COMMERCIAL BANK CREDIT AND DOMESTIC FOOD PRODUCTION IN NIGERIA

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Abstract
This study examined the impact of commercial bank credit to the agricultural sector on domestic food production in Nigeria spanning 1991-2021. The study used the auto regressive distributed lag (ARDL) model to carry out its empirical analysis. Findings from the study revealed that, both in the short-run and in the long-run, commercial bank credit to the agricultural sector has positive impact on domestic food production in the country. However, in terms of the sizes of the estimated coefficients, the impact of commercial bank credit to the agricultural sector on domestic food production is low, increasing food production by about 0.05 and 0.08 per cents in the short and long respectively. The study found that the high cost of borrowing from commercial banks is limiting the nation's ability to produce food. Based on these findings, more credit facilities should be made accessible to farmers at affordable single-digit interest rates by commercial banks in order to boost domestic food production.

Keywords: Commercial Bank, Bank Credit, Food Production, Bound Test

1. INTRODUCTION

One prerequisite for a sustainable growth in emerging countries is development financing, because funding for diverse economic sectors will support the growth of the economy as a whole (Sakshi, 2022). This is because strategically focusing financial interventions on the real sector encourages the deepening of financial intermediation, which in turn helps to stimulate the diversification of the economy, which has enormous potential to promote inclusive growth, the creation of jobs, industrialization, and increased production across all sectors according to Sakshi (2022).

The commercialization of innovations has been found to be critically dependent on finance (Okwuchukwu, 2022). In agriculture, financing continues to be essential for mechanization, including the acquisition of machinery, training in its use, transportation of produce and equipment, and even sale of harvested goods. Consequently, it is believed that agricultural funding is essential for the production of food. Dalberg (2018) estimated that Sub-Saharan Africa needs an average of $240 billion in agricultural funding annually. According to a recent estimate, Nigeria alone has a similar need for agricultural financing. A bottom-up estimate places Nigeria's financing deficit for agriculture at above $120 billion (Ministry of Foreign Affairs, 2022).

To ensure food security and promote national growth, it is important to address the sector's financial imbalance. Because of this, both public and private funding must be taken into account. Commercial banks are the next largest source of funding for the agricultural industry in Nigeria, although the public sector still makes up the majority of the sector's funding (Obi-Nwosu, et al 2022). However, even though public sector funding is seen as essential, many stakeholders in Nigeria are not so optimistic about public finance programs because they believe they are ineffective, biased, and corrupt (Okwuchukwu, 2022; Fagbadebo & Mbada, 2021). The public sector according to Ngong et al. (2022) already faces a large financial gap on top of this. In light of this, this paper alongside scholars like Golley and Samuel (2021), and Nakazi and Sunday (2020), argues that commercial bank financing could be a reliable source of investment for the agricultural sector in Nigeria.

Over time, commercial banks have increased their funding in Nigeria. Although the total amount of loans offered by commercial banks to the private sector has increased since 2019, only around 5% of overall credit goes to agriculture, but that percentage is growing, with an above-average growth rate of about 35% year-on-year (National Bureau of Statistics [NBS], 2020, as cited in Ministry of Foreign Affairs, 2022, p. 40). Despite these, medium to big processors and merchants with offices in major cities and personal assets as collateral currently have the most access to bank loans for the agriculture sector. Loans made through branches in Lagos, Port Harcourt, and Abuja account for 85% of the credit (NBS, 2020). Currently, the Agricultural Credit Guarantee Scheme Fund (ACGSF) only guarantees less than 5% of all agricultural credit, mostly small loans (Ministry of Foreign Affairs, 2022, p. 25). Although it is anticipated that Nigerian banks' total portfolio of agricultural loans will increase, it is unlikely that small farmers, who make up the bulk of the farming population in the nation, will have easier access to this credit. Additionally, data from the Nigerian Central Bank (CBN) reveals an increase in the amount of funds that commercial banks are lending to the agricultural sector. In particular, commercial bank lending to Nigeria's agricultural sector increased from ₦128.41 billion to ₦449.31, ₦610.15, and ₦1457.82 billion in 2010, 2015, 2018, and 2021 respectively (CBN, 2022). The goal of this funding intervention is to increase agricultural output and address the nation's problem with food insecurity. Despite this, the production of food, however, has not fared so well. According to data from the World Bank, the prevalence of acute food insecurity in the population increased to 21.4% between 2018 and 2020 alone (World Bank, 2022). Making informed policy decisions and interventions requires the provision of empirical facts regarding the effects of commercial bank credit to the agriculture sector. As a result, this study evaluates the impact of commercial bank agricultural loans on the nation's food output.

2 LITERATURE REVIEW

2.1 Conceptual Literature

2.1.1 Commercial Bank Credit

Credit is described by Kenton (2020) as a debt-based funding arrangement between a business and a financial institution, like a commercial bank. It is often used to finance sizable capital investments and/or pay for ongoing operating expenses that the entity might not be able to otherwise afford. It is a tool for allowing the transfer of purchasing power from one person or organization to another, according to Ssenyonga (2016). Ssenyonga (2016) further added that the specialization of functions enabled by credit is the foundation for increased production efficiency. According to Golley and Samuel (2021), a commercial bank debt is one in which a lender and borrower exchange financial assets. Okuneye and Ajayi (2021) defines commercial bank credit as a sum of money that a commercial bank lends to a borrower at interest, typically with collateral security, for a set length of time.

This study adopts Okuneye and Ajayi's (2021) definition as its working definition.

2.1.2 Domestic Food Production

The Legal Information Institute. (2022) defines agricultural food production as the process of creating farm products. It also defines a farm product as an agricultural good, such as wheat, corn, or soybeans, or a type of livestock, such as cattle, hogs, sheep, horses, or chickens, that is used or produced in farming operations, or a byproduct of such a crop or livestock that is in the possession of a person engaged in farming operations and is in its unprocessed state, such as ginned cotton, wool-clip, maple syrup, milk, or eggs. According to Chait (2020), agricultural food production is the process of raising cultivated plants or animals to produce goods that will support or improve human life. It is the production of any agricultural product or commodity, whether it be raw or processed, including any product or commodity generated from animals that is marketed for human or animal consumption. This study adopts Chait's (2020) definition as its working definition of domestic food production.

2.2 Theoretical Framework

The literature is replete with theories that attempt to explain the beneficial effects of credit markets on productivity. According to Schumpeter's (1912) theory, the financial system fosters output development by distributing savings, fostering innovation, and providing capital for profitable projects. In their respective research, McKinnon (1973) and Shaw (1973) came to the conclusion that financial development had a favorable impact on productivity. Financial markets, according to Levine (1991) and Saint-Paul (1992), help enterprises diversify their holdings, lower risks, and boost production growth. When a bank enters into agreements for bank loans or purchases assets, the fractional reserve theory of banking contends that it has the ability to generate credit money out of nothing (Frederic, 2012). Banks do not just lend out the deposits that customers have given them; they also produce their own bank deposits as a result of lending to customers. There is also the monetary circuit theory (MCT), which maintains that the banking industry, rather than the government, creates money endogenously (Graziani, 1989).

The financial intermediation theory of bank credit, which emerged from the writings of early bankers like Mises (1912) and was later made popular by great economists like Keynes (1936), Gurley and Shaw (1955), and Werner (2016), is the study's theoretical framework because it focuses on how commercial banks mediate in improving the performance of the agricultural sector in terms of food production in Nigeria. According to the theory, banks are essentially financial intermediaries that collect deposits and disburse them like other non-bank financial firms. In other words, banks generate liquidity by borrowing short-term from depositors with short maturities and lending long-term to borrowers with longer maturities (Werner, 2016).

The relevance of the financial intermediation theory to this research can be attributed to two key advantages. First, it backs up the notion that borrowers borrow money merely because they lack enough money for investments. As a result, farmers require more money to invest in their business.

Credit will increase farmers' income, which will increase investment in the agricultural sector and their savings, which will improve the system's efficiency in allocating resources. Second, a proportional relationship between agricultural financing and food output is also expressed by this hypothesis. As a result, there will be a relative rise in food availability when agricultural productivity grows sustainably.

2.3 Empirical Literature

A review of a number of recent studies made up this study's empirical literatures. Okwuchukwu (2022) investigated the impacts of funding for the agricultural sector on the sector's production in Nigeria from 1981 to 2018. The study used the vector error correction model (VECM) on an annual time series dataset of agricultural productivity, commercial banks' credit to the agricultural sector, agricultural credit guarantee scheme, government spending on the agricultural sector, and interest rate on loans. Results indicated that public spending on agricultural productivity had a detrimental impact on the agricultural sector's GDP contribution. The study also revealed that commercial banks' loans and advances to agriculture had a detrimental and statistically significant impact. The research also showed that the agricultural credit guarantee program was statistically significant and correlated positively with agricultural output. Additionally, it was shown that the interest rate had a negative, albeit minor, impact on agricultural productivity.

Similarly, Onuegbu et al. (2022) looked at how bank loans affected agricultural output between 1988 and 2021 in Nigeria. The study used the Ordinary Least Square (OLS) technique of analysis on an annual tie series data set comprising of credit to agricultural sector, government spending on agricultural sector, agricultural credit guarantee scheme fund, and interest rate. The analysis demonstrates that while interest rates have a negative and minor impact on agricultural output, bank loans, government spending, and the fund for the agricultural credit guarantee system all have positive and significant effects. Therefore, the study draws the conclusion that deposit money bank credit has a favorable impact on agricultural output in Nigeria and has increased agricultural production in Nigeria over the course of the study.

Also, Obi-Nwosu et al. (2022) analyzed the effect of commercial banks' credit to agriculture on the agricultural sector's contribution to Nigerian real gross domestic product from 1986 to 2020. The study used the Autoregressive Distributive Lag (ARDL) model to carry out its empirical analysis. It used the variable of agricultural sector contribution to real gross domestic product, commercial banks credit to agriculture, inflation rate, and interest rate for its empirical analysis. The findings of this study showed that commercial banks' credit to agriculture has a positive but insignificant effect on the sector's contribution to real gross domestic product. In a regional study, Ngong et al. (2022) investigated the impact of bank credit on agricultural productivity in the Central African Economic and Monetary Community (CEMAC) from 1990 to 2019. Using an annual time series dataset comprising of agricultural value added to GDP, domestic credit to the agricultural sector by banks, broad money supply, land, inflation, physical capital, and labour supply, the study employed the ARDL model to carry out its empirical analysis. Findings showed the existence of a long-run co-integration among the variables. The findings disclosed that with the exception of domestic credit to the agricultural sector and land that had a positive and significant impact on agricultural productivity, other variables adversely affected agricultural productivity. Similarly, in Sub-Saharan Africa, the relationship between the state of the loan market and agricultural output was empirically examined by Shuaibu and Nchake (2021). Because potential reverse causality and endogeneity are addressed, the study used a two-stage least square instrumental variable and difference generalized method of moments dynamic panel model. The results demonstrate that improved credit market conditions boost agricultural productivity. The findings also demonstrate that increased production is linked to greater infrastructure and access to agricultural inputs.

In a Nigeria study, Golley and Samuel (2021) evaluated the effects of commercial bank credit on the agricultural sector from 1993 to 2019. The study used Multiple regression analysis on an annual time series data-set comprising of loan assessment, food availability, food assessment, food utilization, and food absorption. The study's results showed a strong positive relationship between loan evaluation and food security in Nigeria. The study came to the conclusion that commercial bank lending has a significant impact on the agricultural industry because it increased food production in the nation by enhancing access to, availability of, and consumption of food.

In a similar study, Okuneye and Ajayi (2021) looked at the impact of government spending on agriculture and commercial bank lending for agriculture on agricultural productivity in Nigeria between 1980 and 2018. The study used the autoregressive distributed lag (ARDL) model on an annual time series data comprising of agricultural output (as determined by the agricultural sector's contribution to GDP), commercial banks' credit to the agricultural sector, interest rate on commercial banks' credit to agricultural sector, and government expenditure on the agriculture. The study's findings revealed that commercial bank loans for agriculture had a considerable negative but negligible effect on Nigeria's agricultural output. The results also demonstrated that Nigeria's agricultural productivity was significantly and favorably impacted by government spending on agriculture.

Using annual time series data from 1981 to 2019, Danladi et al. (2021) evaluated the impacts of agricultural finance on agricultural productivity in Nigeria. The ARDL model was employed by the study to conduct its analysis. Crop and livestock production were the study's dependent variables, while public financing, commercial bank lending to agriculture, and interest rate were its independent variables. According to the findings, short-term effects of both public and private finance were favorable but minor. Public finance persisted in its insignificance over time as private finance increased and became more prominent. As a result, private financing is superior to public financing at raising agricultural productivity. The study also showed that there was a long-term inverse association between interest rates and the outputs of crop and livestock production during the time.

Furthermore, Osabohiena et al. (2020) examined how agro-financing impacts on food production in Nigeria covering the period of 1981 to 2018. The empirical analysis of the study was carried out using the vector auto-regression (VAR) model. The study's model used the variables of food production index, agro-financing (agricultural credit guarantee scheme fund operations-cumulative loans), agricultural machinery (tractors), agricultural employment (% of total employment), arable land (hectare), and inflation rate. According to the study's findings, a 1% increase in farmers' access to agricultural financing is linked to a 0.002% rise in food output. The results showed that increased access to low-interest agricultural financing encourages farmers to purchase high-yield seedlings, equipment, and other farm implements that have a beneficial impact on overall agricultural yield and increase food production.

Using the ARDL model, Nakazi and Sunday (2020) used quarterly data to assess the effect of commercial banks' agricultural credit on agricultural growth in Uganda spanning 2008:Q3 to 2018:Q4. The study used the variables of agricultural sector GDP contribution to overall country GDP, commercial bank credit to agriculture sector, commercial bank agriculture credit that specifically goes to production, commercial bank agriculture credit that specifically goes to processing and marketing, inflation rate and interest rate. The study provides evidence that commercial banks' agricultural credit contributes significantly to Uganda's agricultural sector growth. In the long run, the study find credit to have significant positive impact on agricultural output. Credit to production is found to have a much higher impact on agriculture output compared to credit to processing and marketing. In the short run, the study finds that bank credit does not have an instantaneous impact on agricultural output. While the review of the previous literatures reveals a number of recent studies, this study advances the research in Nigeria; in contrast to earlier research, it presents a case for capturing the cost of borrowing by using the maximum lending rate instead of the prime lending rate. This uniquely captures the true cost of borrowing for Nigerian farmers in modeling the relationship between commercial bank credit and food production in the country.

3. METHODOLOGY

3.1 Types and Sources of Data

Secondary data was used in this study. It used annual time series data spanning 1991 to 2021. Data availability determined the base and terminal years for the study. The data for food production, commercial bank credit to the agricultural sector, and lending rate were gotten from the Annual CBN Statistical Bulletin; while the data for labour force in agricultural sector was sourced from the World Bank Statistical Database.

3.2 Model Specification.

Following the study's theoretical framework, the study adapted the works of Okwuchukwu (2022). As a departure from Okwuchukwu's (2022) model that included agricultural credit guarantee scheme and government spending on the agricultural sector; this study specifically limits its analysis to assessing the impact of commercial bank credit on food production in the country. As such it models food production as a function of commercial bank credit to the agriculture sector, agricultural labour, and lending rate. Consequently, the functional and baseline models are presented as Equations [3.1] and [3.2]:

[3.1] $$FOODP=f(COMMC,AGRICL,LENDR)$$

[3.2] $$FOODP_t = \alpha_0 + \alpha_1 COMMC_t + \alpha_2 AGRICL_t + \alpha_3 LENDR_t + \varepsilon_t$$

Apriori Expectation- *COMMC, AGRICL >0; LENDR < 0.*

where, α_0 is the intercept; α_1, α_2 and α_3 are the coefficients of the variables; ε_t represents the error term; *FOODP* represents food production (captured by the value of crop production, livestock and fish production), *COMMC* represent commercial bank credit to the agriculture sector, *AGRICL* stands for agricultural labour (captured by employment in agriculture as % of total employment), while *LENDR* stands for lending rate (captured by the maximum lending rate).

3.3 Estimation Procedure

3.3.1 Descriptive statistics: The study carried out the descriptive statistics which summarizes the basic statistical features of the data-set under consideration. It considered the mean, the minimum and maximum values, standard deviation, skewness, kurtosis, and the Jarque-Bera test for the data. These descriptive statistics shall provide a historical background for the behavior of the data.

3.3.2 Unit Root Test- The Phillips-Perron (PP) unit root test was used to test for the presence of unit root in the time series data. Here, the PP test builds on the Dickey-Fuller test, that is, the null hypothesis of unit root exists: $H_0 = \alpha = 0$.

3.3.3 The ARDL Approach to Co-integration- The ARDL method involves these steps; the first step after stationarity test is to examine the presence of co-integration using the bounds testing procedure (Pesaran, Shin and Smith, 2001). The second step is to estimate the coefficient of the long-run relationships. Having found long-run relationships among the variables, in the next step the long-run relationship is estimated. The third step is to estimate the short-run dynamic coefficients. The fourth stage involves testing for the stability of the model, by using the Cumulative sum of recursive residuals (CUSUM) and the Cumulative sum of squares of recursive residuals (CUSUMSQ). The ARDL model is written as;

[3.3] $$Y_t = \alpha_0 + \phi_t Y_{t-1} + \beta_t X_{t-1} + \varepsilon_t$$

where, Y_{t-1} and X_{t-1} are time series variables, ε_t is the vector of the stochastic error term. Generally, the model can also be defined as ARDL (p, q) the p and q are lag of the parameter which forms Equation [3.4];

[3.4] $$y_t = \alpha_0 + \sum_{i=0}^{p} \phi_i y_{t-1} + \sum_{j=0}^{q} \beta_j x_{t-1} + \varepsilon_t$$

In view of the above explanation, the ARDL model used in this study is presented as;

[3.5] $$\Delta FOODP_t = \alpha_0 + \sum_{t=0}^{p} \phi_1 \Delta FOODP_{t-1} + \sum_{t=0}^{p} \phi_2 \Delta COMMC_{t-1} + \sum_{t=0}^{p} \phi_3 \Delta AGRICL_{t-1} + \sum_{t=0}^{p} \phi_4 \Delta LENDR_{t-1} + \alpha_1 FOODP_{t-1} + \alpha_2 COMMC_{t-1} + \alpha_3 AGRICL_{t-1} + \alpha_4 LENDR_{t-1} + \varepsilon_t +$$

where, α_0 is the intercept, *t* is the time dimension while Δ is difference operator, and ε_t is the error term. The long-run co-integration is estimated as;

[3.6] $$\Delta FOODP_t = \alpha_0 + \sum_{t=0}^{p} \phi_1 \Delta FOODP_{t-1} + \sum_{t=0}^{p} \phi_2 \Delta COMMC_{t-1} + \sum_{t=0}^{p} \phi_3 \Delta AGRICL_{t-1} + \sum_{t=0}^{p} \phi_4 \Delta LENDR_{t-1} + \varepsilon_t$$

The selection of ARDL maximum lag (p q) is based on the automatic lag length selection in the E-views. The study derived the short-run dynamic parameter from the Error Correction Model (ECM) estimation, associated with the long-run estimate as given below;

[3.7] $$\Delta FOODP_t = \alpha_0 + \sum_{t=0}^{p} \phi_1 \Delta FOODP_{t-1} + \sum_{t=0}^{p} \phi_2 \Delta LnCOMMC_{t-1} + \sum_{t=0}^{p} \phi_3 \Delta AGRICL_{t-1} + \sum_{t=0}^{p} \phi_4 \Delta LENDR_{t-1} + \delta ECM_{t-1} + \varepsilon_t$$

In Equation [8] ϕ_1, ϕ_2, ϕ_3 and ϕ_4 are short-run dynamic coefficients converging to long-run equilibrium, while ECT_{t-1} is the speed of adjustment parameter and error correction model originating from the estimated equilibrium relationship.

Bound Test- The Bound test models the ARDL equation by the use of least square procedure to investigate the existence of long-run relationship in a model, the *F*-statistics test is conducted for the joint significance of the coefficient of lagged variables, $H_0 : \phi_1 = \phi_2 = \phi_3 = \phi_4 = 0$ against the alternative $H_1 : \phi_1 \neq \phi_2 \neq \phi_3 \neq \phi_4 \neq 0$. The calculated F-statistics is compared to the critical value. If the *F*-statistics value lies above the upper bound of critical value, the null hypothesis is rejected. If the *F*-statistic value falls below the lower bound of critical value, the null hypotheses cannot be rejected that is, there is no long-run relationship among the variables, however, if the *F*-statistic value lies within the bound test the result is inconclusive.

3.4 Residual Diagnostic Tests

To validate the results of ARDL model, the Breusch-Godfrey serial correlation LM test, the Jarque-Bera test, and the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMSQ) tests were used to test for serial correlation, normality, and the stability of the ARDL model respectively.

4. RESULTS AND DISCUSSION OF FINDINGS

4.1 Descriptive Statistics

The results of the descriptive statistics are presented on Table 1.

Table 1: *Descriptive Statistics Result*

	FOODP	*COMMC*	*AGRICL*	*LENDR*
Mean	2084.545	254.1120	43.59968	24.40211
Maximum	2127.370	1457.822	50.57000	36.09000
Minimum	2035.730	5.012700	34.97000	18.36250
Skewness	-0.024311	1.918196	-0.223999	0.687296
Kurtosis	1.861107	6.466312	1.531699	2.725642
Jarque-Bera	1.678446	34.53040	3.043954	2.537838
Probability	0.432046	0.000000	0.218280	0.281135
Observations	31	31	31	31

Source: *Author's computation using E-views 10.*

Analysis of the descriptive statistics show that the difference between the data-set's minimum and maximum values serves as evidence of considerable variances relative to the mean values of each data-set. All datasets with the exception of *COMMC* had normal skewness since samples from a normal distribution are predicted to have an expected skewness of 0. Similarly, all datasets with the exception of *COMMC* had normal kurtosis because values for asymmetry and kurtosis between -2 and +2 are regarded acceptable to demonstrate a normal univariate distribution. The Jarque-Bera test also serves as a goodness-of-fit test, determining whether sample data have skewness and kurtosis that are consistent with a normal distribution. The Jarque-Bera statistics similarly reveals that all datasets, with the exception of *COMMC*, were normally distributed using a probability value of 5%. Since individual statistical analysis does not invalidate further analysis, this study proceeded with the ARDL estimation.

4.2 Unit Root Test

The results of the Philips-Perron (PP) unit root tests are is presented on Table 2.

Table 2: *Phillips-Perron (PP) Unit Root Test Result*

Variables	PP Test		
	Levels	**1st Difference**	**Inference**
FOODP	-3.670974 (-3.568379)	-	1(1)
COMMC	4.516217 (-3.568379)	-	1(1)
AGRICL	-2.431289 (-3.568379)	-6.514611 (-3.574244)	1(0)
LENDR	-3.296223 (-3.568379)	-9.811947 (-3.574244)	1(1)

Figures in parenthesis represents the critical values at the 5% level
Source: *Author's computation using E-views 10.*

The result of the Phillips-Perron (PP) unit root test are presented on Table 2. Following the PP test, a data-set is stationary if its calculated value is greater than its critical value. The result on Table 2 shows that *FOODP*, *COMMC* were stationary at levels. *AGRICL* and *LENDR* were stationary at first difference. Consequently, the data-sets, met the stationarity condition.

4.3 ARDL Results.

With the ARDL optimal lag structure given as (4, 4, 4, 2) the result of the ARDL Bound test, the short-run and the long-run results are given.

4.3.1 The ARDL Bound Test- On Table 3 is the result of the bound test which establishes the existence of long-run relationship in the model.

Table 3: *ARDL Bound Test Result*

F-Bounds Test	**Null Hypothesis: No levels relationship**			
Test Statistic	**Value**	**Signif.**	**I(0)**	**I(1)**
F-statistic	5.984227	10%	2.37	3.2
K	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Source: *Authors computation using E-view 10*

The Bound test result showed that the F-statistics value of 5.98 is greater than the upper bound critical values (I(1)) at all the levels of significance, indicating the existence of long-run relationship in the model. As such the study proceeded to conduct the short-run and long-run forms of the ARDL model.

4.3.2 The ARDL Short-run and Long-Run Estimation

The result of the short-run and long-run coefficient estimates are presented on Tables 4 and 5 respectively.

Table 4: *Short-Run Coefficient Estimates*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(COMMC)	0.003763	0.006853	0.549128	0.5963
D(COMMC(-1))	0.051830	0.015684	3.304565	0.0092
D(COMMC(-2))	0.058008	0.014414	4.024474	0.0030
D(COMMC(-3))	0.034360	0.014039	2.447494	0.0369
D(AGRICL)	0.177227	1.590508	0.111428	0.9137
D(AGRICL(-1))	2.566013	2.077056	1.235409	0.2480
D(AGRICL(-2))	13.47002	3.343754	4.028413	0.0030
D(AGRICL(-3))	-5.483963	3.259083	-1.682671	0.1267
D(LENDR)	-0.115974	0.123133	-0.941855	0.3709
D(LENDR(-1))	-0.258061	0.104479	-2.469965	0.0356
*CointEq(-1)**	-0.579476	0.108026	-5.364231	0.0005
R-squared	0.936359			
Adjusted R-squared	0.872719			

Source: *Authors computation using E-view 10*

The coefficient of co-integration (CointEq (-1)) which shows how quickly variables adjust to a shock and return to equilibrium is estimated in the short-run equation on Table 4. The estimated coefficient of the CointEq (-1)) is -0.58 and it was highly statistically significant at the 1% level. This indicates that the deviation from the current production path is corrected by 58% annually in the model. The R-squared value of 94% shows a high goodness of fit for the model, indicating that a high percentage of the variance in the dependent variable is explained by the independent variables collectively.

The result of the short-run coefficients of commercial bank credit to the agricultural sector (*COMMC*) had a positive impact on food production with significant lag values. Within this period, commercial bank credit to the agricultural sector increased food production in the country to as high as 0.058 per cents. A similar result was recorded for the impact of agricultural labour (*AGRICL*) on food production, although all period lags were positive with the exception of lag 3. The inverse relationship of lag 3 is a reflection of the fact that up to some point Nigeria's agricultural sector high labour intensive and largely unskilled labour adversely affects food production. In addition, the result of the short-run coefficients of lending rate (*LENDR*) showed that the cost of borrowing had an inverse impact on food production. The high cost of borrowing for agricultural purposes is detrimental to food production in the short-run.

Table 5: *ARDL Long-run Coefficient Estimates*

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
COMMC	0.087263	0.039839	2.190365	0.0562
AGRICL	0.724924	1.090671	0.664658	0.5229
LENDR	-0.164001	0.765608	-0.214210	0.8352
C	2092.140	48.88746	42.79503	0.0000

Source: *Authors computation using E-view 10*

The result of the long-run coefficients of commercial bank credit to the agricultural sector (*COMMC*) had a positive impact on food production and it was statistically significant at the 10 per cent level. Its coefficient states that a percentage increase in commercial bank credit to the agricultural sector would increase food production by 0.09 per cents. This finding is corroborated by Golley and Samuel (2021). Similarly, agricultural labour (*AGRICL*) equally had a positive impact on food production in Nigeria, increasing food production by 0.71 per cents. However, its coefficient was insignificant, showing Nigeria's predominantly low skilled and high labor intensive structure rather than being mechanized. The capacity of the country to produce food is somewhat constrained by this. Additionally, the coefficient for the lending rate (*LENDR*) had a negative and inverse relationship of about -0.16 per cent with food production in the long-run. A similar finding was made by Onuegbu et al. (2022). This is an indication that the cost of borrowing from commercial banks is limiting the nation's ability to produce food.

4.4 Residual Diagnostic Test Results

The residuals for this study were tested for serial correlation, normality and stability.

Breusch-Godfrey Serial Correlation LM Test Result

The Breusch-Godfrey serial correlation LM test was used to test for serial correlation as presented on Table 6.

Table 6: *Breusch-Godfrey Serial Correlation LM Test*

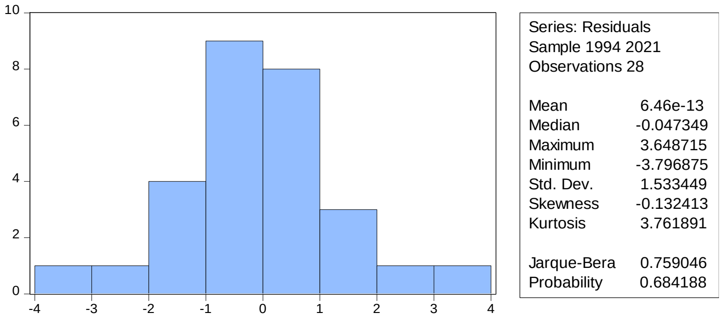
F-statistic	1.731925	Prob. F(2,7)	0.2449
Obs*R-squared	8.937813	Prob. Chi-Square(2)	0.1115

Source: *Authors computation using E-view 10*

The result of the Breusch-Godfrey LM test accepted the null hypothesis of no serial correlation in the residual, because the probability of its F-statistics value of 0.24 was greater than the 5% level. As such the ARDL model was free from the problem of serial autocorrelation.

Jarque-Bera Normality Test Result

The Jarque-Bera test result on Figure 1 was used to ascertain the distribution of the residuals in the ARDL model.

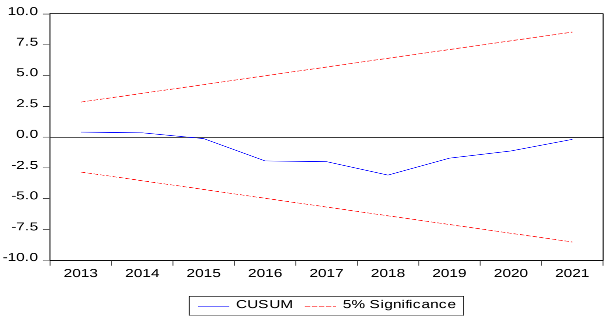


Source: *Authors computation using E-view 10*
Figure 1: *Jarque-Bera Normality Test Result*

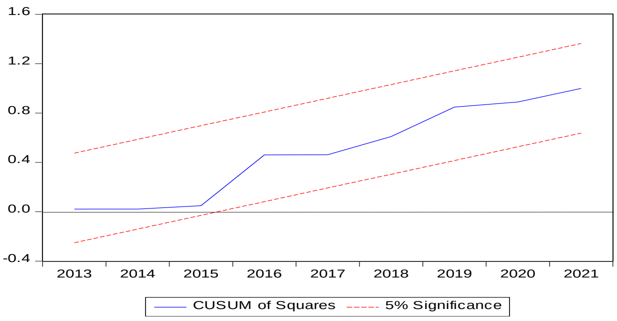
The result of the Jarque-Bera statistics has skewness and kurtosis that matches that of a normal distribution. Furthermore, the probability value of the Jarque-Bera statistics of 0.76 is greater than the 5% level, as such the null hypothesis for this test which states that the residuals are normally distributed is accepted.

CUSUM and CUSUMSQ Stability Test Results

The results of the CUSUM and CUSUMSQ tests used to test for stability of the ARDL model are reported on Figures 1 and 2 respectively. The tests are applied to the residuals of the estimated model.



Source: *Authors computation using E-view 10*
Figure 1: *CUSUM Plot Result*



Source: *Authors computation using E-view 10*
Figure 2: *CUSUMSQ Plot Result*

An analysis of the plots of the CUSUM and the CUSUMSQ statistics on Figures 2 and 3 respectively were all within the two straight line indicating that the ARDL model is stable.

5 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study uses the ARDL model to examine the impact of commercial bank credit to the agricultural sector on domestic food production in Nigeria spanning 1991-2021. Findings from the study reveal that, both in the short run and in the long run, commercial bank credit to the agricultural sector has positive impact on domestic food production in the country. However, in terms of the sizes of the estimated coefficients, the impact of commercial bank credit to the agricultural sector on domestic food production is low, increasing food production by about 0.05 and 0.08 per cents in the short and long respectively. The study also concluded that the high cost of borrowing from commercial banks is limiting the nation's ability to produce food.

5.2 Recommendations

Based on the study's findings, it was recommended that, in order to increase domestic food production, more credit facilities should be made available to farmers and at reasonable single digit interest rate by commercial banks. This can be accomplished through enhancing the financial sector and improving commercial banks' liquidity positions. Additionally, the study recommended that both the federal and state ministries of agriculture should invest in agricultural education on better farm practices throughout rural communities in Nigeria in order to increase the efficiency of labor in the agricultural sector.

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