance output performance by 5.57% in the long run.

Table 6. ARDL long run coefficient.

Variable	**Coefficient**	**Std. error**	***t*-Statistic**	**Prob.**	**Remarks**
LNBCA	0.111984	0.099701	1.123192	0.2802	Insignificant
LNGEA	0.103285	0.030148	3.425894	0.0041	Significant
INTR	5.75×10^{-5}	0.004463	0.012883	0.9899	Insignificant
@TREND	–0.049383	0.015617	–3.162167	0.0069	Significant

Source: Author's computation.

5.7. Diagnostic tests

Diagnostic test is key in every econometric estimation as it determines whether or not the model is well specified, well fitted, and so on. Particularly, the residual normality test basically measures the probability that the residuals of the target variable are normally distributed, which would imply that no other significant inference can be further derived from the target variable. The result from this test is presented in **Table 7**, where we reject the null hypothesis given that the probability (0.6292) is greater than 5%. Thus, we conclude that the residuals of the dependent estimated model are normally distributed. Similarly, we found that there is

no serial correlation because the probability value of 0.3933 is greater than the 5% level of significance. Thus, we conclude that there is no traceable case of serial correlation. We also discovered that the model is homoscedastic.

Table 7. Diagnostic test.

Test	*F*-statistics	Prob.	Decision rule
Normality test	0.9265	0.6292	Residuals are normally distributed
Serial correlation	1.0095	0.3933	No serial correlation
Heteroscedasticity	1.0242	0.4913	No Heteroscedasticity
Ramsey-Reset	0.1703	0.6866	Model is well specified

Source: Researcher's computation, 2023 from E-view 10.

Finally, the CUSUM and CUSUMSQ tests are critical because they determine whether or not the model parameters are stable[40]. The result of the tests is presented in **Figure 2** below. According to the revelation, the model parameters fall within the 5% critical level, which represents the red line boundaries. Thus, the parameters are within acceptable econometric bounds, implying that the model is stable and fitted for policy implications and guidance.

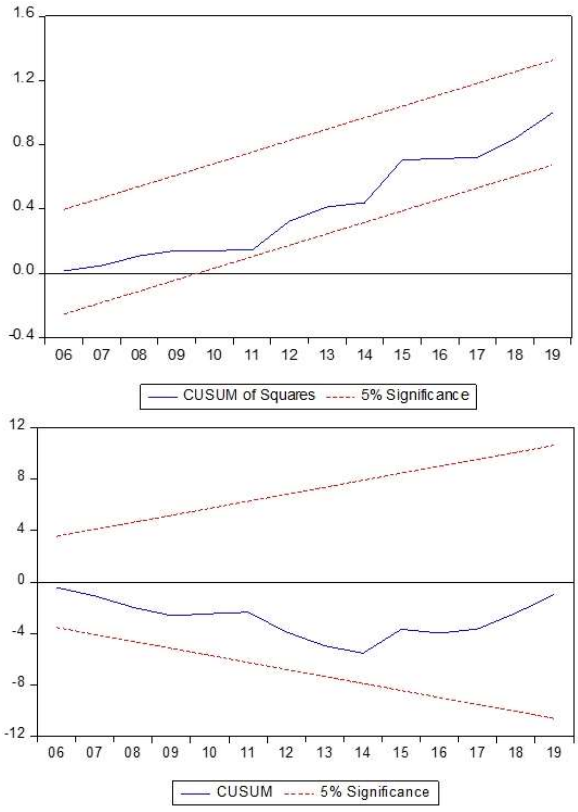

Figure 2. CUSUM and CUSUMSQ tests.

5.8. Granger causality test

The results of the pairwise Granger causality test in this study are presented in **Table 8**, indicating the evidence of several causal relationships among the series under consideration. First, the outcome proved a one-way causal effect running only from agriculture output (AGO) to bank credit to agriculture (BCA) in Nigeria. This shows that only agriculture output derives bank credit to agriculture output. The implication is that when agriculture output increases, bank credit to agriculture will expand due to its demand to expand agriculture productivity. That is, bank credit cannot independently induce agriculture output performance, which is against

our appriori expectation. In contrast and in accordance with our appriori expectation, the result indicates that government expenditure on agriculture enhances agriculture productivity, as proved by a one-way causal effect running only from government expenditure to agriculture output. In practical terms, it implies that an increase in government expenditure on agriculture will drastically expand the performance of the sector. All other causal effects show no causal relationship.

Table 8. Granger causality test.

Null hypothesis	Obs.	*F*-Statistic	Prob.
LNBCA does not Granger Cause LNAGO	35	1.00226	0.4242
LNAGO does not Granger Cause LNBCA		3.67389	0.0168
LNGEA does not Granger Cause LNAGO	35	4.66368	0.0057
LNAGO does not Granger Cause LNGEA		0.94696	0.4528
INTR does not Granger Cause LNAGO	35	1.21231	0.3295
LNAGO does not Granger Cause INTR		0.15262	0.9601
LNGEA does not Granger Cause LNBCA	35	0.38435	0.8178
LNBCA does not Granger Cause LNGEA		1.17220	0.3460
INTR does not Granger Cause LNBCA	35	1.04946	0.4011
LNBCA does not Granger Cause INTR		1.26510	0.3089
INTR does not Granger Cause LNGEA	35	0.42359	0.7902
LNGEA does not Granger Cause INTR		1.43789	0.2497

Source: Author's computation.

5.9. Discussion of the findings and implication

This study seeks to examine the impact of deposit money banks on agriculture output in Nigeria from 1981 to 2019. The dependent variable employed is agriculture output, while the regressors are the deposit money bank credit to agriculture, government expenditure on agriculture, and the interest rate. The model was subjected to the dynamic ARDL model, as suggested by the unit root test and outcome. The results of the model estimation obtained for both the short run and long run are presented in this chapter. First, the finding revealed that the impact of money deposit bank credit to agriculture output in both terms is weak and negative in the short run but positive and intangible in the long run. In essence, the influence of money deposit bank credit to the agriculture sector was not felt in the period under review in Nigeria. This, though validating the work of Okuneye and Ajayi[14], is against our appriori expectation. According to Okuneye and Ajayi[14], the different financial incentives channeled to the agricultural sector did not translate into substantial and sustainable agricultural production growth in Nigeria. However, this finding contradicts the work of Osabohien et al.[18]. According to the findings of Osabohien et al.[18], bank credit to the agriculture sector enhances the productivity of the sector significantly in Nigeria. The differences in the result may be due to the time frame, frequency, or sources of data used. Further results revealed that the impact of government expenditure on agriculture exhibits a strong positive impact on the agriculture sector's performance, which is in accordance with our appriori expectation as well as validating the empirical work of Okafor[2] in Nigeria. This means that government expenditure on agriculture is a key determinant of agricultural productivity in Nigeria. Thus, the key finding here suggests that government expenditure on agriculture enhances agricultural performance more than the deposit of bank credit in the period under review in Nigeria. This implies that the influence of government fiscal policy through its spending instruments on the agriculture sector is more effective than the effort put in by the bank to inform credit in an attempt to improve the performance of the sector.

6. Summary, conclusion, and policy guide

This study primarily seeks to examine the impact of money deposit banks on agriculture output over the period 1981–2019. Specific objectives examined include the investigation of the long-run impact of bank credit on agriculture output, the long-run influence of government expenditure on agriculture productivity, and the causal relationship between interest rates and agriculture output in Nigeria. The result from the RDL dynamic model indicates that the impact of bank credit on agriculture output is positive but weak. This means that bank credit issued to the sector has not generated the desired growth in agriculture as expected. In contrast, it was discovered that government expenditure as an instrument of fiscal policy is crucial in an emerging agrarian economy like Nigeria. In essence, boosting the agricultural sector required the active participation of the government through its fiscal instrument—government expenditure. This conclusion validates the view of the Keynesian theory of national income. According to the Keynesian model, government participation in the operation of the national economy is critical to achieving economic growth. However, this negates the submission of the monetarists, who preferred the adoption of monetary policy instruments such as the money supply as a way of improving the performance of an economy.

Given the empirical submission, the following recommendations and policy implications have been put forward:

1) Since the impact of bank credit on the agriculture sector is weak, it suggests that either the credit issued by the bank to the sector is inadequate to influence output growth in the sector or the loans do not get to the real farmers to achieve their original purpose. Thus, the money deposit bank credit to the agriculture sector should be made simple and accessible to the deserving farmers and at a lower cost of borrowing. In essence, more loans or credit facilities should be available to qualified farmers in rural areas to enhance their output performance. Also, the bank should constitute a monitoring team to ensure that the facilities really get to the targeted farmers and are not hijacked by politicians or those who will divert the funds for another purpose not related to agriculture performance.
2) In addition to the first policy mentioned above, the government should encourage the adoption of farm tools or implements that are up-to-date (modern farm tools), and subsidized agro-chemicals and fertilizers should be made available to encourage greater output performance.
3) Although government expenditure exerts a strong impact on agriculture output, there is still room for improvement or increased government spending on the sector. That is, the government should still significantly increase its budgetary allocation to the agriculture sector if achieving greater productivity in the sector is the target of the government. Another way the government can encourage the sector is by encouraging the export of the output of the sector for external earnings. This can be done by directly buying the products of the sector at a reasonable price and exporting them. That way, the farmers will be encouraged to perform better in their output, thereby making the sector more competitive on international markets.
4) Provision should be made for the training and capacity building for staff of the institutions that are saddled with the responsibility of implementation of relevant policies (CBN, banks, ministry of agriculture, etc.) to strengthen institutional capacity, as well as enlightening the loan beneficiaries on their operations and fund management, including the due amount to borrow based on individual capacity to repay, how to repay the borrowed fund without pressure, and how to invest it in the farm business with minimum risk.
5) The government should actively venture into farm enterprises by setting up large farms in rural and urban centers.
6) In conclusion, practical policies and steps are required to increase the output performance of the sector. These policies include a lower interest rate charged on funds borrowed for agricultural purposes. This can be achieved by the Bank of Agriculture and the Central Bank of Nigeria.

Author contributions

Conceptualization, methodology, estimation was written by AUJ, while interpretation and conclusion were carried out by ON. All authors have read and agreed to the published version of the manuscript.

Conflict of interest

There is no conflict of interest between authors.

References

1. Central Bank of Nigeria. Statistical bulletin. Available online: https://www.cbn.gov.ng/out/2016/sd/2015%20statistical%20bulletin%20contents%20and%20narratives.pdf (accessed on 31 October 2023).
2. Okafor CA. Commercial banks credit and agricultural development in Nigeria. *International Journal of Business & Law Research* 2020; 8(3): 89–99.
3. Ololade RA, Olagunju FI. Determinants of access to credit among rural farmers in Oyo State, Nigeria. *Global Journal of Science Frontier Research Agriculture and Veterinary Sciences* 2013; 13(2): 16–22.
4. Ayeomoni IO, Aladejana SA. Agricultural credit and economic growth nexus. Evidence from Nigeria. *International Journal of Academic Research in Accounting, Finance and Management Sciences* 2016; 6(2): 146–158.
5. Ogbonna SI, Osondu CK. Determinants of supply of funds to agricultural sector from formal sources in Nigeria from 1992 to 2012. *Greener Journal of Agricultural Sciences* 2015; 5(3): 81–92. doi: 10.15580/GJAS.2015.3.051815074
6. Ita AJ, Owui HO, Dunsin OM, Ita R. Commercial banks lending and the growth of agricultural sector in Nigeria. *IIARD International Journal of Banking and Finance Research* 2020; 6(3): 1–13.
7. Udih M. Bank credits and agricultural development: Does it promote entrepreneurship performance? *International Journal of Business and Social Science* 2014; 5(11): 102–107.
8. Nwankwo O. Agricultural financing in Nigeria: An empirical study of Nigerian Agricultural Co-operative and Rural Development Bank (NACRDB): 1990–2010. *Journal of Management Research* 2013; 5(2): 28–44. doi: 10.5296/jmr.v5i2.2806
9. Olokoyo FO. Determinants of commercial banks' lending behavior in Nigeria. *International Journal of Financial Research* 2011; 2(2): 61–72.
10. Patrick HT. Financial development and economic growth in underdeveloped countries. *Economic Development and Cultural Change* 1966; 14(2): 174–189. doi: 10.1086/450153
11. Schumpeter JA. *The Theory of Economic Development*. Harvard University Press; 1934.
12. Cameron AGW. The origin of the atmospheres of Venus and the Earth. *Icarus* 1963; 2: 249–257. doi: 10.1016/0019-1035(63)90021-6
13. Levine R. Financial development and economic growth: Views and agenda. *Journal of Economic Literature* 1997; 35(2): 688–726.
14. Okuneye BA, Ajayi FO. Commercial Bankâ€™s credit, government expenditure and agricultural output in Nigeria: An error correction model. *KIU Journal of Social Sciences* 2021; 7(1): 73–82.
15. Agunuwa EV, Inaya L, Proso T. Impact of commercial banks' credit on agricultural productivity in Nigeria (time series analysis 1980–2013). *International Journal of Academic Research in Business and Social Sciences* 2015; 5(11): 337–350. doi: 10.6007/IJARBSS/v5-i11/1921
16. Uremadu SO, Ariwa FO, Uremadu CED. Impact of government agricultural expenditure on agricultural productivity in Nigeria. *Current Investigations in Agriculture and Current Research* 2018; 5(3): 679–688.
17. Afolabi M, Ikpefan OA, Osuma GO, et al. Impact of agricultural credit on economic growth in Nigeria. *WSEAS Transactions on Business and Economics* 2021; 18(52): 511–523. doi: 10.37394/23207.2021.18.52
18. Osabohien R, Mordi A, Ogundipe A. Access to credit and agricultural sector performance in Nigeria. *African Journal of Science, Technology, Innovation and Development* 2022; 14(1): 247–255.
19. Egwu PN, Nnabu BE, Mbam BN, Nwibo SU. Credit rationing by deposit money banks and implication on agricultural output in Nigeria. *Global Journal of Agricultural Sciences* 2020; 19(1): 59–69. doi: 10.4314/gjass.v19i1.8
20. Megudu PZ, Musa I, Abalis EP. Commercial banks' credit and agricultural output in Nigeria: 1980–2018. *International Journal of Research and Innovation in Social Science (IJRISS)* 2019; 3(5): 244–251.
21. Oyelade AO. Impact of commercial bank credit on agricultural output in Nigeria. *Review of Innovation and Competitiveness* 2019; 5(1): 5–20. doi: 10.32728/ric.2019.51/1

22. Awotide BA, Abdoulaye T, Alene A, Mangyong VW. Impact of access to credit on agricultural productivity: Evidence from smallholder cassava farmers in Nigeria. In: Proceedings of The 29th International Conference of Agricultural Economists; 9–14 August 2015; Milan, Italy. doi: 10.22004/ag.econ.210969
23. Filli FB, Onu JI, Adebayo EF, Tizhe I. Factors influencing credits access among small scale fish farmers in Adamawa State, Nigeria. *Journal of Agricultural Economics, Environment and Social Sciences* 2015; 1(1): 46–55.
24. Chisasa J, Makina D. Bank credit and agricultural output in South Africa: Cointegration, short run dynamics and causality. *Journal of Applied Business Research (JABR)* 2015; 31(2): 489–500. doi: 10.19030/jabr.v31i2.9148
25. Obilor SI. The impact of commercial banks' credit to agriculture on agricultural development in Nigeria: An econometric analysis. *International Journal of Business, Humanities and Technology* 2013; 3(1): 85–94.
26. Kolapo TF, Ayeni RK, Oke MO. Credit risk and commercial banks' performance in Nigeria: A panel model approach. *Australian Journal of Business and Management Research* 2012; 2(2): 31–38.
27. Tawose JOB. Effects of bank credit on industrial performance in Nigeria. *International Business and Management* 2012; 4(1): 158–168.
28. Gujarati DN. *Basic Econometrics*, 5th ed. McGraw-Hill Education; 2008.
29. Joshua U. An ARDL approach to the government expenditure and economic growth nexus in Nigeria. *Academic Journal of Economic Studies* 2019; 5(3): 152–160.
30. Pesaran MH. The role of economic theory in modelling the long run. *The Economic Journal* 1997; 107(440): 178–191. doi: 10.1111/1468-0297.00151
31. Pesaran HH, Shin Y. Generalized impulse response analysis in linear multivariate models. *Economics Letters* 1998; 58(1): 17–29. doi: 10.1016/S0165-1765(97)00214-0
32. Joshua U, Güngör H, Bekun FV. Assessment of foreign direct investment-led growth argument in South Africa amidst urbanization and industrialization: Evidence from innovation accounting tests. *Journal of the Knowledge Economy* 2022. doi: 10.1007/s13132-022-01015-9
33. Joshua U, Adedoyin FF, Sarkodie SA. Examining the external-factors-led growth hypothesis for the South African economy. *Heliyon* 2020; 6: e04009. doi: 10.1016/j.heliyon.2020.e04009
34. Joshua U. Accounting for the determinants of FDI inflow in Nigeria amidst global oil price shock and economic recession. *Academic Journal of Economic Studies* 2020; 6(3): 30–38.
35. Joshua U, Bekun FV. The path to achieving environmental sustainability in South Africa: The role of coal consumption, economic expansion, pollutant emission, and total natural resources rent. *Environmental Science and Pollution Research* 2020; 27(9): 9435–9443. doi: 10.1007/s11356-019-07546-0
36. Adeyinka AJ, Daniel AA, Olukotun GA. An assessment of the contributions of commercial banks to agricultural financing in the Nigerian economy. *International Journal of Advanced Academic Research—Social Sciences and Education* 2015; 1(2): 1–16.
37. Nosike AN. Total government spending on agriculture and its output growth in Nigeria. *American Based Research Journal* 2019; 8(2).
38. Joshua U, Salami OM, Alola AA. Toward the path of economic expansion in Nigeria: The role of trade globalization. *Journal of Labor and Society* 2020; 23(2): 205–220. doi: 10.1111/lands.12471
39. Idoko CU, Jatto SM. Government expenditure on agriculture and economic growth in Nigeria (1985–2015). *International Journal of Academic Research and Reflection* 2018; 6(4): 24–39.
40. Amade MA, Mohammed I, Ibisanmi EV, et al. Interaction between domestic investment foreign direct investment and economic growth in Nigeria. *Academic Review of Economics and Administrative Sciences* 2022; 15(2): 261–275. doi: 10.25287/ohuiibf.904346