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ARTICLE

Agricultural Financing and Agricultural Output in Nigeria

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Abstract

This study examined agricultural financing and agricultural output in Nigeria, focusing on the moderating effect of interest rates from 1978 to 2020. Using vector error correction model estimation, the results indicated that an increase in agricultural bank credit generally leads to an increase in agricultural output. This suggests that a rise in bank credit to agriculture will enhance productivity in the agricultural sector. To ascertain the effect of interest rates on agricultural bank credit and output, interest rates were interacted with bank credit to agriculture. It was observed that considering interest rates in relation to bank credit contributed 15.1% less to agricultural performance growth compared to non-consideration of interest rates. This indicates that agro-economic activities are significantly influenced by both interest rates and bank credit. Furthermore, the study found that bank credit to agriculture, when considered with interest rates, caused changes in agricultural output. This implies that monetary policies favoring bank credit to agriculture will boost agro-productivity in Nigeria. Among the policy recommendations, the CBN should adopt monetary policies and schemes, particularly those related to interest rates, that favor the supply of bank credit to agriculture. This approach will translate to more meaningful growth in agricultural performance.

Keywords: Agricultural financing, agricultural output, interaction term, VECM, Nigeria.

JEL: C58, F43, R42, F63

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1. Introduction

The debate concerning the relationship between agricultural financing and agricultural output has been a subject of discussion in recent decades (Ibitomi & Ijaiya, 2018) and continues to emerge as a topic of discussion in recent years (Orji et al., 2020). The main argument in this debate center on the impact of agricultural financing on agricultural output performance in many countries, with Nigeria being no exception. Among all the sectors in Nigeria, the agricultural sector remains the most significant single

contributor to the region's economic growth, accounting for over 32% of the region's Gross Domestic Product (GDP) and employing more than 65% of the total workforce (Matthew et al., 2019). The importance of agriculture to the growth of the Nigerian economy cannot be undermined. Agriculture provides food for households, employment opportunities for job seekers, income for farmers, and serves as a source of foreign exchange for the government (Ogundipe et al., 2019).

Despite its critical importance, the agricultural sector in Nigeria faces numerous challenges, with inadequate financing being one of the most pressing issues. Agricultural financing encompasses the provision of funds necessary for the acquisition of a wide range of inputs such as seeds, fertilizers, machinery, equipment, and technology. These inputs are essential for boosting productivity, improving yields, and achieving sustainable agricultural growth (Obansa & Maduekwe, 2013). The financing gap in the agricultural sector has been a major impediment to realizing its full potential. This gap is characterized by the insufficient availability of credit facilities tailored to meet the specific needs of farmers. Many farmers, particularly smallholders, struggle to access formal financial services due to stringent lending criteria, high-interest rates, and the lack of collateral. As a result, they are often forced to rely on informal sources of finance, which can be unreliable and costly (Afolabi, 2010).

Moreover, the agricultural sector's perceived high risk discourages commercial banks from extending credit to farmers. Agricultural activities are inherently risky due to factors such as weather variability, pest infestations, and fluctuating market prices. This perception of risk is further exacerbated by the lack of insurance schemes that could mitigate these risks. Consequently, banks prefer to invest in less risky ventures, leading to a significant underfunding of the agricultural sector (Balogun & Out, 1991). In addition to these challenges, the existing agricultural financing schemes and policies have not been effectively implemented or adequately targeted. Government initiatives such as the Nigerian Agricultural and Co-operative Bank (NACB), the Agricultural Credit Guarantee Scheme Fund (ACGSF), and the Commercial Agriculture Credit Scheme (CACS) were designed to enhance credit access for farmers. However, these schemes have often been marred by bureaucratic inefficiencies, corruption, and poor management, limiting their impact (Nwafor, 2017; Idowu et al., 2020).

Furthermore, the discovery of oil and the subsequent economic shift have diverted attention and resources away from agriculture. The oil boom led to a decline in public investment in agriculture, resulting in deteriorating infrastructure, such as roads and storage facilities, which are crucial for agricultural productivity and market access (Olagunju, 2000). The focus on oil revenues has also led to inconsistent agricultural policies, further compounding the sector's financing challenges. The lack of investment in agricultural research and development (R&D) is another critical issue. Innovation and technological advancement are key drivers of agricultural productivity. However, inadequate funding for R&D has hindered the development and dissemination of improved farming

techniques, high-yield crop varieties, and efficient resource management practices. This has limited the sector's ability to adopt modern technologies and improve overall productivity (Ekpo & Umoh, 2012).

Historically, the Nigerian government and financial institutions have introduced several initiatives to address this financing gap. Programs such as the Nigerian Agricultural and Co-operative Bank (NACB), the Agricultural Credit Guarantee Scheme Fund (ACGSF), and the Commercial Agriculture Credit Scheme (CACS) were designed to facilitate the flow of credit to the agricultural sector. However, these initiatives have often fallen short of their objectives due to various factors, including the perceived high risks associated with agricultural investments, inadequate implementation strategies, and the reluctance of banks to extend credit to farmers (Adeleye et al., 2020).

The discovery of oil in Nigeria further compounded the challenges faced by the agricultural sector. The shift in focus towards oil revenue led to a decline in government attention and budgetary allocations to agriculture, resulting in a neglect of the sector's financing needs (Nwaigbo, 1991). This neglect has had a detrimental impact on agricultural productivity and, by extension, on the overall economic development of the country. In recent years, there has been renewed interest in reviving the agricultural sector as a means of diversifying the economy and reducing dependency on oil revenues. The Central Bank of Nigeria (CBN) has introduced various monetary policies and intervention programs aimed at stimulating agricultural financing and enhancing agricultural output. These policies include interest rate adjustments, credit schemes, and other financial incentives designed to encourage banks to extend credit to the agricultural sector.

However, there remains a significant gap in the literature regarding the effectiveness of these policies and interventions. While previous studies have examined the relationship between agricultural financing and agricultural output, they have often overlooked the moderating effect of interest rates on this relationship. Understanding how interest rates influence the impact of bank credit on agricultural output is crucial for developing targeted financial interventions that can drive substantial improvements in agricultural productivity. This study aims to fill this research gap by investigating the extent to which the CBN's interest rate policies and various agricultural credit schemes have influenced agricultural output in Nigeria. Specifically, it will evaluate the impact of bank credit on agricultural performance and analyze how the interaction between interest rates and bank credit affects agricultural output. By addressing this critical issue, the study seeks to provide valuable insights for policymakers, financial institutions, and stakeholders

in the agricultural sector, highlighting the need for sustainable and effective financial strategies to support agricultural growth.

The findings of this study will contribute to the existing body of knowledge on agricultural financing and offer practical recommendations for enhancing the effectiveness of financial interventions in the agricultural sector. Ultimately, this research aims to promote agricultural development and economic growth in Nigeria by addressing the financing challenges faced by the agricultural sector and proposing viable solutions for overcoming these challenges.

2. Literature Review

2.1. Theoretical Review

Two complementing theories Credit Channel Theory (CCT) and law of return to scale provides basic understanding of the issue under discussion. CCT has been extensively employed to highlight how policy variables affect both credit supply and demand in any economy. [Dobrinisky and Markov \(2003\)](#) introduced the "credit channel view," which posits that monetary policy shocks impact real economic performance via credit supply by commercial banks and other financial institutions. The bank lending channel, a key component of this theory, explains that changes in central bank policy affect the amount of credit issued by deposit money banks to the agricultural sector, which subsequently influences the real economy. This channel suggests that monetary policy affects bank assets (loans) and liabilities (deposits) and shifts in the supply of bank loans impact the external finance premium, influencing real economic activity ([Black, Hancock, & Passmore, 2010](#)). This theory comprises two main channels: the bank lending channel and the balance sheet channel.

The bank lending channel explains how changes in central bank policies, such as interest rate adjustments, affect the amount of credit that deposit money banks provide to various sectors, including agriculture. When the central bank tightens monetary policy by raising interest rates, the cost of funds for banks increases. As a result, banks might reduce the volume of loans they extend. This reduction in loan supply can particularly affect sectors dependent on bank financing, such as agriculture. For instance, if farmers and agribusinesses face higher borrowing costs or limited access to credit, their ability to invest in inputs, technology, and expansion diminishes, thereby affecting agricultural output and productivity.

The theory further suggests that monetary policy impacts bank assets (loans) and liabilities (deposits)

and shifts in the supply of bank loans influence the external finance premium—the additional cost of obtaining external finance over internal funds. When the supply of bank loans is disrupted, borrowers reliant on bank credit may incur higher costs to find alternative financing, which can stifle investment and reduce economic activity ([Black, Hancock, & Passmore, 2010](#)).

The balance sheet channel complements the bank lending channel by considering the impact of monetary policy on borrowers' balance sheets. A contractionary monetary policy increases borrowing costs, which can deteriorate the financial conditions of borrowers. For agricultural producers, higher interest rates mean higher debt servicing costs, which can strain their financial health and reduce their ability to invest in productive activities. This interaction between monetary policy and financial conditions underscores the importance of credit availability in sustaining agricultural productivity and overall economic growth. Additionally, the Law of Returns to Scale provides a theoretical linkage between credit and agricultural output. This economic principle explains how output changes in proportion to changes in input variables. [Tahir et al. \(2015\)](#) noted that deposit money banks and other financial institutions mobilize surplus funds from income holders as savings and convert them into loanable funds for investors. These loans support operating expenses, purchase of inputs, and capital investments in the agricultural sector, thereby enhancing productivity and economic growth. Studies have shown that formal credit plays a vital role in agricultural output and overall economic development. For example, [Khan \(1981\)](#), [Gul and Khan \(1993\)](#), [Amir \(1999\)](#), and [Rehman \(2003\)](#) reported higher crop yields for credit borrowers compared to non-credit borrowers. Institutional credit significantly impacts agricultural productivity by providing necessary inputs such as fertilizers and seeds ([Zuberi, 1990](#); [Ahmad, 2011](#)). Furthermore, [Nwanyanwu \(2012\)](#) emphasized that deposit money banks make credit available by channelling surplus funds from depositors to investors with innovative ideas but lacking capital.

[Osabohien et al. \(2019\)](#) highlighted that while agricultural credit is crucial, it must be complemented by social protection to buffer against the shocks and risks associated with farming. This comprehensive framework underscores the importance of credit in boosting agricultural output and economic growth, particularly in the context of Nigeria's agricultural sector.

2.2 Empirical Review

Empirical studies on the relationship between agricultural financing and agricultural output have been conducted both in Nigeria and abroad. Among these studies, some focused on bank loans/credit to agriculture in relation to agricultural output, while others focused on the disbursement of agricultural credit in connection to agricultural output.

Among the studies in Nigeria, for instance, [Okore and Nwadiubu \(2022\)](#) examined the impact of agricultural financing on agricultural output in Nigeria, covering the period from 1986 to 2022. Using proxies for agricultural financing, such as commercial bank loans to agriculture (CBLA) and the disbursement of the Agricultural Credit Guarantee Scheme Fund (ACGSF), and a proxy for agricultural output as the contribution of agriculture to overall GDP, the results from the OLS revealed that CBLA and the disbursement of the ACGSF had a positive and significant impact on agricultural output.

[Sulaimon \(2021\)](#) evaluated the link between the Agricultural Credit Guarantee Scheme Fund (ACGSF) and agricultural performance in Nigeria, covering the period from 1981 to 2019, with the aid of threshold regression analysis. In capturing the performance of agriculture, real agricultural gross domestic product was used. The study revealed that below the ACGSF thresholds of ₦1,060,389.00, the effect of ACGSF on agricultural performance is negative and insignificant, while above ₦5,951,809.00, the effect of ACGSF on agricultural performance is positive and significant.

[Udoka, Mbat, and Duke \(2016\)](#) examined the effect of commercial banks' credit on agricultural output in Nigeria. Estimated results showed that there was a positive and significant relationship between the Agricultural Credit Guarantee Scheme Fund and agricultural production. This means that an increase in the Agricultural Credit Guarantee Scheme Fund could lead to an increase in agricultural production in Nigeria. There was also a positive and significant relationship between commercial banks' credit to the agricultural sector and agricultural production in Nigeria. In addition, the study confirmed a positive and significant relationship between government expenditure on agriculture and agricultural production. However, the study also showed a negative relationship between interest rates and agricultural output in line with theoretical postulations. This is because an increase in interest rates discourages farmers and other investors from borrowing, thus leading to less agricultural investment and output.

Using the Error Correction Model (ECM) technique, [Ogbuabor and Nwosu \(2017\)](#) evaluated the impact of Deposit Money Bank's (DMB) agricultural credit on

agricultural productivity in Nigeria, covering the period from 1981 to 2014. One of the empirical findings revealed that agricultural credit had a positive impact on agricultural productivity. The study showed that Nigeria's agriculture can be boosted through sufficient funding. Therefore, they suggested that the adequate supply of credit to the agricultural sector at a reduced interest rate should be ensured by the relevant bodies.

[Anetor, Ogbechie, Kelikume, and Ikpesu \(2016\)](#) examined credit supply and agricultural production in Nigeria using data spanning 1981–2013. Results from their vector autoregressive estimates showed that the Agricultural Credit Guarantee Scheme Fund (ACGSF) contributed poorly in explaining agricultural sector performance, while commercial loans to the agricultural sector significantly impacted agricultural production. It was further revealed by the variance decomposition estimates of the study that the major source of changes in agricultural production is commercial loans to the agriculture sector, while the ACGSF accounts for a very low variation. Among others, they recommended that participatory banks in the scheme of credit supply should be encouraged and motivated.

Employing the Ordinary Least Square technique, [Okafor \(2020\)](#) examined the effect of commercial bank credit on Nigeria's agricultural productivity from 1980 to 2013. Among the empirical findings, it was deduced that credit to the agricultural sector and the Agricultural Credit Guarantee Scheme Fund have positive and significant effects on agricultural output. To boost the confidence of lending banks and enhance agricultural production in Nigeria, the study recommended that the Central Bank of Nigeria should absorb some parts of the losses incurred by deposit money banks on their exposure to the agricultural sector.

[Olowofeso, Adeboye, Ajo, Kufre and Ochoche \(2017\)](#) investigated the relationship between credit to agriculture and agricultural output in Nigeria with the estimation technique known as nonlinear autoregressive distributed lag (NARDL) model. The study which employed a time series data covering from 1992Q1 to 2015Q4 showed no evidence of asymmetry in the impact of credit to agriculture sector output growth. Furthermore, the finding revealed that the total agricultural output growth is majorly contributed by the impact of the positive changes in agricultural credit. The study recommended an enhanced open door to agricultural access to boost agricultural output. [Oparinde, Amos and Adeselu \(2017\)](#) assessed the effect of ACGSF on fishery development in Nigeria from 1981 to 2015 using ARDL model. The results showed that the value of fishery loans guaranteed has significant negative effects on fishery development in both short- and long-run. [Orok and Ayim \(2017\)](#) examined the impact of ACGSF on agricultural

development in Nigeria from 1990 to 2016 using OLS technique. The results revealed significant positive relationship between ACGSF and agricultural development.

Orji, Ogbuabor, Anthony-Orji and Alisigwe (2020) examined causality between agricultural financing and agricultural output in Nigeria using Pairwise Granger causality test. The findings showed no causal linkage between agricultural financing and agricultural output within the period under review. **Reuben, Nyam and Rukwe (2020)** assessed the impact of ACGSF on agricultural output in Nigeria from 1998 to 2017 using OLS technique. The results showed that ACGSF has significant positive effect on agricultural output. **Okafor (2020)** examined the effect of commercial banks credit on agricultural development in Nigeria using Augmented Dickey Fuller test, Phillip-Perron test and OLS technique. The results revealed that banks credit to agriculture and ACGSF have significant positive effects on agricultural output.

Osabohien, Mordi and Ogundipe (2020) studied how Nigeria's agricultural sector performance would be enhanced through access to credit. Using a theoretical baseline of Cobb-Douglas production and Autoregressive Distribution Lag (ARDL) method, the results revealed that agricultural credit captured by agricultural credit guarantee scheme fund (ACGSF) and commercial bank credit to agriculture obviously increased agricultural performance by 32.11% and 93.65% respectively. The study implies that credit access increases agricultural performance. Therefore, based on the findings, the study recommended that access to credit by farmers should be enhanced to increase their purchasing power needed to obtain relevant input materials.

Fowowe (2020) examined the effect of financial inclusion on agricultural productivity in Nigeria with Generalized Household Survey (GHS) panel data set using fixed effects estimation. The findings showed that financial inclusion (ownership and usage of account, borrowing and saving) has significant positive effect on household agricultural productivity. In a similar study, **Osabohien et al. (2020)** examined the effect of household credit access on agricultural production in Nigeria with cross-sectional data using propensity score matching (PSM) technique. The results showed that households with access to credit have relatively better yields than households with no credit access.

Adeleye, Daramola, Onabote and Osabohien (2021) conducted a study on the impact of environmental degradation and non-renewable energy on agro-productivity in Nigeria. Applying yearly time series data spanning from 1980 to 2018, vector autoregressive framework and impulse response

functions techniques, it was found that domestic credit has an inverse relationship with agro-productivity. The study attributed such outcome to high lending rate charged by financial intermediaries.

Eyo, Nwaogu, and Agenson (2020) analyzed the effect of agricultural credit guarantee scheme (ACGSF) on agricultural output in Nigeria using OLS technique. The findings showed significant positive impact of ACGSF on agricultural output. Similarly, In a related study, **Akinriola and Okunola (2017)** estimated the effect of ACGSF on agricultural productivity in Nigeria from 1978 to 2014 using linear ARDL model. The results revealed long-run equilibrium between the value of loans, number of loans and agricultural productivity. Although in the long run, the value of loans has no significant effect on agricultural productivity, the number of loans does.

Zuberi (1990) used Cobb-Douglas production function to estimate the contribution of institutional credit to technological improvements which impact on agricultural sector in Pakistan. The study which covered from the period: 1956 to 1986 revealed that Pakistan's agricultural sector witnessed increasing returns to scale. Therefore, the country has pursued balanced economic growth policy between the two sectors namely agriculture and industry. The study envisaged that policy makers might have ignored price signal and output when allocating credit in the agricultural sector. A study on the impact of institutional credit on agricultural production was carried out by **Iqbal, Ahmad, and Abbas (2003)** with a focus on Pakistan. The study which used ordinary least squares (OLS) method estimated that ten percent rise in the institutional credit disbursement would cause one percent rise in the agricultural gross domestic product (GDP). The finding indicated that the coefficient for agricultural credit is positive and significant at five percent level which suggested that institutional credit affect agricultural production positively. Therefore, they recommended for an expansion of agricultural credit and extension of the institutional credit net by the commercial banks and other financial institutions to the larger group of small farmers of the farming community.

Sial, Awan and Waqas (2011) explored the role of institutional credit in agricultural production in Pakistan using the time series data for the period of 1972 to 2008. Cobb-Douglas production function is estimated using OLS and all the variables are transformed to per cultivated hectare. It is estimated from the result that one percent increase in institutional credit will increase agricultural production by sixteen percent. Thus, result showed that agricultural credit is positively related to agricultural production. Using ARDL estimator, **Ahmad (2011)** examined the role of institutional credit on agricultural output with a focus on Pakistan from

1974 to 2008. The empirical findings revealed that although credit has insignificant impact on the agricultural output, they are positively related. While credit plays significant role in providing for agricultural inputs, it has indirect role. The study concluded that agriculture credit itself cannot play direct role in enhancing the output but indirectly promotes the growth of the sector through the purchase of various modern inputs. Therefore, the study recommended that the base of agriculture credit should be extended to small farmers among the rural areas by the commercial banks.

Saeed, Abid and Muhammad (2014) empirically analysed the impact of agricultural credit on agricultural productivity in Pakistan. In analysing the data, the study which employed field survey and logistic regression model found that amount of credit, short term and long-term loans have positive and significant impact on agricultural productivity. The positive signs borne by the parameters suggested that increase in bank credit for farmers will promote the use of standard agricultural inputs like high yield variety of seeds, mechanized farming measures etc which will boost agricultural productivity. Thus, the study recommended for on-time provision of credit facility for farmers which will translate to increase in output.

In a similar study, **Akudugu (2016)** evaluated agricultural productivity, credit and farm size nexus in Ghana using hierarchical competitive model. The results showed a significant positive relationship between credit from formal and informal sources and household agricultural productivity.

Chisasa and Makina (2013) employed OLS estimates of Cobb-Douglas production function to examine the impact of bank credit on agricultural output in Nigeria. The study covered from 1970 to 2009 and found while keeping other factors constant, one percent increase credit resulted to 0.6 percent increase in agricultural out. In terms of the elasticities of Cobb-Douglas output, the study also indicated that the joint influence of credit and capital accumulation gave rise to constant return to scale which implied that increasing the two inputs will increase the agricultural output proportionately. The finding showed that bank credit impacted on the agricultural output positively. With the application of Johansen cointegration and causality tests, **Chisasa and Makina (2015)** examined the dynamic relationship between bank credit and agricultural output in South Africa employing annual time series data spanning from 1970 to 2011. The study found that bank credit has a negative impact on agricultural output in the short run. The finding reflected that the negative impact as found in the short run could be traced to the inherent attributes in South Africa namely short-term nature of the credit, high interest rate and

uncertainties relating to climatic conditions, fluctuating prices, high input costs etc. On the other hand, the study found that in the long run, bank credit influences agricultural output positively as it was estimated that 1 percent rise in bank credit will result in 0.49 percent rise in agricultural output while holding other factors in the model constant. The causality check revealed that for the agricultural sector, finance drives growth.

Florence and Nathan (2020) assessed the impact of commercial banks' credit on agricultural growth in Uganda from 2008Q3 to 2018Q4 using Autoregressive Distributed Lag Model (ARDL). The findings showed that banks' credit have significant positive impact on agricultural output in the long-run and insignificant impact in the short-run. Along the same methodology, **Islam (2020)** examined the effect of agricultural credit on agricultural productivity in Bangladesh from 2000 to 2019 using ARDL. The findings showed significant positive effects of agricultural credit on agricultural productivity in the short- and long-run. **Bahsi and Ceti (2020)** assessed the impact of agricultural credit on agricultural production value in Turkey with time series data from 1998 to 2016 using the Ordinary Least Squares (OLS) technique. The results showed a significant positive impact of agricultural credit on agricultural output.

Dilshad, Muhammad and Muhammad (2018) examined the role of institutional credit on agricultural output. Using Autoregressive Distributed Lag approach for the long run estimation, the finding indicated that formal credit has a positive and significant effect on agriculture output. **Abdallah, Ayamga, and Awuni (2018)** used logit model to examine the impact of agricultural credit on farm income under the Savanna and Transitional zones of Ghana. The study found that farming households in transitional zones in Ghana are poor and that financial inclusion is required to increase revenue through the sale of agricultural commodities resulting from the increased output. Hence, increasing household income is needed to reduce poverty and enhance livelihoods among rural farming households.

Ngong, Thaddeus and Onwumere (2020) examined banking sector development and agricultural productivity in Central African Economic and Monetary Community (CEMAC) from 1990 to 2018 using Panel Autoregressive Distributed Lag Model (PARDL) and Vector Error Correction Model (VECM). The findings revealed a long-run relationship between banking sector and agricultural productivity. Also, bi-directional causality exists between banking sector and agricultural productivity in the CEMAC region. Similar study by **Anh, Gan and Anh (2020)** examined the impact of credit on agriculture performance in Vietnam from 2004Q4 to 2016Q4 using Indicator Saturation (IS) break test, ARDL bounds test and Toda-Yamamoto

Granger causality test. The findings showed that agricultural credit has significant positive influence on agricultural output in both short-run and long-run. Also, a unidirectional causality exists running from agricultural credit to agricultural output.

On the other hand, study of [Mboulou \(2020\)](#) engaged in determining the magnitude of the impact of agricultural credit on productivity in Congo. Using data from 2011 agricultural survey, endogenous switching regression and multiple linear regression, the results obtained showed that access to credit is a function of the working and organizational conditions of farmers. Thus, the results showed that access to credit among farmers had a negative impact on their productivity. The outcome can be explained by the fact that the organization and working conditions pose the problem of information asymmetry between the farmer and the worker. This asymmetry is likely to limit agricultural production.

Interest rate and Agricultural Output

[Ezeanyeji \(2014\)](#) assessed the impact of interest rate deregulation on agricultural productivity in Nigeria from 1986 to 2010 using OLS. The study found that a rise in interest rates caused an insignificant increase in agricultural productivity, contradicting [Mckinnon \(1973\)](#) and [Shaw \(1973\)](#), who argued that interest rates stimulate investment in agriculture through increased savings and investment demand. This implies that interest rate deregulation played an insignificant role in agricultural productivity during this period.

[Amassoma, Nwosa, and Ofere \(2011\)](#) explored the relationship between interest rate deregulation, lending rate, and agricultural productivity from 1986 to 2009. They found the coefficient of interest rate to be negative and insignificant to agricultural output, aligning with a priori expectations. Their regression results revealed that a one percent decrease in interest rate would stimulate agricultural output by forty percent.

[Tarasov \(2013\)](#) examined how interest rates affected decisions to insure agricultural produce using a financial methodology and a demand function for insurance proposed by Weiss (2007). Testing data from Ukraine and the United States (2002-2011), the study showed that higher interest rates required larger government subsidies for agricultural insurance to be viable, reducing incentives for producers.

[Onyishi, Arene, and Ifiorah \(2015\)](#) investigated the impact of interest rate reforms on agricultural finance and growth in Nigeria from 1970 to 2011. Applying the Chow test, the study found a significant differential

impact on aggregate credit volume to the agricultural sector between regulated and deregulated regimes. The average savings interest rate was positive and statistically significant during both periods, indicating its major role in determining aggregate credit volume to agriculture in Nigeria. However, the low deposit interest rate during the regulation regime hampered savings. The study also found that interest rate deregulation positively and significantly affected agricultural growth.

[Kareem et al. \(2013\)](#) analyzed factors influencing agricultural output in Nigeria from 1977 to 2011 using OLS. They found that interest rate, among other factors, significantly influenced agricultural output. Similarly, [Ajudua, Ojima, and Okonkwo \(2015\)](#) examined the effects of monetary policy on Nigeria's agricultural sector between 1986 and 2013 using OLS regression. Their model predicted that a rise in interest rate would decrease agricultural growth and any increase in monetary policy rate would contract growth in the sector. They suggested implementing a concessionary low interest rate to encourage rural farmers to borrow and invest in large-scale agricultural activities.

[Zuberu, Ari, and Iliya \(2019\)](#) investigated the effect of agricultural financing on productivity in Nigeria from 2000 to 2015. Their findings revealed a significant impact of agricultural financing on technological advancement and output production. [Chinedu, Chigozie, and Ikenna \(2022\)](#) studied the effect of microfinance credit on agricultural sector output in Nigeria from 1992 to 2019 using the ARDL model. They found that microfinance loans and deposits positively affected agricultural sector output, while shareholders' funds had a negative impact.

[Anthony and Tijjani \(2022\)](#) examined how agricultural financing can improve food security in Nigeria from 1981 to 2020 using the ARDL model. They found that commercial bank credit to agriculture, agricultural credit guarantee scheme fund, government expenditure on agriculture, and interest rate all significantly impacted food security as measured by agricultural output. However, the study's use of agricultural output as a proxy for food security was deemed misleading since food security also involves food affordability and nutritional adequacy. [Oluwaseyi and Risikat \(2020\)](#) similarly investigated agricultural financing and growth performance for two periods, pre-2000 and post-2000. They found significant positive impacts of agricultural financing on agricultural output and manufacturing sector output in pre-2000, but no negative impact post-2000, suggesting the need for a longer sample period for analysis.

Ogundajo et al. (2022) examined credit financing, monetary policy, and the performance of Nigeria's agricultural sector using the ARDL technique. Their findings contradicted previous studies by showing a weak positive impact of agricultural guaranteed scheme funds on agriculture output, negative and insignificant impacts of credit to agriculture, and a strong positive impact of inflation and interest rate on agriculture output. Akpan (2022) explored the role of institutions and legal frameworks in agricultural financing in Nigeria, finding that institutions and legal frameworks, such as federal, state, local government authorities, farmers' cooperatives, NGOs, extension services, and laws, directly impact agricultural financing in the country.

In India, Shinde and Patil (2014) examined the role of the State Bank of India in agricultural finance using descriptive statistics and trend analysis, concluding that agricultural financing in India has improved yields and modernized the agricultural sector. Saqib et al. (2015) investigated the feasibility of local agricultural financing within an Islamic banking framework, finding that Islamic financing instruments like Ribā-free financing are essential for poor Muslim farmers who avoid interest-based financing. They argued that Islamic agricultural financing would improve agricultural performance.

Among the reviewed empirical literature on banks' credit to agriculture and agricultural output, studies like those by Isiorhovoja and Chukwudi (2009), Adetiloye (2012), Ammani (2012), Imoisi et al. (2012), Egwu (2016), Nnamocha and Eke (2015), Ogbuabor and Nwosu (2017), Olowofeso et al. (2017), Oparinde et al. (2017), Orok and Ayim (2017), Okafor (2020), Reuben et al. (2020), Islam (2020), and Adeleye et al. (2021) have end dates of observation up to 2019. This study extends the scope to 2020, filling a research gap as the additional year can significantly impact economic analyses.

While several studies have explored the relationship between bank credit and agricultural output, this paper introduces an interaction term in the model specification, considering that agricultural output could be affected by both deposit money banks' credit to agriculture and the responsiveness of interest rates. This unique approach addresses a gap in the existing literature.

3. Data and Methodology

3.1 Data

The variables employed are specified in the model. They are agricultural output (AO), Bank Credits to Agriculture (BC), interest rate (INT), money supply (MS) and BC/IN which stands for moderating variable that equally serves as the interaction term. AO represents the agricultural value measure of contribution to economic output (GDP). The BC captures only the credit given to the agricultural sector in Nigeria. ACGSF is a scheme established by Decree No. 20 of 1977 and started operations in April 1978. The Fund guarantees credit facilities extended to farmers by banks up to 75% of the amount in default net of any security realized. The Fund is managed by the Central Bank of Nigeria, which handles the day-to-day operations of the Scheme. MS is found to trace both M2 and M3 as seen from the statistical bulletin. From the bulletin, AO, BC, MS are in ₦' Billion while ACGSF is in ₦' Thousand. This study therefore rescaled the values in different units to be in the same base by taking the natural logarithm of the series. Interest rate (INT) is not rescaled as it is already in percentage. Eventually, the interaction term which is serving as the moderating variable (BC/IN) is captured by multiplying the values of INT each by the values of BC across their years respectively.

In consideration of the a priori signs, it is expected theoretically that bank credit (BC) should possess a positive sign (+) with AO. Implying that increase in BC will bring about a rise in AO all other things being equal. Same is applicable to ACGSF with AO. On the contrary, it is expected that a rise in the interest rate (INT) will bring about decrease in AO. Invariable, INT possesses a negative (-) sign with AO. This implies if the rate of cost of borrowing by agriculturists/investors is high, it discourages investment or the activities in the sector which will mar AO. When there is a rise (or fall) in INT, it is expected that there will be a fall (or rise) in MS respectively. Therefore, a fall (-) (or rise (+)) in MS will cause a rise (+) (or fall (-)) in AO respectively. The introduction of the interaction term (BC*INT) as captured by BC/IN is expected to influence the agricultural output either positively or negatively. Comparing the relationship between BC/IN and AO, when INT is witnessing a fall (-) (or rise (+)), AO is expected to have a positive (+) (or a negative (-)) link with BC/IN respectively.

Apart from the interaction term (BC/IN), the other statistical data like agricultural output (AO), bank credits to agriculture (BC), agricultural credit guarantee scheme fund (ACGSF), interest rate (INT) and money supply (MS) were obtained from CBN statistical

Bulletin of 2011 and 2017 with volumes of 22 and 31 respectively. On the other hand, the data on *BCIN* as the interaction term was generated by multiplying the value of *INT* by the values of *BC* respectively.

3.2 Model Specification

Agricultural economists investigating long-run relationships among levels of inputs, outputs, and costs generally use concepts of returns to scale and size. Econometric studies which utilize production or profit functions commonly are concerned with returns to scale (de Janvry; Lau & Yotopoulos, 1972; Joseph & Obikaonu, 2021). McElroy (1969) establishes the relationship between returns to scale, Euler's theorem, and the form of production functions. Mathematically, as noted by McElroy,

$$\epsilon(Y, X/|X|) = (\nabla f \cdot X/|X|)/y, \quad (1)$$

where ∇f is derived from $y=f(x)$, a production function. The function coefficient ϵ is known under various names, such as elasticity of scale or local returns to scale. A general representation of variations in output associated with a proportional increase in inputs (k) is

$$f(k, X) = G[k \cdot X/|X|, f(x)], \quad (2)$$

In line with the objectives of the study, the above model which is derived from $y=f(x)$, is further modified to reflect the purpose of the study. Hence, the need to capture the input variables as bank credit to agricultural sector (*BC*), agricultural credit guarantee scheme fund (*ACGSF*) while the output variable proxied by y is agricultural output (*AO*).

Recall, the target is not to consider the effect of the proportionate change in the output variable (*AO*) arising from the proportionate change in the input variables. The study recognizes the credit channel theory which Dobrinsky and Markov (2003) suggested that shocks from monetary policy impacts on real economic performance via the credit supply by commercial banks and other financial institutions. The theory explains that Central Banks' policy changes affect the amount of credit that deposit money banks issue to agricultural sector, which in turn affects the real economy.

To capture the likely effect of the monetary policy changes on the agricultural output, interest rate (*INT*) and money supply (*MS*) are introduced in the model. Furthermore, effort is made to vividly capture the effect of the monetary policy via interest rate by interacting itself with bank credit (*BC*), thereby obtaining an interaction term in the model known as *BCIN* (bank credit*interest rate). In elaborate form, the general functional notation of the model is specified as:

$$AO = f(BC, ACGSF, INT, MS, BCIN) \quad (3)$$

However, in a linear regression equation format equation 4 is stated as follows:

$$AO = \alpha + \beta_1 BC + \beta_2 ACGSF + \beta_3 INT + \beta_4 MS + \beta_5 BCIN + \mu \quad (4)$$

This study examines the impact of bank credit on agricultural output using interest rates as a moderating variable. The term 'moderating variable' could also be considered as the interacting variable known as interaction term. Froehlich (2015) argued that a moderating (interacting variable i.e. interaction term) can "influence the relationship between an independent variable and a dependent variable by increasing, decreasing, or even reversing the relationship". This study envisages the likelihood of interest rates influencing the relationship between bank credit and agricultural output. The quest to ascertain the interaction term of bank credit and interest rate ($BC \cdot INT = BCIN$) and its effect on agricultural output, informed the adaptation of the model as stated above.

3.3 Estimation Techniques

The techniques used in the estimation of the model are stated below. The data employed were also subjected to some tests for validity of the estimation procedures. This led to the use of the estimation procedures:

1. **Preliminary Analyses:** The preliminary analyses in this study helped to prepare the ground for the main statistical and econometrics analyses. Furthermore, the analyses aided in revealing the true nature or properties of the data employed in the study. Among these analyses conducted were *descriptive statistics*, *graphical analyses*, and *formal pre-tests*.

- Descriptive Statistics
- Graphical Analyses
- Formal Pre-tests
 - Unit root test
 - Cointegration test
- 2. Model Estimation
 - Vector Error Correction Model test (VAR)
 - System Equation of VEC
 - VEC Granger Causality test
- 3. Post Estimation
 - Serial Correlation

4. Results and Discussion

4.1 Descriptive Analyses

It is important to look at the nature of the dataset employed for regression analysis. To have a feel of the

dataset, it becomes imperative to consider the raw data and not the transformed data. Thus, the descriptive statistics are presented below

Table 1: Descriptive Statistics

	AO	BC	ACGSF	INT	MS	BCIN
Mean	7163.690	149.7763	2937677.	12.50000	6814.401	1881.270
Median	1426.970	33.26000	242028.3	13.00000	628.9500	493.9000
Maximum	37241.61	1049.680	12456251	26.00000	36014.88	12071.32
Minimum	10.01000	0.230000	12838.90	5.000000	11.86000	1.150000
Std. Dev.	9850.364	242.5710	3868524.	4.339739	10606.49	3081.287
Skewness	1.418173	1.995844	1.009213	0.480082	1.491988	1.901335
Kurtosis	4.113817	6.499277	2.549356	3.863358	3.927854	5.577226
Jarque-Bera	16.63642	50.48650	7.663179	2.987250	17.49568	37.80846
Probability	0.000244	0.000000	0.021675	0.224557	0.000159	0.000000
Observations	43	43	43	43	43	43

Source: Compiled from E-views 12

Adeleye (2018) opined that the use of raw data of the variable employed is better than the use of the transformed data with respect to analyses of descriptive statistics. This position is upheld as the aim of descriptive statistics to obtain a mass of raw data and summarize it in some useful manner. Thus, descriptive statistics is considered to explore the data with the goal of creating insight. In table 1, it is observed that the average value considering from 1978-2020 for each of the variables namely agricultural output (AO) is ₦7,163.69b, bank credit to agriculture (BC) is ₦149.78b, agricultural credit guarantee scheme fund (ACGSF) is ₦2937677m, interest rate (INT) is 12.5%, money supply (MS) is 6814.40b, interaction term of interest rate with bank credit (BCIN) is ₦1881.27b. The middle values (after sorting observation either from the lowest to the highest value or from the highest to the lowest value) as captured by median for each of the variables used in the model considering from 1970-2017 namely, AO is ₦1426.97b, BC is ₦33.26b, ACGSF is ₦242028m, INT is 13%, MS is ₦629b, BCIN is ₦493.9b.

In respect to each of the variables employed spanning from 1978-2020, it is found from the table that the minimum value for AO is ₦10.01b while its maximum is ₦37242b, BC maximum is ₦11049.68b while the minimum value is ₦0.23b. ACGSF has a minimum and maximum values of ₦12,839 and ₦12,456,251 respectively. The highest INT within the scope of study stood at 26% while the lowest rate was 5%. MS

assumed the maximum and minimum values ₦36014.88b and ₦11.86b respectively. Considering the interaction term (BCIN), the maximum value stood at ₦12071.3b while its minimum value assumed ₦1.15b.

The deviation from the sample means with respect to each of the variables stood at ₦9850.4b for AO, ₦242.57b for BC, ₦3,868,524 for ACGSF, 4.34% for INT, ₦10606.5b for MS, and ₦3081.3b for BCIN. The analyses of the data with respect to skewness and kurtosis are better analyzed by Jarque-Bera statistic. Thus, this statistic revealed that AO has a Jarque-Bera (JB) statistic of 16.63 with associated P-value of 0.000244. This implies that AO does not have a normal distribution. Bank credit (BC) has JB value of 50.49. This implies that the variable (BC) is not normally distributed as revealed by P-value of 0.000000. Same applicable to ACGSF with JB probability of 0.02167. Interest rate (INT) is normally distributed as its Jarque-Bera (JB) statistic is 2.99 with P-value of 0.2246. MS and BCIN are not normally distributed as their JB values are 17.5 and 37.8 with associated P-values of 0.000159 and 0.000000 respectively.

Unit Root Test Results

To avoid the problem of spurious regression, the data employed were subjected to unit root test using Augmented-Dickey fuller (ADF) and Phillip Perron tests.

Table 2: Augmented Dickey – Fuller (ADF) Unit Root Test Results

Variable	At level t-statistics	5% Critical value	1st difference t- statistics	5% Critical value	Integration order
LAO	-0.052782	-2.933158	-6.655767**	-2.935001	I(1)
LBC	-1.335732	-2.933158	-7.299740**	-2.935001	I(1)
LACGSF	-1.465413	-2.933158	-6.363635**	-2.935001	I(1)
INT	-2.888138	-3.520787	-8.972428**	-3.523623	I(1)

LMS	0.395169	-2.933158	-6.170706**	-2.935001	I(1)
LBCIN	-1.900917	-2.933158	-7.240224**	-2.935001	I(1)

Note: ** denotes significance at 5 percent level.

Source: Researcher's Compilation, 2021.

Table 3: Phillips Perron (PP) Unit Root Test Results

Variable	At level t-statistics	5% Critical value	1st difference t- statistics	5% Critical value	Integration order
LAO	-0.052782	-2.933158	-6.656155**	-2.935001	I(1)
LBC	-2.536621	-2.933158	-7.648563**	-2.935001	I(1)
LACGSF	-1.456718	-2.933158	-6.366535**	-2.935001	I(1)
INT	-2.746706	-3.520787	-9.104933**	-3.523623	I(1)
LMS	0.370847	-2.933158	-6.184515**	-2.935001	I(1)
LBCIN	-2.405320	-2.933158	-7.257388**	-2.935001	I(1)

Note: ** denotes significance at 5 percent level.

Source: Researcher's Compilation, 2022.

Table 2 and 3 reveals that the series of *LAO*, *LBC*, *LACGSF*, *INT*, *LMS*, and *LBCIN* at levels are non-stationary. These are confirmed by the absolute t-statistics. It was observed that at levels *LAO* absolute t-statistic (0.052782) is less than its critical value (2.933158). The absolute t-statistic of *LBC* and *LACGSF* are 1.335732 and 1.465413. These values are less than the critical value (2.933158). These implied that at level, the series on *LBC* and *LACGSF* are not stationary. It was also found from the series on *INT* and *LMS* that their absolute t-statistics (2.888138 and 0.395169) are less than their critical values (3.520787 and 2.933158 respectively). *BCIN* has absolute t-value of 1.900917 with associated critical value of 2.933158. Therefore, all the series of the variables at levels are not stationary.

The above table also revealed that, at first difference all the series of the data became stationary. As observed from the table: the absolute ADF t-statistics of *LAO*, *LBC*, *LACGSF*, *LMS* and *LBCIN* are 6.6562, 7.6486, 6.3665, 6.1845 and 7.2574 respectively. These values are greater than their critical value which stood at 2.935001. Also, in the case of *INT*, its absolute t-value is 9.1049 and the absolute critical value is 3.5236. This is an indication that their series are integrated of order one. The test showed that these series were non-stationary at level but were stationary after first difference. This entails that all the variables are integrated of order one i.e. *I*(1).

Co-integration Test Results

Having seen that at level, all the variables are non-stationary and integrated of order one, the study applied Johansen co-integration to determine whether there is presence of long run equilibrium relationship existing among the variables of the study such as agricultural output (*AO*), bank credits to agriculture (*BC*), agricultural credit guarantee scheme fund (*ACGSF*), interest rate (*INT*), money supply (*MS*) and the interaction term of interest rate with bank credit (*BCIN*). The result of the Johansen cointegration test is presented in Table 4:

Table 4 revealed that the null hypothesis of no co-integration can be rejected since the trace statistics (144.79) is less than the five percent critical value (95.75) respectively. This assertion of the presence of co-integration is supported by the significance of the p-value (0.0000) which is greater than 0.05. The result indicated that there is long run relationship existing among the variables under study.

Vector Error Correction Model (VECM)

The presence of stable lasting nexus among the variables as found from Johansen cointegration led to the application of VECM. With this approach, the long-term equilibrium associated with variables was estimated.

Table 4: Unrestricted Co-integration Test Results (Trace)

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.847897	144.7854	95.75366	0.0000
At most 1	0.471455	67.57443	69.81889	0.0745
At most 2	0.362915	41.43171	47.85613	0.1753

At most 3	0.262074	22.94675	29.79707	0.2487
At most 4	0.141985	10.48637	15.49471	0.2452
At most 5 *	0.097541	4.207891	3.841465	0.0402

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

Source: Eviews 12 Output

Table 5: VECM Estimate (Modeling LAO)

Variable	Coefficient	Standard E.	t-Statistic
<i>Long-run estimate</i>			
LBC	22.16422	5.34484	4.14684**
LACGSF	2.393830	0.40316	5.93766**
INT	1.073210	0.36108	2.97224
LMS	-6.650130	0.70376	-9.44937**
LBCIN	-15.08532	4.76017	-3.16907**
C	19.85206	0.05065	
<i>Short-run estimate</i>			
Ecm(-1)	-0.114776	0.01221	-9.40245**
LAO	-0.365720	0.21646	-1.68958
LBC	-0.834086	0.53924	-1.54677
LACGSF	-0.110378	0.09126	-1.20943
INT	-0.052135	0.03313	-1.57351
LMS	0.325203	0.24062	1.35154
LBCIN	0.650311	0.48792	1.33283
C	0.198029	0.05065	3.91018**
<i>R-Squared =0.746</i>			
<i>F-stat =13.855**</i>			
<i>Prob(F-stat) =0.000</i>			

Post Diagnostic Tests

Jarque-Bera = 0.3459

J-B(prob) = 0.8411

Heterosk(F-stat)=0.55

Prob(F-stat) = 0.8604

Source: Compiled from E-views 12' Output

Granger Causality Test

With the test, the causal relationships among the estimated variables were ascertained. Thus, the table is presented below:

Table 6: Granger Causality

Null Hypothesis:	Obs	F-Stat.	Prob.
LBC does not Granger Cause LAO	42	20.4268**	6.E-05
LAO does not Granger Cause LBC	42	1.05610	0.3104
LACGSF does not Granger Cause LAO	42	0.59982	0.4433
LAO does not Granger Cause LACGSF	42	5.30354**	0.2670
INT does not Granger Cause LAO	42	5.96368**	0.0192
LAO does not Granger Cause INT	42	0.17438	0.6785
LMS does not Granger Cause LAO	42	1.28394	0.0264
LAO does not Granger Cause LMS	42	4.91124**	0.0326

LBCIN does not Granger Cause LAO	42	20.1234**	6.E-05
LAO does not Granger Cause LBCIN	42	0.82602	0.3690

Sources: Researcher's compilation from E-view (version 12)

The above table reveals the causality among the variables. The output was compiled from Granger Causality test.

5.0 RESULTS

5.1.1 To what extent has deposit money bank credit to agriculture impacted on agricultural output in Nigeria within the period under review?

As observed from table 5, deposit money bank credit has a positive relationship with agricultural as captured with agricultural output (LAO). The coefficient borne by the parameter (LAO) is 22.16 approximately. It is clearly observed from the result that 1% increase in bank credit brought about an 22.2% increase in agricultural output (LAO) on the average. This outcome revealed and equally answered the research question number one. In answering the research question, bank credit has significantly impacted on agricultural output (LAO) within the period under study. This is ascertained by the significance of the t-statistics [4.14684**].

Among others, [Olowofeso, et. al \(2017\)](#) and [Okafor \(2020\)](#) empirically found that credit to the agricultural sector has positive and significant effect on the agricultural sector. More so, studies revealed that the output growth of the agricultural sector is mainly contributed by the positive changes in the agricultural credit. Therefore, this study aligns itself with previous studies. This suggests that a rise in bank credit will enhance the productive level in the agricultural sector.

5.1.2 Has interest rate as an interacting variable influenced the agricultural performance in Nigeria?

To answer this research question, interest rate (INT) as a moderating variable was interacted with bank credit to agriculture (LBC) to generate an interaction term (LBCIN). In table 5, it was observed that the interaction term (LBCIN) has a coefficient -15.085. The outcome showed that the estimated parameter (LBCIN) has a negative and significant nexus with agricultural output (LAO). The finding revealed that due to monetary policy as observed from interest rate, bank credit is negatively and significantly related to agricultural output in Nigeria within the period of study. Furthermore, it was observed that in view of the growth of the agricultural performance (LAO), the consideration of interest rate (INT) in relation to bank credit (LBC) contributed less, compared to non-consideration of interest rate (INT) (in relation to bank credit) by 15.1%. This finding is in conformity with [CBN \(2016\)](#) which opined that "interest rate aids the flow of credit in the economy and help financial entities

such as banks, corporate organization etc. carry out their intermediation role". It becomes obvious that agro-economic activities is primarily influenced by interest rates.

5.1.3 In connection with the interaction term, is there established significant causation between the deposit money bank credit to agriculture and agricultural output in Nigeria?

The interacted term of bank credit with interest rate (LBCIN) revealed that significant causality runs from bank credit (with reference to interest rate) to agricultural output (LAO). This is confirmed from the P-value [6.E-05] of $LBCIN \Rightarrow LAO$ while there is no causality running from $LAO \Rightarrow LBCIN$ as shown by the P-value [0.3690]. The study showed that bank credit in relation to interest rate is expected and was found to cause agricultural output. Although [Drehmann, Sorensen and Stringa \(2006\)](#) did not capture the presence of moderating variable (LBCIN) on the agricultural output in their study, they integrated credit and interest rate risk and argued that both are two most important risks faced by the commercial banks. In a way, the finding of causality follows the path to adduce that bank credit in relation to interest rate cause agricultural output changes. This implies that monetary policies in favor of bank credit will boost the agro-productivity in Nigeria. On the other hand, [Borio and Gambacorta \(2017\)](#) related the possibility that the supply of bank loans may become less responsive at very low interest rates even controlling for demand and other bank-specific conditions which potential reason could be attributed to the negative impact of very low rates on the profitability of banks' lending activities.

5.2 Implication of the Results

The results estimate that a 1% increase in deposit money bank credit to agriculture leads to an average increase of approximately 22.2% in agricultural output (LAO). This implies that an increase in the volume of bank credit to agriculture will enhance the productivity of the agricultural sector, subsequently raising the level of output. Similarly, a rise in the Agricultural Credit Guarantee Scheme Fund (LACGSF) will also boost agricultural output. The coefficient of the parameter indicates that a 1% increase in LACGSF translates to a 2.4% rise in LAO. This provides clear evidence that, other things being equal, an increase in credit will improve agricultural performance in Nigeria.

The role of bank credit in the agricultural sector is crucial, as the growth of this sector cannot be

assessed without considering the importance of credit provided by banks. Through bank credits, farmers, agriculturists, and investors can access agricultural inputs such as fertilizers, technological advancements, managerial expertise, and infrastructure. These resources, made available through bank credit, undeniably contribute to agricultural growth.

The study's findings show that interest rates affect the demand for and allocation of available loanable funds. For a sustainable increase in agricultural output, the availability of inputs, potentially through bank credit, is required. Interest rates influence the level of consumption and the pattern of investment in agro-allied matters. Furthermore, the study indicates that agricultural output decreases when bank credit is considered alongside interest rates. High interest rates discourage borrowing, thereby slowing down agro-productivity, while low interest rates encourage borrowing, positively impacting agricultural output growth. Therefore, as agricultural output grows with lower interest rates, profit expectations increase (other things being equal) since agro-businesses pay a smaller portion of their income as interest on borrowed funds. Conversely, higher interest rates lead to lower profit margins. This interaction term (LBCIN) represents a research gap, highlighting an area not considered by other studies.

5.3 Conclusion

The general goal of this research was to evaluate the nexus between agricultural financing and agricultural

output in Nigeria. The specific objectives were to: evaluate the impact of bank credit on agricultural performance in Nigeria, ascertain the effect of bank credit when interacted with interest rates (as a moderating variable) on agriculture in Nigeria, and determine the existence or absence of any significant causal link between bank credit, interest rates, and agricultural output in Nigeria. The research employed data from past years, obtained from the CBN statistical bulletin spanning from 1978-2020. To ensure the significant and positive impact of bank credit as a means of financing agriculture in Nigeria, relevant authorities must ensure a continuous supply of bank credit to the agricultural sector. This can be achieved by mitigating factors that may divert commercial banks from their traditional intermediation role.

Policymakers and the CBN should adopt monetary policies and schemes, particularly those related to interest rates, that favor bank credit, leading to more meaningful growth in agricultural performance. Changes in bank credit, when interacted with interest rates, help predict changes in agricultural output. Efforts should be made to balance agricultural growth performance and banking industry growth performance through agro-productivity growth and bank credit. There is a possibility that the supply of bank loans may become less responsive at very low interest rates due to the side effect on the profitability of banks' lending activities. On the other hand, bank credit in relation to interest rates could also promote agricultural output growth.

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