

IMPACT OF AGRICULTURAL FINANCING ON AGRICULTURAL OUTPUT: THE ROLE OF COMMERCIAL BANKS

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Abstract

The study investigates the impact of agricultural financing by commercial banks on agricultural output in Nigeria. Agricultural sector contribution to GDP was used to define agricultural output, while the agricultural financing was defined by commercial bank credit to the agricultural sector. The study employed real interest rate and inflation rate as control variables. The time span under study was 40 years which dated from 1981-2020 using annual secondary data, Data on agricultural output and commercial bank agricultural financing, were obtained from the Nigerian central bank annual statistical bulletin(CBN) whereas interest rate and inflation rate were obtained from united nation conference on trade and development (UNCTAD). The Autoregressive Distribution Lag (ARDL) was adopted due to its efficiency, robustness and dynamic nature in time series analysis. It was discovered the explanatory variables under study only have a long run relationship with the explained variable. Specifically, commercial bank agricultural financing rate has a positive and substantial impact on agricultural output whereas real interest rate and inflation rate have a negative and insignificant relationship with agricultural output in the long run. The study recommends that reliable sources of agricultural financing should be developed and policies aimed at boosting allocation of credit to agricultural sector should be created and implemented correctly so as to increase agricultural output.

Keywords: *Agricultural Output, Commercial Bank Loan, Inflation, Interest Rate, ARDL*

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1. Introduction

Nigeria, being a developing nation, has vast swathes of farmland as well as a pleasant climate for agriculture. An essential fragment of the Nigerian economy has always been agriculture, regardless of the oil boom. Thus, the agricultural sector diminishes poverty, offers employment for the skyrocketing population, alongside aiding economic prosperity.

Apart from providing a primary source of income, the agricultural sector also serves as a major stream of revenue for the development of the economy's other primary and tertiary sectors, including mining, industry, transportation, health, education, and non-formal government and service supply (Soneye, 2014).

When Nigeria gained independence in 1960, the economy was primarily agronomic, with agriculture accounting for over 60% of GDP. However, agriculture's proportion of GDP has decreased over time. During 1960-1970, the segment provides 55.8% of GDP, but between 1971 and 1980, it dropped to 28.4%. The average value for Nigeria during 1981-1990, 1991-2000, 2001-2010 and 2011-2020 was 18.2 %, 24.42%, 27.39% and 21.46% respectively with a minimum of 12.24 % in 1981 and a maximum of 36.97% in 2002 (World Bank, 2020). The Federal Government's neglect of the agriculture sector in favour of growing the oil division has typically been the basis of Nigerian agricultural economy's crisis i.e. the discovery of oil was the fundamental reason of agricultural output decline.

Another cause of decline in agricultural productivity is the problem of sufficient financing. Every business venture warrants the employment of finances in order to erect and maintain the company. Physical capital, such as land and building, plant and machinery, and other fixed assets, all need funding. It is worth noting that as businesses' activities grow, so do its financial needs and more access to capital would help with expansion (Mbutor, Ochu, & Okafor, 2013).

It is almost impossible to exaggerate the relevance of financing in agriculture. The purchase and use of capital in agriculture is referred to as agricultural finance. It is concerned with the supply and demand for finances in the agriculture industry. Finance is vital for increased scale of production in agriculture due to the need for food consumption necessitated by Nigeria's rapidly growing population alongside the demand for agricultural produce both as finished goods and inputs for the further production.

A more responsible lending system with strong legal underpinnings and a risk-sharing structure may result in a more stable financial climate. Limited liquidity and no risk on the part of borrowers, on the other hand, may have a detrimental impact on growth (Johnson, 2013).

Other factors that are likely to affect the agricultural output are real interest rate and inflation rate. Interest rate is the cost of borrowing of funds. In Nigeria, interest rate policy is a crucial in terms of its role in enlisting financial resources to support growth in the economy. An increase in the rate of interest could deter one from accessing credit thus reduction in potential output. Thus, interest rate could possibly affect access to financing and in the case of this research, agricultural financing.

Inflation rate on the other hand is a major issue affecting both demand and supply in Nigeria due to the issue of prices of goods and services being unstable. Therefore, investigating the effect of inflation at sectoral level is of relevance.

In spite of Nigeria's rich agricultural land and resource possession but it is not being fully utilized therefore, agriculture's role to the national economy has been steadily declining. In general, the shape of agriculture in Nigeria remains poor and underdeveloped, owing to a incoherence of public and private spending on boosting agricultural production. As a result, the sector continues to rely on primitive techniques to feed a growing population without making any initiatives to add value (Idoko & Jatto, 2018). This has harmed the sector's productivity, contributions to economic development, and ability to fulfil its basic function of food production.

Because the majority of government policies on agriculture are characterized by discrepancies, poor executions, and misappropriation of finances, the policies have been frequently reviewed and adjusted to be appropriate with the existing finance needs of the agricultural sector. It also contributes to the agricultural sector's poor effectiveness. This condition inhibits agricultural investment, reduces the country's food output, raises level of joblessness, and slows Nigeria's industrialization (Awoyemi, Afolabi, & Akomolafe, 2017).

Consequently, the overall goal of this research is to see how agricultural financing affects agricultural output through the role of commercial banks, alongside seek answers to the following research questions: Is there a relationship between agricultural financing by commercial banks and Nigeria's agricultural output? Does interest rate have an impact on

Nigeria's agricultural output? Is there a causal relationship between inflation rate and agricultural output in Nigeria?

2. Literature Review

There are still a lot of potential reserves in the banking industry that aren't being used for agriculture (Rothernberg, et al., 2016). Investigation of loans and advances from Inusa, Daniel, Dayagal, & Chiya (2018) showed that they had an inverse correlation with agricultural output, implying that loans and advances intended for agriculture had been diverted to other products or places, hindering the sector's progress. Agriculture received only 5.4% of commercial bank credit in Nigeria's third quarter of 2021, trade and commerce 6.6%, manufacturing industry 16.6%, and oil and gas 18.3%.

Egwu (2016) findings, which were based on the ordinary least square regression technique, indicated that commercial bank loans to the agriculture industry and ACGSF were substantial to agriculture industry output, indicating a long-run relation that mitigated poverty and stimulated growth in Nigeria's economy between 1980 and 2010. Employing the hierarchical competitive model to examine the connections of agricultural productivity, access to credit and farm size in Ghana, the results show that access to formal and informal credit increases agricultural productivity (Akudugu, 2016).

Formal credit is a crucial element in the development of the agriculture industry in emerging countries. It boosts farmers' ability to carry out purchases, allowing them to invest in better farm inputs and agricultural technology to boost crop yield. Examining the impact of agro-financing on agricultural output in Nigeria for the period between 1990 and 2019 and applying the canonical co-integration approach to achieve its objectives, findings revealed that agro-financing had a considerable impact on Nigerian agricultural sector output and on average, a 1% increase in agro-financing can boost agriculture output by between 1% and 2% (Osabohein, Olurinola, & Matthew, 2020).

Oloukoi (2021) made a short-term comparative impact assessment of credit supplied to the agricultural sector on agricultural value-added among member nations of the West African Economic and Monetary Union (WAEMU). Credit induces agricultural value-added only in the medium and long term, according to a panel VAR model and an autoregressive distributed lag (ARDL) model. In the case of WAEMU, loan only seems to be a medium of elevating the

limitation of capital underuse after 3 years, and short-term loan accorded to agriculture in WAEMU has a poor impact on agricultural value-added from one country to another.

When it comes to specific cash crops, Asaleye, Alege, Lawal, Popoola, & Ogundipe (2020) discovered that in palm oil, finance shock is more likely to produce variance in aggregate employment than aggregate agricultural output, but cocoa, cotton, and groundnut indicated the opposite. The result indicate a positive correlation between funding of cash crops and agricultural success, with the exception of the financing of cocoa and oil palm, which have a negative correlation with employment of agriculture. The Influence of ACGSF on fishery development in Nigeria between 1981 and 2012 indicate that fishery sub-sector was the least financed in the agricultural sector of the economy and that the guaranteed value of fisheries loans had considerable but unfavourable short- and long-term effects on fishery development (Oparinde , Amos, & Adeseluka, 2017).

Empirical findings of the analysis of the impact of formal Agricultural Credit on Agricultural Output in Pakistan from 1973-2014 indicate positive and significant relationship between agriculture credit and agricultural output (Chani, 2018).

Anh, Gan, and Anh (2020) examined the influence of agricultural credit on the agricultural GDP of Vietnam from 2004:Q4 to 2016:Q4, taking into account agricultural labour, public investment, and rainfall as key determining factor of agricultural GDP, and conclude that credit to agricultural GDP has a unidirectional causal relationship. As a result, agricultural lending has a beneficial short- and long-term impact on agricultural GDP. In Turkey too, agricultural finance and agricultural productivity from 1998-2016 have a positive and significant relationship according (Bahsi & Çetin, 2020).

For the period 1998-2018, the ARDL was used to analyse how agricultural sector performance will be enhanced in Nigeria through access to credit and the results showed credit to agriculture, arable land and agricultural employment significantly increased agricultural performance (Osabohein, Mordi, & Ogundipe, 2020).

Using quarterly time series data sourced from Uganda 2008Q3 -2018Q4, in the long run, credit to production is found to have a much higher impact on agriculture output compared to credit to processing and marketing while in the short run, bank credit does not have an instantaneous impact on agricultural output (Nakazi & Nathan, 2020).

Babajide (2020) studied the effects of financial inclusion on agricultural productivity in Nigeria and empirical results of the study show that financial inclusion, irrespective of how it is measured, has exerted positive and statistically significant effects on agricultural productivity in Nigeria. Credit by the farm credit institutions is positively related to the income and output of the farm and the magnitude of the estimated impact is larger during the 1990s than in the 2000s (Nadolnyak, Shen, & Hartarska, 2017).

The impact of the ACGSF on the development of the agricultural sector in Nigeria was studied by Orok & Ayim (2017), and the findings revealed a significant positive relationship between ACGSF and the development of the agricultural sector with a greater impact on the crop sector than on livestock and fishing.

Toda and Yamamoto granger non causality technique was used to study the impact of bank's credit on Nigerian agricultural productivity with key variables such as agricultural gross domestic product, commercial bank credit to agricultural sectors, interest rate, government spending on agriculture, and ACGSF, the result attained was that there is a short-run unidirectional causality running from ACGSF to agricultural gross domestic product thereby with no other causality is found to run from agricultural gross domestic product to any other variable and vice versa (Lawal, Olayanju, Ayeni, & Olaniru, 2019).

Okafor (2020) shows that credit to agricultural sector, government spending on agricultural sector, commercial bank credit and agricultural credit guarantee scheme fund have positive and significant effects on agricultural output while interest rate has negative and insignificant effect on agricultural output. However, interest rates mostly influenced the level of diversity in Islamic commercial bank financing in the agriculture sector (Mubarok, 2021). Islamic banks have contributed to financial inclusion in such a way that customers that refrain from taking credit due to interest on the basis of their religion have the option of getting loans too.

On the contrary, Orji, Ogbuabor, Anthony-Orji, & Alisigwe (2020) revealed that the variations in agricultural output growth cannot be explained by variations in government's agricultural financing and vice versa within the time period under consideration i.e. government's agricultural financing did not induce agricultural output increase, and agricultural output growth did not impact government's agricultural financing.

Using the Auto Regressive Distributed Lagged regression model (ARDL), the impact of agricultural financing on agricultural sector contribution to GDP in Nigeria from 1981-2016

show that government funding to agriculture and ACGSF had a non-significant impact on agricultural sector contribution to GDP meanwhile, commercial banks' credit, loans and advances to the agricultural sector had a positively significant impact on agricultural sector contribution to GDP (Ndubuaka, Okoro, Kabiru, & Chiaka, 2019).

Another perspective is the examined relationship between government agricultural spending and agricultural output in Nigeria using annual time series data from 1981-2019 revealed that there is a positive bidirectional relationship between government agricultural spending on agricultural output in Nigeria, though, significant in the long-run only (Mile, Ijirshar, Asom, Sokpo, & Fefa, 2021). Also, the long-term causation between banking sector development and agricultural productivity in the six Central African Economic and Monetary Community (CEMAC) states from 1990-2018, reveal that bidirectional causality exists between banking sector and agricultural productivity in the CEMAC region (Ngong, Thaddeus, Uchechukwu, & Omwumere, 2020).

3. Methodology

The research is to implement the econometric method of analysis; Autoregressive Distributed Lag (ARDL) technique. Data on the dependent variable, Agricultural output (AOTP) and independent variable, commercial banks' agricultural financing (CBAF) were obtained from CBN bulletin (2021) from 1981-2020. Whereas, data on control variables real interest rate (INTR) and inflation rate (INFR) were sourced from World Development Indicators (WDI) between the periods 1981-2020.

This study adopts the Autoregressive Distribution Lag (ARDL), an ordinary least square (OLS) based model due to its robustness and consistency in time series analysis. ARDL bounds testing can be utilized conveniently regardless of the sequence of series integration because it has both long-run and short-run dynamics i.e. whether I(1) or I(0). The ARDL method is also more efficient when compared to other methods for secondary data with small and finite sample data size. This model takes sufficient lags to represent the data generation process in a framework that goes from generic to specific.

This research adapts the empirical work of Orji, Ogbuabor, Anthony-Orji, & Alisigwe, (2020) in order to specify the functional form of the model thus:

$$AOTP = f(CBAF, INTR, INFR) \quad (2.1)$$

From the above function, the model below is derived;

$$AOTP_t = \alpha + \beta_1 CBAF_t + \beta_2 INTR_t + \beta_3 INFR_t + \mu_t \quad (2.2)$$

The model in logarithm form is expressed as;

$$\ln AOTP_t = \alpha + \beta_1 \ln CBAF_t + \beta_2 INTR_t + \beta_3 INFR_t + \mu_t \quad (2.3)$$

Where;

AOTP: Agricultural Output captured in billions of naira

CBAF: Commercial Bank Agricultural Financing captured in billions of naira

INTR: Real Interest Rate

INFR: Inflation Rate

α is the constant

$\beta_1, \beta_2, \beta_3$ are the coefficients of the parameter estimate

t is the time period

μ is the error term

Equation (2.3) could be modified to the Auto-Regressive Distributed Lag Model (ARDL) in its broadest version as follows:

$$\Delta \ln AOTP_t = \beta_0 + \beta_1 \ln AOTP_{t-1} + \beta_2 \ln CBAF_{t-1} + \beta_3 INTR_{t-1} + \beta_4 INFR_{t-1} + \sum_{i=0}^k \beta_5 \Delta \ln AOTP_{t-i} + \sum_{i=0}^p \beta_6 \Delta \ln CBAF_{t-i} + \sum_{i=0}^p \beta_7 \Delta INTR_{t-i} + \sum_{i=0}^p \beta_8 \Delta INFR_{t-i} + \lambda ECT_{t-i} + \mu_t \quad (2.4)$$

Δ stands for the difference in respective variables and (-) is a lag sign and ECT stands for error correction term. To satisfy the long-run relationship, ARDL bound test requires a null hypothesis for no co-integration $H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$; which means non-existence of long run relationship for equation (2.4).

4. Findings

Stationarity Test Result

Table 1 indicates that using the significance value of 5%, LNAOTP and LNCBAF are not stationary at level however, after first difference they became stationary or integrated of order one I(1) whereas INTR and INFR are stationary at level I(0).

Table 1: Augmented Dickey-Fuller (ADF) Unit Root Test

Variable	Level t-statistics	p-value	1st Difference t-statistics	p-value	Order of Integration
<i>LNAOTP</i>	-0.182906	0.9323	-5.959880	0.0000	I(1)
<i>LNCBAF</i>	-1.006956	0.7414	-7.120002	0.0000	I(1)
<i>INTR</i>	-7.359547	0.0000	-9.968538	0.0000	I(0)
<i>INFR</i>	-3.679411	0.0085	-5.471900	0.0001	I(0)

Source: Authors Computation, 2022 using E-Views 10

Bounds Test for Cointegration

Table 2 below indicate the results for the ARDL bounds test between AOTP and its determinants. The Wald F-statistic, 5.004172 is greater than the lower bound critical value of 3.1 and the upper bound critical value of 4.088 at 5% level of significance. Therefore, we reject the null hypothesis of no long-run relationship thereby implying the existence of cointegration or a long-run relationship between the variables in the model.

Table 2: Cointegration Bounds Test

F-statistic		5.004172
Significance Levels	<i>I(0)</i>	<i>I(1)</i>
10%	3.592	3.454
5%	3.1	4.088
1%	4.31	5.544

Source: Authors Computation, 2022 using E-Views 10

Short-Run and Long-Run Analysis

The short run and long run results are posted in Table 3. The table indicates that there is no short-run effect of CBAF, INTR and INFR on AOTP in Nigeria. We also find that the EC_{m-1} is given as -0.105725 which indicated that the speed of convergence or adjustment towards the long run takes 10.572 %. This result is significant at 5% level.

However, the long run estimates at a 5% significance level show that CBAF has a positive and significant effect on AOTP therefore; a 1% unit increase in CBAF would increase AOTP by 0.31% in the long run. Regarding INTR, it has a negative and insignificant impact on the agricultural output of Nigeria therefore; a 1% rise in INTR would lead to an insignificant 0.8% decrease in AOTP. Similarly, INFR has an insignificant and negative impact on AOTP, thus a 1% increase in inflation rate would lead to an insignificant 1.36% decrease in AOTP.

Table 3: Short-Run and Long Run Estimation

Dependent variable = $\ln AOTP$				
Variable	Coefficient	Standard Error	T-statistic	P-value
Short-run Estimates				
CointEq(-1)*	-0.105725	0.019993	-5.288146	0.0000
Long-run Estimates Restricted Constant and No Trend				
$\ln CBAF$	0.314980	0.056898	5.535880	0.0000
$INTR$	-0.008166	0.018072	-0.451890	0.6542
$INFR$	-0.013631	0.010914	-1.248917	0.2202
Constant	8.385647	0.477714	17.55369	0.0000

Source: Authors Computation, 2022 using E-Views 10

Causality Test

The results on table 4 indicate that with the probability value being higher than the 5% significance level, the result of the Granger Causality Test indicates that LNCBAF, INTR and INFR do not Granger cause agricultural output LNAOTP and vice-versa. This suggests that neither variation in commercial bank agricultural financing, changes in real interest rate nor changes in inflation rate can be used to predict agricultural output. The result further shows that that there is no granger causality relationship between LNCBAF and INTR, also LNCBAF and INFR. However, there is a unidirectional causal relationship between INFR and INTR such that INFR granger causes INTR. Therefore, inflation rate changes can lead to changes in real interest rate but not vice versa over the period being studied in this research.

Table 4: Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
LNCBAF does not Granger Cause LNAOTP	38	1.21571	0.3094
LNAOTP does not Granger Cause LNCBAF		0.67609	0.5155
INTR does not Granger Cause LNAOTP	38	1.15325	0.3280
LNAOTP does not Granger Cause INTR		1.49563	0.2389
INFR does not Granger Cause LNAOTP	38	0.33011	0.7212
LNAOTP does not Granger Cause INFR		0.96860	0.3901
INTR does not Granger Cause LNCBAF	38	2.45559	0.1013
LNCBAF does not Granger Cause INTR		2.05782	0.1438
INFR does not Granger Cause LNCBAF	38	0.77154	0.4705
LNCBAF does not Granger Cause INFR		1.74926	0.1896
INFR does not Granger Cause INTR	38	7.18532	0.0026
INTR does not Granger Cause INFR		0.50571	0.6077

Source: Authors Computation, 2022 using E-Views 10

Hypothesis Testing

Based on the research questions raised, the following hypotheses were tested thus;

H₀₁: There is a no relationship between agricultural financing by commercial banks and agricultural output in Nigeria. Based on empirical findings, the long run regression estimates show that there is a positive relationship between commercial banks agricultural financing and agricultural output in Nigeria. Therefore, we reject the null hypothesis that states that there is no relationship between agricultural financing by commercial banks and agricultural output in Nigeria.

H₀₂: Interest rate has no impact on agricultural output in Nigeria. The empirical analysis indicates that in the long run real interest rate has a negative relationship with agricultural output. On that basis, we reject the null hypothesis that states that interest rate has no impact on agricultural output in Nigeria.

H₀₃: There is no causal relationship between inflation rate and agricultural output in Nigeria. The findings of the Granger causality test show that inflation rate does not granger cause agricultural output in Nigeria and vice versa. Therefore, we fail to reject the null hypothesis that states that there is no causal relationship between inflation rate and agricultural output in Nigeria.

5. Conclusion

The result of this study reveals that the association between commercial bank's agricultural financing (CBAF) and Nigerian agricultural output (AOTP) is positive and significant meaning a unit increase in commercial bank agricultural financing will bring about an increase in agricultural output. This implies that growth in agricultural output responds positively to financing brought about by commercial banks to the agricultural sector. The study also reveals that the real interest rate (INTR) and inflation rate (INFR) have a negative relationship and unsubstantial relationship with AOTP in the long run which means that a unit increase in real interest rate and inflation rate will bring about a decrease in agricultural output.

As such, credit to agricultural sector by commercial banks proves essential for yielding growth in the sector's output. High interest rates make it difficult for farmer especially those operating on a small-scale to access credit and thus reduce the level of agricultural output generated. This shows that there is need to adequately provide finance for agricultural practices seeing it serves as a means of subsistence, increases food security, reduces poverty and is an important sector in stimulating the economy.

In light of the study's findings, the following recommendations are made

- i. Policies aimed at boosting banking sector allocation of credit to agricultural sector should be developed and implemented correctly.
- ii. Increased efficient and effective measures that will ensure the farmers' access credit should be in place.
- iii. In order to boost agricultural output, accessed funds should be properly monitored so as to ensure its efficient application. Also, owners of agro-businesses should be educated on how to access the many sources of agricultural financing alternatives obtainable.

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