Effect of Bank Lending on Agricultural Output in Nigeria From 1981 – 2021 (Auto-regresive Distribution Approach)

SALISU, Temitope Quadri (Salisutemitope1703@gmail.com)
University of Ibadan https://orcid.org/0009-0000-0051-6726
ALAMU, Olamilekan Kabir
Federal University Ado-Ekiti

Research Article

Keywords: Agriculture, Bank Lending, Economy growth, Interest rate

Posted Date: August 10th, 2023

DOI: https://doi.org/10.21203/rs.3.rs-3235799/v1

Additional Declarations:
The authors declare no competing interests.

EFFECT OF BANK LENDING ON AGRICULTURAL OUTPUT IN NIGERIA FROM 1981 – 2021 (AUTO-REGRESIVE DISTRIBUTION APPROACH)

SALISU, Temitope Quadri[1] and **ALAMU,** Olamilekan Kabir[2]
[1] Member Department of Economics, University of Ibadan
Salisutemitope1703@gmail.com

[2]Member Department of Finance, Federal University Ado-Ekiti
Alamuolamilekan007@gmail.com

Abstract: *Lending plays a vital role in expediting agricultural modernization and encouraging farmer involvement in the development process. By alleviating financial constraints, lending offers the motivation to embrace new technologies that might otherwise be adopted at a slower pace. This study investigates the effect of bank lending on agricultural activities in Nigeria from 1981 - 2021 using secondary form of analysis. Different diagnostic tests were carried out which include descriptive statistics, pear wise correlation matrix, unit root test, co-integration test and auto regressive distributed model (ARDL). The result of the study shows that commercial bank lending to agriculture and interest rate has a positive and statistically significant effect on agricultural output in Nigeria. The study recommends that government should strengthen financial institutions which are the credit agencies in order to ensure efficient disbursement of fund to agricultural and manufacturing sectors and ensuring that funds are not misappropriated for other purposes, in order to boost economic growth.*

Index Terms: Agriculture, Bank Lending, Economy growth, Interest rate

Introduction

The significance of agriculture in human development cannot be overstated. It fulfills essential food requirements for human populations, serves as the primary occupation in agrarian nations, and embodies the way of life, culture, and customs of the people (Olagunju and Ajiboye, 2010). In Nigeria, agriculture holds a crucial role as the economic backbone for many households and is a substantial sector of the country's economy (Ayeomoni and Aladejana, 2016). Its contributions to Nigeria's economy are diverse, encompassing the provision of food, contribution to the gross domestic product (GDP), employment opportunities, supply of raw materials for agro-allied industries, and generation of foreign earnings (in the past, agricultural exports were the primary source of foreign exchange earnings until the early 1970s) (Ogbonna and Osondu, 2015). Abayomi (2015) emphasized that increasing agricultural production is essential for achieving industrialization, as it accounts for approximately 70 percent of the sectors providing employment for the working population. In the pre-1970s era, Nigeria's economy relied heavily on agriculture, solid minerals, and other metals, reflecting an agrarian nature. Agricultural commodities also served as the major source of export earnings for the country.

Lending is the use of or possessing of funds and services without immediate payment. It can be in the form of money borrowed or agricultural credit which includes trade credit and bank credit. Agricultural lending therefore can be in various forms for example seed, fertilizer with deferred payment, use of tractors, labours, storage facilities and so on. The term lending also means the capacity to borrow (Mgbakor, Patrick & Divine, 2014). However, commercial banks have traditionally played an important role in financing agriculture. Commercial banks are interested in giving out loans and advances to their numerous customers bearing in mind the three principles guiding their operations which are profitability, liquidity, and solvency. However, commercial banks decision to lend out loans are influenced by a lot of factors such as the prevailing interest rate, volume of deposits, the level of their domestic and foreign investment, banks liquidity ratio, prestige, and public recognition to mention a few (Olokoyo, 2011).

In the realm of financial intermediation, traditional banks (deposit-money banks) play a pivotal role by channeling deposits collected from surplus spending units into various sectors of the economy such as loans and investments. This makes them crucial catalysts for Nigeria's economic progress as they promote savings, provide capital for development, encourage trade activities, act as investment inducement agents, offer managerial advice to small-scale industrialists, contribute to the development of the capital market, and facilitate international trade (Ajie, 2015). As pointed out by Ajie and Ewabore (2013), agriculture serves as a source of human and animal consumption, as well as raw materials for agro-based industries. Its contributions to the economy include fostering growth, creating employment opportunities for the growing population, and combating poverty. The advancement of agriculture and value addition activities in the downstream agroprocessing sub-sector offer a potential platform for effective wealth generation and sustainable poverty eradication. Since food is a fundamental necessity of life, agricultural practice plays a crucial role in its production. Furthermore, agriculture acts as a key link to other productive sectors by providing essential raw materials as inputs, making it fundamental to the overall growth and interconnectedness of the economy with other sectors.

Statement of the Problem

Nigeria, much like other African countries, possesses abundant agricultural farmland and favorable geographic conditions that support year-round agricultural production. However, commercial banks, as noted by Obilor (2013), have shown little interest in financing agriculture. To incentivize banks, the Central Bank of Nigeria introduced the Agricultural Credit Guarantee Scheme (ACGS) to mitigate risks associated with agricultural lending. Unfortunately, this approach did not yield the desired results due to the substantial capital requirements involved in labor- and capital-intensive agricultural ventures (Nwankwo, 2013). Consequently, despite its diverse agro-ecological resources, Nigeria heavily relies on importing basic food items and raw materials for industries (Itodo, Apeh, and Adeshima, 2013).

According to Oyelade (2019), one of the reasons behind the decline of the agricultural sector's contribution to the GDP is the lack of access to credit from commercial banks. This lack of access hinders farmers from seizing economic opportunities, increasing output, and escaping poverty. The persistent credit constraint has long plagued poor farmers and rural residents, and access to formal credit remains a critical component needed to boost agricultural production. Sadly, most farmers continue to struggle to access formal credit, which limits their ability to adopt advanced agricultural technologies and enhance productivity.

Objectives of the Study

(i) To examine the trend between bank lending and agricultural activities (subsector of agriculture) in Nigeria.

(ii) To examine the effect of commercial bank lending to agriculture on agricultural out in Nigeria

(iii) To analyze the short and long run dynamism between agricultural output and bank lending

Overview of Nigerian Economy and Its Agricultural Sector

Nigeria is the largest country in Africa, covering a vast land area of 923,768 km2, and is home to an estimated population of over 170 million people (NPC, 2011 Est.). It borders the Gulf of Guinea on the western coast of Africa and shares boundaries with the Republic of Benin, Chad, and Cameroon to the east. The country's diverse vegetation, dynamic topography, and favorable agro-climatological conditions make it well-suited for agricultural activities, and it possesses good arable farmland.

The Nigerian economy comprises various industries, with services accounting for 32% of the GDP, manufacturing for 11%, and agriculture for 30%. Therefore, agriculture plays a significant role in Nigeria's economic growth and development.

Agriculture involves land cultivation for crop production and animal rearing for human use and livestock feed. Additionally, the sector encompasses sub-sectors such as forestry, fishery, processing, and marketing of agricultural products. Agriculture not only creates job opportunities but also provides raw materials for numerous agro-allied industries.

In many Third World and developing countries, agriculture has been a longstanding practice and is

crucial for their transition towards economic prosperity. In Nigeria, as in many developing nations, agriculture contributes over a quarter of the GDP, and its significance is even higher in the least developed countries (United Nations, 2007).

According to the World Bank development report (2007, 2008), agriculture is a vital source of sustenance for over 2.5 billion people worldwide. It engages a large portion of the global population directly or indirectly in the agricultural value chain.

Bank Credit and the Nigerian Economy

Since the inception of the banking system, it has been playing a pivotal role in providing credit to the Nigerian economy. To assess the impact of bank credit on economic growth, the aggregate bank credit to the economy is used as a proxy, measured by the gross domestic product (GDP). This credit is further categorized into credit to the public sector (government) and credit to the private sector. This section of the study focuses on analyzing credit to these sectors from 1992 to 2008 to evaluate its influence on the growth of the Nigerian economy.

Data on aggregate domestic credit from deposit money banks reveals that between 1993 and 1994, credit to the economy increased from 64.5 percent to 67.3 percent. From 1995 to 2008, credit to the economy experienced fluctuations, with growth rates as follows: 24.1% in 1995, 34.7% in 1996, 25.9% in 1997, 14.8% in 1998, 55.7% in 1999, 42.1% in 2000, 32.7% in 2001, 37.9% in 2002, 15.3% in 2003, 38.4% in 2004, 20.5% in 2005, 40.2% in 2006, 86.1% in 2007, and 45.7% in 2008 (CBN, 2010). The highest growth rate was recorded in 2007, which could be attributed to the gains on post-consolidation of Nigerian Banks.

Trend of Bank lending to Agriculture

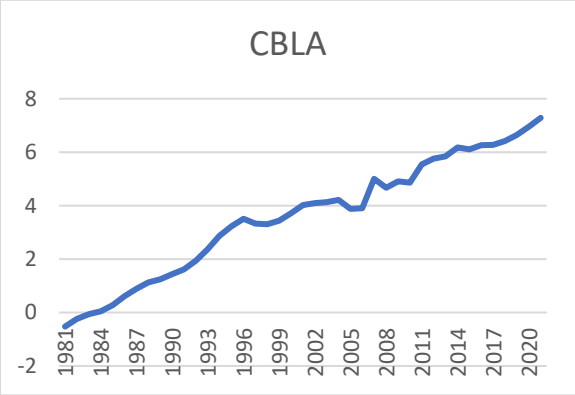
According to the data presented in the figure, there has been a consistent increase in bank lending to agriculture from 1981 to 2021. Between 1981 and 1985, the average bank lending to agriculture was -0.10143%. This increased to 1.06% during the period of 1986 to 1990. Similarly, from 1991 to 1995, the bank lending to agriculture doubled, reaching an average of 2.41%.

The trend continued with an even higher rate of increase from 1996 to 2000, with bank lending reaching an average of 4.068%. Subsequently, from 2001 to 2005, the bank lending remained constant at 4.068%. However, in the period of 2006 to 2010, there was a further increase in bank lending to agriculture, reaching an average of 4.66%.

The upward trend continued, and from 2011 to 2015, bank lending rose to 5.88%. The most recent data from 2016 to 2021 showed that bank lending continued to increase, reaching an average of 6.63%.

In conclusion, the analysis demonstrates that bank lending to agriculture has been consistently increasing over time throughout the study period.

Figure 2.1 Trend of Bank lending to Agriculture



Source: Authors Computation from Central Bank of Nigeria Statistical Bulletin (2021)

Nigeria's Agricultural Credit Policies

Since the 1970s, the Nigerian government has made various attempts to revive the agricultural sector and achieve self-sufficiency in food supply. Credit policies have been designed with the goal of fostering growth and development in agriculture, aiming to achieve self-sustaining growth in sub-sectors and improving the well-being of Nigerians. The Central Bank of Nigeria (2007) highlighted that the purpose of agricultural financing initiatives and policies is to establish an effective system to cater for credit schemes in a sustainable manner. This system would encompass various programs and institutions providing credit at macro and micro levels to small, medium, and large-scale producers.

Over the years, successive Nigerian administrations have introduced several policies and programs to restore agriculture's former glory and address the challenges of insufficient credit financing faced by farmers. These initiatives are part of the government's comprehensive work-plan and framework for

achieving overall agricultural growth and sustainable development.

Since the 1970s, the government has implemented a range of policy initiatives to provide agricultural finance services, aiming to facilitate agricultural growth in the sector. These policies include various schemes, initiatives, programs, and institutions, some of which are no longer in existence or have undergone changes in name and structure. Notable among them are the sectoral allocation of credit (1970-1996), People's Bank of Nigeria (1990-2002), Nigerian Family Economic Advancement Program (1997-2001), Small and Medium Enterprise Equity Investment Scheme (2001-2008), Rural Banking Program (1977-1991), lending as a percentage for savings mobilization in rural areas (1977-1996), and concessionary interest rate (1980-1987). However, there are still ongoing policies in Nigeria, which are discussed below.

Agricultural Production and Productivity in Nigeria

The agricultural sector in Nigeria is a significant employer, engaging 60% of the country's working population and contributing over 40% to its GDP. However, households primarily reliant on agriculture face higher poverty levels (World Bank, 2014). Within the agricultural sector, crop production holds the largest share, accounting for about 88% of the total GDP from agriculture (Mogues et al., 2014).

Between 2002 and 2012, the agricultural sector in Nigeria experienced an annual growth rate of approximately 5.9%. However, this growth is attributed mainly to population growth and expanded farming on larger lands, likely by commercial farmers (Oseni et al., 2014).

The predominant form of agriculture in Nigeria is rain-fed, characterized by low productivity, limited technology adoption, and high labor intensity. Low agricultural productivity is linked to factors such as minimal fertilizer use, soil fertility decline, and reliance on traditional rain-fed farming methods. Research has shown that Nigerian farmers across all regions are operating below their production frontiers, indicating potential for increased agricultural productivity without significant changes in input use (Liverpool-Tasie et al., 2011; Oseni and Winters, 2009). Limited use of inputs and improved farm technology, including better seeds and fertilizers, contributes to the low agricultural productivity in the country.

More than 80% of Nigerian households attribute their poverty to agricultural challenges, with 44% citing problems related to the lack of affordable agricultural inputs like fertilizers and seeds (Oseni and Winters, 2009). The Federal Ministry of Agriculture and Rural Development is involved in efforts to estimate fertilizer usage and availability.

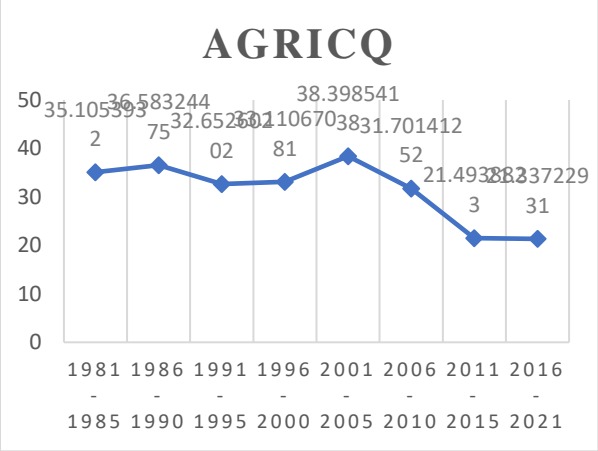
Trend Analysis of Agricultural Output in Nigeria

Figure 2.1 presents the trend of agricultural output in Nigeria, measured in billion dollars and percentage growth rates. Between 1981 and 1985, agricultural output stood at $35.105 million, with a growth rate of 2.54%. From 1986 to 1990, both the value of agricultural output and its growth rate increased, reaching $36.5 million.

However, during the period of 1991 to 1995, agricultural output experienced a decline in its total value. Subsequently, from 1996 to 2000, the value of agricultural output rose to $33.1 million. Again, in the periods of 2001 to 2005, the figure for agricultural output increased significantly to $38.3 million.

However, in the periods of 2006 to 2010 and 2011 to 2016, agricultural output declined to $31.7 million and $21.49 million, respectively. Finally, from 2016 to 2021, agricultural output further reduced to $21.3 million.

Figure 2.2: Trend of Agricultural Output in Nigeria from 1981 to 2021



Source: Author's Computation from Central Bank of Nigeria (CBN, 2021)

Nigerian Commitment towards Agricultural Output and Production

Since Nigeria gained independence, successive governments have demonstrated their commitment to the agricultural sector by implementing policy reviews aimed at achieving the country's economic growth and development objectives. Before the dominance of crude oil as the main revenue source, abundant resources in agriculture were the focus. The government has initiated and executed various policies and programs to stabilize and enhance the agricultural sector. While some of these projects are still ongoing, others have been abandoned due to their failure to meet the intended goals.

Some of the programs that have been implemented include the Farm Settlement Scheme (1959), National Accelerated Food Production Program (NAFPP) (1972), Agricultural Development Projects (ADPs) (1972), Nigerian Agricultural Cooperation and Rural Development Bank (NACRDB) (1973), River Basin Development Authorities (RBDAs) (1976), Operation Feed the Nation (OFN) (1976), Agricultural Credit Guarantee Scheme Fund (ACGSF) (1977), Green Revolution Program (1980), and Directorate of Foods, Roads, and Rural Infrastructures (DFRRI) (1985). Additionally, mechanisms such as credit schemes have been adopted to provide adequate support to rural farmers and ensure sufficient agricultural supply in the country. The Central Bank of Nigeria (CBN) has facilitated these credit schemes, offering lending opportunities at lower interest rates for the agricultural sector to willing farmers.

Successive Nigerian governments have consistently made conscious efforts to improve credit flow to the agriculture sector. Some of the ongoing credit schemes currently available for agriculture and its value chains include the Commercial Agriculture Credit Scheme (CACS) introduced in 2009, Nigeria Incentive-Based Risk Sharing System for Agricultural Lending (NIRSAL) launched in 2011, and the Micro, Small, and Medium Enterprises Development Fund (MSMEDF) launched in 2013.

Empirical Literature Review

Obilor (2013) conducted a study to assess the impact of commercial banks' credit under the Agricultural Credit Guarantee Scheme Fund on the agricultural sector in Nigeria. The findings indicated that both the Agricultural Credit Guarantee Scheme Fund and government fund allocation to agriculture had a positive and significant effect on agricultural productivity. However, other variables showed a significant negative effect. In the same vein, Tomak (2013) investigated the influence of bank-level (size and access to funds) and market-based (interest rate, inflation rate, GDP) variables on bank lending behavior in Turkey, using data from 15 private commercial banks and 3 state-owned banks for the period 2003-2012. The empirical results demonstrated that bank business loans were influenced by factors such as bank size, total liabilities, nonperforming loans to total loans (NPL), and inflation rate. Additionally, the ownership structure of the banks also affected their lending behavior.

Udoka et al. (2016) examined the impact of commercial banks' credit on agricultural output in Nigeria and formulated four research hypotheses to guide their study. They adopted an ex-post facto research design for the study. The results showed that an increase in commercial banks' credit to the agricultural sector led to a corresponding increase in agricultural production in Nigeria. Moreover, there was a positive and significant relationship between government expenditure on agriculture and agricultural production, while the interest rate showed a negative relationship with agricultural output, which aligned with theoretical expectations.

Mboto et al. (2017) investigated the effect of agricultural sector credit on agricultural output in Nigeria during the period from 1999 to 2016. The results indicated that both deposit money bank credit and the Agricultural Credit Guarantee Scheme Fund had a significant impact on agricultural output in Nigeria.

Ajayi et al. (2017) conducted a study to assess the impact of agricultural financing policy and deposit money bank loans on agricultural productivity in Nigeria. The results indicated that deposit money bank loans (CBF) and the Agricultural Credit Guarantee Scheme Fund (ACGSF) as a proxy for agricultural financing policy had a significant positive effect on agricultural productivity. However, the lending rate

(LR) showed a significant negative impact on agricultural productivity.

Emenuga (2019) investigated the relationship between commercial bank credit and real sector development in Nigeria over a period of 37 years (1981-2017). The study found that commercial banks' credit to agriculture and the Agricultural Credit Guarantee Scheme were positively related to agricultural development, while the interest rate was negatively related to agricultural development in Nigeria.

Eniloloba and Ode-omenka (2018) examined the impact of credits on agricultural output in Nigeria from 1978 to 2016. The findings revealed that there was no long-run relationship between deposit money bank credit to the agriculture sector in Nigeria and agricultural sector output.

Bulama et al. (2019) evaluated the impact of the Bank of Agriculture (BOA) in financing farming activities of farmers in Maiduguri. The results showed that household size, household income, education of the farmers, and the amount of credit, both short-term and long-term loans, had a significant positive impact on agricultural productivity. The BOA's loan recovery rates fluctuated over the last 8 years, with an average recovery rate of 70.45%, indicating low default. Poor loan repayment was attributed to factors such as low product prices, insurgency, and inadequate supervision by BOA staff.

Adewale et al. (2022) examined the effect of farmers' credit on agricultural productivity from 1981 to 2016 using data from the World Bank Development Index (WDI). The Ordinary Least Squares (OLS) estimation showed that agricultural bank credit had a significant positive effect on agricultural output, while bank lending rate and foreign exchange rate did not show a significant effect on agricultural output.

Ngog et al. (2022) studied the impact of bank credit on agricultural productivity in the Central African Economic and Monetary Community (CEMAC) from 1990 to 2019. The study found long-run co-integration among the variables. It revealed that DCPSB, land, and PHKAP had a positive impact on agricultural value-added (AGRVA), while broad money supply, INF, and labor had a negative impact on AGRVA to the GDP.

Methodology

Sources and Method of Data Collection

The data for the study was sourced using a secondary mode of sourcing data and the data for the research will be sourced from Central Bank of Nigeria (CBN) statistical bulletin (2021)

Model Specification

Agricultural output is a function of commercial bank lending to agriculture, and interest rate

AGRICQ = f (CBLA, & INT) ……. (1)

Where;

AGRICQ = Agricultural Output (measured by agricultural GDP in Nigeria)

CBLA = Commercial bank lending to agriculture in Nigeria

INT = Interest Rate (using domestic lending rate)

The linear function of equation (1) will be given below as:

$AGRICQ = \beta_0 + \beta_1 CBLA + \beta_2 INT$ ……. (2)

The variables will be transformed to their natural logarithms to eliminate any serial correlation and to normalize the variables.

$LN(AGRCIQ) = \beta_0 + \beta_1 LN(CBLA) + \beta_2 (INT) + u_t$…….. (3)

A-priori Expectation

The a-priori expectation is that a positive relationship would be established between Agricultural output and, commercial bank lending to agriculture, while a negative relationship will be established between interest rate according to Udoka (2016), Emunuga (2019), Lawal *et al.,* (2019) and Adewale *et al.,* (2022)

$$\frac{dCBLA}{dAGRCIQ} < 0 \; and \; \frac{dINT}{dAGRICQ} > 0;$$

DATA ANALYSIS AND INTERPRETATION

Descriptive Statistics

	AGRICQ	CBLA	INT
Mean	8511.76	192.61	17.31
Median	2015.42	48.56	17.5
Maximum	41126.06	1457.82	29.8
Minimum	17.05	0.59	7.75
Std. Dev.	11183.50	317.81	4.64

Skewness	1.37	2.29	0.26
Kurtosis	4.01	8.31	3.52
Jarque-Bera	14.72	84.01	0.95
Probability	0.01	0.00	0.62
Sum	348982.2	7897.16	709.71
Sum Dev	5.15	4051.	860.36
Obsv	41	41	41

Source: Author's Computation, 2023.

Table 4.1 presents the descriptive statistics of the dependent variable and independent variables respectively. From the table, the average of AGRICQ, CBLA, and INT is 8511.762, 192.613, and 17.30987 respectively, the standard deviation which captures discrepancy indicates that AGRICQ, CBLA, and INT have a standard deviation coefficient11183.50, 317.8070, and 17.5000 respectively, hence AGRICQ has the highest discrepancy while INT has the lowest discrepancy. The max and min indicate the highest value and lowest value of each variable and show the level of variability among the variables individually. The skewness captures the shape of a distribution. The skewness shows that all the variables are positively skewed with a skewness coefficient signifying AGRICQ, CBLA, and INT tailed to the right. The kurtosis measures the sharpness of the peak of a distribution, AGRICQ, CBLA, and INT are all leptokurtic with a kurtosis coefficient greater than 3.

Correlation Matrix

The Correlation Matrix is a technique of analysis that explains the relationship between dependent and independent variables and also the relationship between the independent variables among themselves. The correlation values were obtained from the Pearson correlation using a two-tailed level of significance of the following explained and explanatory variables respectively.

Table 4.2 Pairwise Correlation Matrix

	LCBLA	LINT
LCBLA	1	
LINT	0.12	1

Source: Author's Computation, 2023.

Table 4.2 presents the correlation coefficients between the independent variables to ascertain the existence or absence of multicollinearity in the model. The correlation is strong, moderate and weak if the correlation coefficient falls between 0.7 – 0.99, 0.40 – 0.69, and 0.00 – 0.39 respectively either the sign is positive or negative. The result of the study is that a correlation coefficient of 0.12 between CBLA and INT shows a weak and positive correlation between the two variables. The correlation between the variables indicates that there is little possibility of multilinearity among the independent variables with most of the coefficients falling between the acceptable region of -0.8 to 0.8.

Stationarity Test

The unit root test of the variables is tested using the Augmented Dickey-Fuller test. The possible outcome of the test is either at levels or first difference, the test will be based on the significance level of either 1%, 5%, or 10%.

UNIT ROOT TEST RESULTS TABLE (ADF)				
Null Hypothesis: the variable has a unit root				
At Level				
		AGQ	CBLA	INT
With Constant	t-Stat	-2.17	-0.84	-3.39
	Prob.	***0.2182***	***0.7965***	***0.0168***
At First Difference				
		d(AGQ)	d(CBLA)	d(INT)
With Constant	t-Stat	-4.01	-7.15	NA
	Prob.	***0.0035***	***0.00***	**NA**

Source: Author's Computation, 2023.

From the result in Table 4.3 using ADF test statistics, INT is stationary at level. That is INT of the variable is integrated of order zero (i.e., I(0)) however, AGRICQ and CBLA are stationary at first difference

due to the random nature of the data. These can be seen by comparing the observed values (in absolute terms) of the ADF test statistics with the critical values (also in absolute terms) of the test statistics at the 5% level. The hypothesis of no stationary was therefore rejected. Based on the foregoing, the result obtained from the unit root test analysis provided a good justification to use autoregressive distributional lag (ARDL).

Optimal Lag Structure Selection

The optimum lag structure is used to determine which lag will be most appropriate based on the recommendations of certain information criteria.

Table 4.4 Lag Structure

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-147.28	NA	0.55	7.91	8.04	7.96
1	-13.93	238.64*	0.00*	1.36*	1.88*	1.55*
2	-8.29	9.19	0.00	1.54	2.45	1.86
3	2.73	16.25	0.00	1.44	2.73	1.89

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Source: Author's Computation, 2023.

Table 4.4 shows the recommended optimal lag selection by various information criteria. this analysis makes use of the Akaike information criteria (AIC) with the optimum lag selection at lag 1. Since all the variables have been integrated in mixed order, ARDL is the most appropriate for the study. The moves to estimate serial correlation for the model are in Table 4.5.

Serial Correlation

Breusch-Godfrey Serial Correlation LM Test:

Null hypothesis: No serial correlation at up to 1 lag

F-statistic	0.56	Prob. F (1,28)	0.456
Obs*R-squared	0.75	Prob. Chi-Square (1)	0.38

Source: Author's Computation, 2023.

The result of the serial correlation is presented in Table 4.5 above. The probability value of the chi-square shows that there is no serial correlation among the regressors with a value of 0.3868. hence, there is no autocorrelation in the model. The moves to estimate the stability test are in Figure 4.1.

Interpretation of result

Bound Test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	8.571244	10%	2.63	3.35
		5%	3.1	3.87
		2.5%	3.55	4.38
k	2	1%	4.13	5

Source: Author's Computation, 2023.

The bound test presented in Table 4.7 aims at determining the existence of a long-run relationship in the model. The F-statistics value of 8.571244 is greater than both the lower and upper bound which are valued at 3.1 and 3.87 respectively at a 5% significance level, this indicates that there is a long-run relationship in the model. The moves to estimate the long-run multiplier are in Table below

Long Run Multiplier

Variable	Coefficient	Std. Error	t-Stat	Prob.
LCBLA	0.78	0.18	4.31	0.0002
LINT	0.08	0.04	1.95	0.0606
C	1.28	0.47	2.73	0.0108

Source: Author's Computation, 2023.

The long-run relationship between the variables is presented in Table 4.7. The result showed that CBLA has a positive and significant effect on AGRICQ with a coefficient of 0.785568, indicating that a 1 per cent increase in CBLA will lead to a 78.5 per cent increase in AGRICQ. Similarly, INT has a positive and significant effect on AGRICQ with a coefficient of 0.084596, indicating that a 1 per cent increase in INT will lead to a 08.4 per cent increase in AGRICQ.

Hence, all the explanatory variables exert a positive and statistically significant effect on AGRICQ in the long run. The moves to estimate the short-run effect are in Table 4.8.

Short Run Coefficients

Variable	Coeff	Std. Error	t-Statistic	Prob.
D(LAGRICQ(-1))	0.302	0.131	2.311	0.028
D(LAGRICQ(-2))	-0.276	0.128	-2.153	0.039
D(LINT)	0.003	0.002	1.654	0.108
D(LINT(-1))	-0.007	0.002	-3.088	0.004
D(LINT(-2))	-0.008	0.002	-4.134	0.000
CointEq(-1)*	-0.094	0.015	-6.151	0.000
R-squared	0.612	Mean dependent var		0.085
Adj R-squared	0.551	S.D. dependent var		0.068
S.E. of reg	0.045	Akaike info criterion		-3.180
Sum squared resid	0.067	Schwarz criterion		-2.922
Log likelihood	66.438	Hannan-Quinn criter.		-3.088
Durbin-Watson stat	2.113			

Source: Author's Computation, 2023.

Table 4.8 indicates the short-run model which measures the short-run dynamics of the parameters alongside the error correction term of the study. Specifically, the study discovered that in the short run, AGRICQ at lag one exerted a significant positive effect on AGRICQ at present. The result implied that an increase in AGRICQ at lag one will lead to an increase in AGRICQ at present. While AGRICQ at lag two exerted a significant negative effect on AGRICQ at present. The result implied that an increase in AGRICQ at lag two will lead to a decrease in AGRICQ at present. Further, INT has a positive and insignificant effect of 0.003392 on AGRICQ in the short run thus, a 1 per cent increase in INT in the short run will lead to a 0.3 per cent increase in AGRICQ. However, INT at lags one and two exerted a significant and negative influence on AGRICQ in the short run. Hence, an increase in INT at lags one and two will lead to a statistically significant decrease in AGRICQ in the short run. The study indicated that CCLA does not influence AGRICQ MSO in the short run, however, the R-square coefficient of 0.612216 indicates that the independent variables combined are responsible for 61 per cent of the change in AGRICQ in the short run. Finally, the error correction term which denotes the speed of adjustment from short-run to long-run reported a correct sign (-) and significant value at a 5% level of significance which corresponds with theoretical *apriori* expectation. The value of the coefficient is -0. 094736 (p=0.00<0.05) and this result shows that a percentage (9.4%) of the short-run inconsistencies are being corrected and incorporated into the long-run equilibrium relationship in each period. Also, the Durbin-Watson stat showed there is no autocorrelation among the variables with a 2.113331 coefficient which falls between the acceptable region of 1.79 – 2.40.\

4.3 Discussion of Findings

The result of the study shows that commercial bank lending to agriculture has a positive and statistically significant effect on agricultural output in Nigeria. This outcome thus suggests that an increase in commercial bank lending to agriculture will stimulate a similar beneficial increase in agricultural output in Nigeria in Nigeria. This agrees with the *a priori* expectation of the study. The study of Obilor (2013) agrees with this finding, Obilor (2013) found that commercial banks' credit to the agricultural sector has a significant positive effect on agricultural productivity in Nigeria. Also, the study by Udoka, *et al.,* (2016) discovered that there was a positive and significant relationship between commercial banks' credit to the agricultural sector and agricultural production in Nigeria, which agrees with the findings of the study. Further studies by Bulama *et al.,* (2019), Emunuga (2019), Lawal *et al.,* (2019) and Adewale *et al.,* (2022) to mention found there is a direct relationship between bank credit and agricultural productivity in Nigeria that is bank credit has a significant positive effect on agricultural productivity in Nigeria.

The result of the study shows that interest rate has a positive and statistically significant effect on agricultural output in Nigeria. This outcome thus suggests that an increase in interest rate will inspire a

similar beneficial increase in agricultural output in Nigeria in Nigeria. In the study of Emunuga (2019), the interest rate was found to be negatively related to Agricultural development in Nigeria, thus negating the result of this study. Similarly, Ajayi et al (2017) concluded that lending rate (LR) has a significant negative impact on agricultural productivity.

Conclusion

This study investigates the effect of bank lending on agricultural activities in Nigeria from 1981 – 2021 using different diagnostic test was carried out which include descriptive statistics, correlation analysis, unit root test, autoregressive distributed lag. The conclusion of this study is that that commercial bank lending to agriculture and interest rate has a positive and statistically significant effect on agricultural output in Nigeria. This means that a percentage increase in commercial bank lending to agriculture will increase agricultural output by 0. 785368% in the long run multiplier. Meanwhile, in the short run multiplier effect, a percentage increase in commercial bank lending to agriculture will increase agricultural output by 0. 302781% in one year lag. Also, interest rate is positively related to agriculture output in Nigeria. The implication of this is that a percentage change in interest rate will cause an increase of 0. 084596%, in agricultural output in the long run multiplier effect. However, in the short run, a percentage change in interest rate will cause an increase of 0. 003392% in agricultural output

Recommendations

Based on findings of this study the following policy recommendations are put forward:

(i) Government is advised to avoid inconsistencies in its agricultural policies and programmes rather it should embrace stable, consistent, and sustainable agricultural policies as that would help to improve agricultural performance in the country which will lead to increase in agricultural output of the country economy.

(ii) The study also recommends that government should strengthen financial institutions which are the credit agencies in order to ensure efficient disbursement of fund to agricultural and manufacturing sectors and ensuring that funds are not misappropriated for other purposes, in order to boost economic growth. Recipients of agricultural and manufacturing sectors banks' credits should be made to undergo entrepreneurial training before the credits are granted so as to reduce risks associated with giving out these credits for the economic growth.

Limitation of the Study

In the end, it must be said that this study is not free from limitation. For instance, the study used two (2) independent variables which are commercial bank lending to agriculture, and interest rate where there are other variables that can influence agriculture output. Further research can still be conducted along this line by using another model aside from the model used in this study. Also, other studies can make use of some other methods in the process of the research which can indicate some other variable or factors that dictate the effect of bank lending on agricultural output in Nigeria.

REFERENCES

Abayomi, A., Adam, S.O. and Alumbugu, A., 2015. Oil exportation and economic growth in Nigeria. *Developing Country Studies*, *5*(15), pp.83-92.

Adewale, A. T., Lawal, O. A., Aberu, F., & Toriola, A. K. (2022). Effect of credit to farmers and agricultural productivity in Nigeria. *East Asian Journal of Multidisciplinary Research*, *1*(3), 377-388.

Ajayi, M. A., Nageri, K. I., & Akolo, C. S. (2017). Impact of agricultural financing policy and deposit money bank loan on agricultural sector productivity in Nigeria. *Amity Journal of Agribusiness*, *2*(1), 1-11.

Ajie H. A. and Ewabore D. B. (2013) Financial Institution: Market and Contemporary Issues. Pearl Publishers Port Harcourt.

Ayeomoni, I. O., & Aladejana, S. A. (2016). Agricultural credit and economic growth nexus. Evidence from Nigeria. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, *6*(2), 146-158.

Bulama, Y. M., Bukar, U., Shettima, B. G., & Maina, S. (2019). Analysis of Chicken Value Chain in Maiduguri Metropolitan Council, Borno

State, Nigeria. *Nigerian Journal of Animal Science and Technology (NJAST)*, *2*(3), 95-102.

Central Bank of Nigeria (20). CBN Annual Report and Statistical Bulletin for the year Ended 31st December 2021.

Central Bank of Nigeria (2007). CBN Annual Report and Statement of Accounts for the year Ended 31st December 2007. Retrieved fromhttp://www.cenbank.org

Central Bank of Nigeria (2010). CBN Annual Report and Statistical Bulletin for the year Ended 31st December 2010.

Emenuga, P. E. (2019). Effect of commercial banks' credit on agricultural productivity in Nigeria. *Acta Universitatis Danubius. Œconomica*, *15*(3), 417-428.

Enilolobo, O. S., & Ode-Omenka, L. C. (2018). The impact of credits on agricultural output in Nigeria. *International Journal of Economics, Commerce and Management*, *6*(12), 232-247.

Itodo, A.I., Apeh, S. & Adeshina, S. (2012). Government expenditure on agricultural sector and economic growth in Nigeria. Journal of Humanitios and Social Science, 8(4), 62 – 67.

Lawal, A. I., Omoju, O. E., Babajide, A. A., & Asaleye, A. J. (2019). Testing mean-reversion in agricultural commodity prices: Evidence from wavelet analysis. *Journal of International Studies*, *12*(4), 100-114.

Liverpool-Tasie, L. S. O., Omonona, B. T., Sanou, A., & Ogunleye, W. O. (2017). Is increasing inorganic fertilizer use for maize production in SSA a profitable proposition? Evidence from Nigeria. *Food policy*, *67*, 41-51.

Mboto, C. I., Eja, M. E., Adegoke, A. A., Iwatt, G. D., Asikong, B. E., Takon, I., ... & Akeh, M. (2009). Phytochemical properties and antimicrobial activities of combined effect of extracts of the leaves of Garcinia kola, Vernonia amygdalina and honey on some medically important microorganisms. *Afr. J. Microbiol. Res*, *3*(9), 557-559.

Mgbakor, M. N., Uzendu, P. O., & Ndubisi, D. O. (2014). Sources of agricultural credit to small-scale farmers in EZEAGU local government area of Enugu State, Nigeria. *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)*, *7*(8), 1-8.

Mogues, T., Fan, S., & Benin, S. (2015). Public investments in and for agriculture. *The European Journal of Development Research*, *27*, 337-352.

Ngong, C. A., Onyejiaku, C., Fonchamnyo, D. C., & Onwumere, J. U. J. (2022). Has bank credit really impacted agricultural productivity in the Central African Economic and Monetary Community?. *Asian Journal of Economics and Banking*

Nwankwo, O. (2013). Agricultural financing in Nigeria: An empirical study of Nigerian agricultural co-operative and rural development bank (NACRDB): 1990-2010. *Journal of Management research*, *5*(2), 28-44.

Obilor S. I. (2013). The impact of commercial banks' credit to agriculture on agricultural development in Nigeria: An econometric analysis. International Journal of Business, Humanities and Technology,3(1), 85-94.

Ogbonna, S. I., & Osondu, C. K. (2015). Determinants of supply of funds to agricultural sector from formal sources in Nigeria from 1992 to 2012. *Greener Journal of Agricultural Sciences*, *5*(3), 081-092.

Olagunju, F. I., & Ajiboye, A. (2010). Agricultural lending decision: A tobit regression analysis. *African journal of food, agriculture, nutrition and development*, *10*(5).

Olokoyo, F. O. (2011). Determinants of commercial banks' lending behavior in Nigeria. *International journal of financial research*, *2*(2), 61-72.

Oseni, G., & Winters, P. (2009). Rural nonfarm activities and agricultural crop production in Nigeria. *Agricultural Economics*, *40*(2), 189-201.

Oyelade, A. O. (2019). Impact of commercial bank credit on agricultural output in Nigeria. *Review of Innovation and Competitiveness: A Journal of Economic and Social Research*, *5*(1), 5-20.

Tomak, S. (2013). Determinants of commercial banks' lending behavior: Evidence from Turkey. *Asian Journal of Empirical Research*, *3*(8), 933-943.

Udoka, C. O., Mbat, D. O., & Duke, S. B. (2016). The effect of commercial banks' credit on agricultural production in Nigeria. *Journal of Finance and Accounting*, *4*(1), 1-10.

Appendix

Unit root test

AGRICQ
Level

Null Hypothesis: LAGRICQ has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.174797	0.2182
Test critical values:	1% level	-3.605593	
	5% level	-2.936942	
	10% level	-2.606857	

*MacKinnon (1996) one-sided p-values.

First Difference

Null Hypothesis: D(LAGRICQ) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.009147	0.0035
Test critical values:	1% level	-3.610453	
	5% level	-2.938987	
	10% level	-2.607932	

*MacKinnon (1996) one-sided p-values.

CBLA

level

Null Hypothesis: LCBLA has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.840109	0.7965
Test critical values:	1% level	-3.605593	
	5% level	-2.936942	
	10% level	-2.606857	

*MacKinnon (1996) one-sided p-values.

first Difference

Null Hypothesis: D(LCBLA) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.153916	0.0000
Test critical values:	1% level	-3.610453	
	5% level	-2.938987	
	10% level	-2.607932	

*MacKinnon (1996) one-sided p-values.

INT

Level

Null Hypothesis: LINT has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.399794	0.0168
Test critical values:	1% level	-3.605593	
	5% level	-2.936942	
	10% level	-2.606857	

*MacKinnon (1996) one-sided p-values.

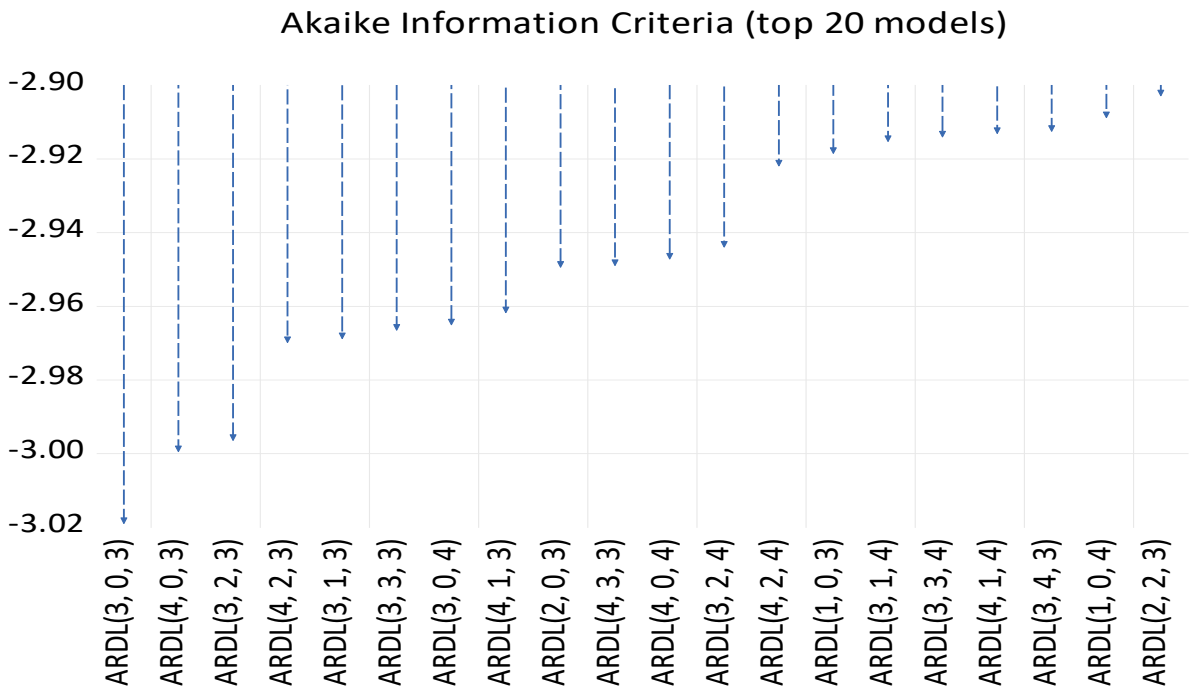
Lag Structure

VAR Lag Order Selection Criteria
Endogenous variables: LAGRICQ LCBLA LINT
Exogenous variables: C
Date: 05/29/23 Time: 17:24
Sample: 1981 2021
Included observations: 38

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-147.2889	NA	0.546811	7.909943	8.039226	7.955941
1	-13.92735	238.6470*	0.000787*	1.364598*	1.881730*	1.548589*
2	-8.293591	9.191928	0.000950	1.541768	2.446750	1.863754
3	2.730907	16.24663	0.000876	1.435215	2.728047	1.895195

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

Model Selection

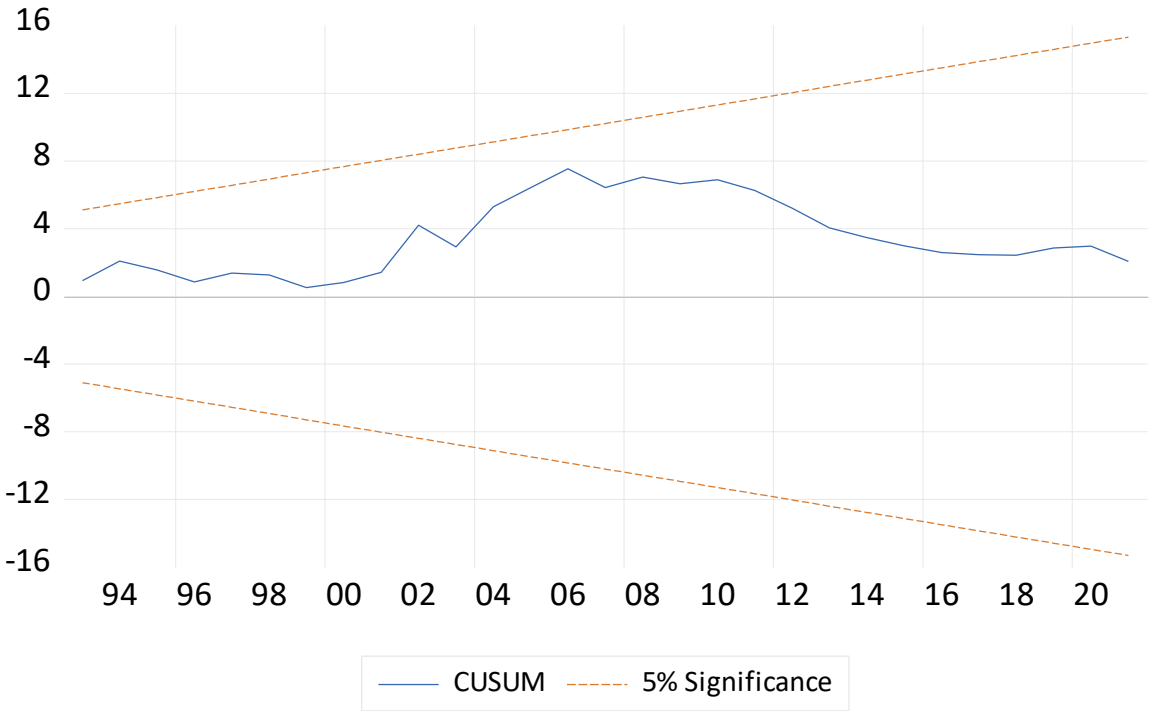


Auto correlation

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 1 lag

F-statistic	0.562889	Prob. F(1,28)	0.4594
Obs*R-squared	0.748866	Prob. Chi-Square(1)	0.3868

Statbility CUSUM



Variance Inflation Factors (VIF)

Variance Inflation Factors
Date: 05/29/23 Time: 17:27
Sample: 1981 2021
Included observations: 41

Variable	Coefficient Variance	Uncentered VIF
LCBLA	0.003827	3.365216
LINT	4.00E-05	3.365216

Bound Test and Long Run Form

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCBLA	0.785368	0.182439	4.304812	0.0002
LINT	0.084596	0.043335	1.952147	0.0606
C	1.288552	0.473293	2.722523	0.0108

EC = LAGRICQ - (0.7854*LCBLA + 0.0846*LINT + 1.2886)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	8.571244	10%	2.63	3.35
K	2	5%	3.1	3.87
		2.5%	3.55	4.38
		1%	4.13	5
			Finite Sample: n=40	
Actual Sample Size	38			
		10%	2.835	3.585
		5%	3.435	4.26
		1%	4.77	5.855
			Finite Sample: n=35	
		10%	2.845	3.623
		5%	3.478	4.335
		1%	4.948	6.028

Short run dynamics

ARDL Error Correction Regression
Dependent Variable: D(LAGRICQ)
Selected Model: ARDL(3, 0, 3)
Case 2: Restricted Constant and No Trend
Date: 05/29/23 Time: 17:29
Sample: 1981 2021
Included observations: 38

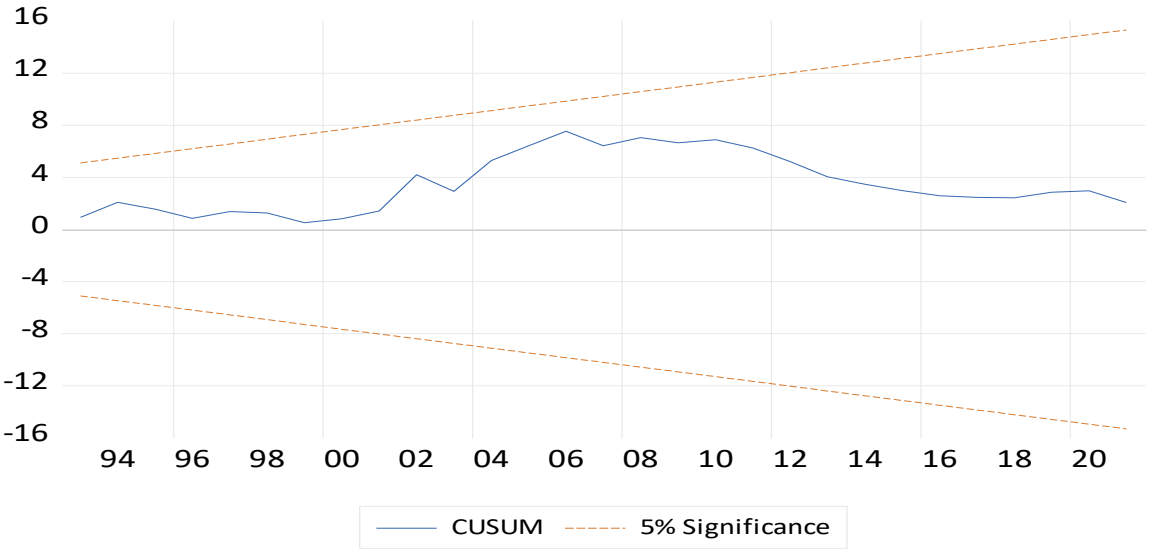
ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LAGRICQ(-1))	0.302781	0.131028	2.310806	0.0282
D(LAGRICQ(-2))	-0.276111	0.128208	-2.153615	0.0397
D(LINT)	0.003392	0.002050	1.654592	0.1088
D(LINT(-1))	-0.007919	0.002564	-3.088419	0.0044
D(LINT(-2))	-0.008693	0.002103	-4.134109	0.0003
CointEq(-1)*	-0.094736	0.015402	-6.150748	0.0000

R-squared	0.612216	Mean dependent var	0.085199
Adjusted R-squared	0.551625	S.D. dependent var	0.068540
S.E. of regression	0.045895	Akaike info criterion	-3.180976
Sum squared resid	0.067404	Schwarz criterion	-2.922410
Log likelihood	66.43854	Hannan-Quinn criter.	-3.088980
Durbin-Watson stat	2.113331		

* p-value incompatible with t-Bounds distribution.

Stability Test



Source: Author's Computation, 2023.

The CUSUM stability test shows that the model is stable as the CUSUM of squares line did not stray out of the significance region. The study moves to the multicollinearity test in Table 4.6.

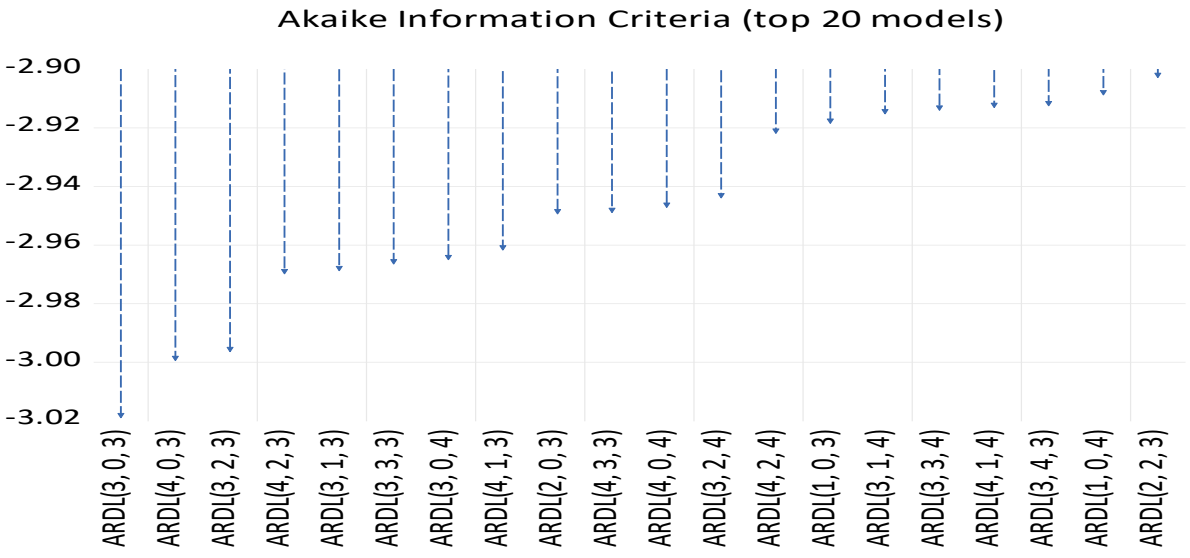
Table 4.6 Multicollinearity Test

Variable	Coefficient Variance	Uncentered VIF
LCBLA	0.003827	3.365216
LINT	4.00E-05	3.365216

Source: Author's Computation, 2023

The multicollinearity test estimated using variance inflation factors (VIF) indicates that all the variables are independent of each, this conclusion is made from the uncentred VIF which are all lesser than 10. Hence, the study concludes that regressors are fit to be regressed on agricultural output. The study moves to the model selection in Figure 4.2

Figure 4.2 Model Selection



Source: Author's Computation, 2023.

The model ARDL model selection presented in Figure 4.2 shows that model 3,0,3 is the most appropriate for the study, this is so because the model has the lowest value among all the other models presented in the figure. The study moves to the interpretation of the result.