



Effect of Microfinance Banks' Performance on Agricultural Growth in Nigeria

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Abstract

This study investigates the effect of microfinance bank performance on agricultural productivity in Nigeria. Empirical results on the impact of bank credit on agricultural productivity are inconclusive. These studies demonstrate diverse results which are debatable and conflicting. Agricultural productivity is proxy by Crop output and Livestock output. The datasets for the study are collocated from the Central Bank of Nigeria (CBN) from 2005-2020. The formulated hypotheses are tested using the granger causality test. The result revealed that microfinance credit has a non-significant effect on both crop output and livestock output. The non-significant effect theoretically can be accredited to information asymmetry, bank capital channel, moral hazard and adverse selection. The results indicate that farmers lack access to microfinance credit facilities. The results revealed that to a large extent, farmers are self-sponsored and for economic diversification, governments must encourage effective ways to increase bank credit flow to the agricultural sector through efficient bank intermediation. More agricultural banks and improvement on the operational activities of the existing ones to ensure direct credit to agricultural activities. Policies creating bottlenecks and undermining credit flow to agricultural productivity should eliminate.

Keywords: Microfinance credit, crop output, livestock output, agricultural productivity, Nigeria

Introduction

Access to credit facilities for agricultural development and growth in Africa and Nigeria has persisted as a crucial and progressive process in the banking system (Fulginiti, Perrin, & Yu 2004). The Unreachability of such credit hinders the development and growth of the sector. Levine and Zervos (1998) note that banks provide diverse financial services to farmers, to foretell economic growth, capital formation and productivity improvements. Rajan and Zingales (1998) argued that the impact of the banking sector investment on agriculture is determined by the level of development in the banking sector to reduce the cost of external finance to firms and encourage productivity. Wurgler (2000) observed that even if bank investment does not translate to a positive impact on agricultural development, it efficiently encourages productivity.

Agriculture enhancement is vital to developing economies including Nigeria. The agriculture sector shoulders the responsibility for 80% of exports and 67% of the gross domestic product in 2019. Financial intermediation is the primary objective of microfinance banks. This is the transfer of capital or liquidity from those who are in surplus to those in deficit (Ekpeta & Iwedi,



2017). The agricultural production is dominated by small-scale farmers who account for about 95% of the country's agricultural production (Mafimisebi et al,2007).

The agriculture in Nigeria is largely rain-fed, hence, vulnerable to flood and drought. With over 70% of the estimated 200 million population depending on agriculture, weather shocks severely affect rural livelihood and agricultural productivity (MeheRette 2009). This system of farming is characterized by a low asset base, low fixed capital, labour-intensive production, small farm size, low investment and expenditure on farm inputs, crude tools and equipment and low productivity, among others (Ijere, 1986; Olayide and Heady, 1982, Mafimesebi et al, 2007). According to Adesina (2012), despite accounting for 67% of the GDP, the agricultural sector only receives 4% of the total loans from commercial banks and 3% from microfinance banks in Nigeria. Unfortunately, the high demands for collateral by banks, lack of capacity to develop appropriate credit instruments for agriculture, high perceived risks of lending to this sector, and general aversion of banks toward agriculture have led to the under-capitalization of the agricultural sector.

The formal financial institutions view the sector as risky and unprofitable owing to various factors identify Ijere, (1986); Olayide and Heady, (1982), Mafimesebi et al, (2007) and are, therefore, hesitant to provide credit facilities (Sanya, & Polly, 2017). The Central Bank of Nigeria (CBN 2016), revealed that significant growth and reorganization were recorded by the Nigerian financial sector. However, a vital area in which banks continue to seek better results is providing access to financial services and thereby bridging the gap that constrains the growth of the agricultural sector. Moreover, the efficacy of this theory solely depends on the sectorial priorities of the nation's economy and its financial institutions' behaviour towards lending to agricultural firms, to boost productivity.

The banking sector being the main supplier of credit to different economic sectors is an integral part of Nigeria's financial systems. Bank credit to agriculture is the credit from financial institutions which is directed to agricultural investments. To facilitates the purchase and usage of new technology in agriculture and promote the lead technology enterprises (World Bank, 2018). A well-established banking system eases the exchange of goods and services through financial services. It equally mobilizes savings through efficient channels to productive investments. The bank as a financial intermediary is expected to provide opportunities for the public to save income that is not spent on consumption (Datta and Sahu, 2021; Omoruyi and Osawmonyi, 2013). The banks use accumulated savings to extend credit facilities to businesses,



investors and other entrepreneurs. Hence, the banks support and promote efficient resource allocation in an economy. Generally, a healthily robust and developed banking sector is crucial to sustaining economic activities, promoting different economic sectors' growth and ensuring financial stability (Ali, Deininger, & Duponchel 2014; Omoruyi and Osawmonyi, 2013).

The goal of microcredits is to assist farmers to improve their agricultural output (Sahu Agarwala, and Maity 2021). The development and stability of the banking system impact its increasing ability to efficiently execute its core mandate functions (King and Levine, 1993). The review of diverse literature shows that bank credit promotes productivity and economic growth (Beck and Levine, 2004; Estrada, Park, & Ramayandi 2010; Hassan, Sanchez, and Yu, 2011; King and Levine, 1993; Levine, 1997).

Agricultural productivity according to Onwumere et al., (2012) is the ratio of the value of total farm outputs to the value of total inputs employed in agriculture cultivation. According to Shafi (1984), agricultural productivity is an index ratio of local agricultural output to the index of total inputs utilized in agriculture production. Unquestionably, agricultural productivity measures exist, amongst which are agriculture value added, total productivity factor, yields per hectare of land, etc. Agricultural productivity is a vital justifying element used to increase sustainable agricultural growth over the years. Notwithstanding, the positive impact of agricultural productivity, the sector is still lagging in Nigeria like many other African countries with huge proportions of land uncultivated.

Nigeria's value added per worker also lags compared to other countries. This implies that there is a need to raise agricultural productivity to achieve sustainable economic growth.

The Food and Agricultural Organization (FAO, 2018) revealed that hunger is customarily calculated using the frequency of undernourishment. Hunger denotes the inability to access enough food to meet energy dietary requirements.

Additionally, statistics from the Food Insecurity Experience Scale show that about 10% of the world population is exposed to abject food insecurity, translating to about 770 million of the world population. The prevalence rate of world undernourishment improved from 13.1% in 2007 to 10.9% in 2017 while the prevalence rate of severe food insecurity worsens from 8.9% in 2016 to 10.2% in 2017 (FAO, 2018). In Nigeria, roughly 45% of the populace is affected by malnutrition and 23% of the population faces acute food deficit. Owing to low agricultural productivity (World Bank, 2018). The FAO evaluations show that the investments required in developing countries to sustain agricultural productivity and expansion exceed the current food



demand trends. The challenging issue is to increase the bank credit required for investments to boost agricultural productivity and reduce hunger.

Ketu (2008) observed that Microfinance banks have disbursed more than eight hundred million micro-credits to over 13,000 farmers across Nigeria to empower their productive capacities. As such it is expected that agricultural output will increase with the increase in finding. The entrepreneurial capacity of the farmers will also improve.

Zohir *et al.* (2004) noted that efficient deployment of microfinance credit facilities for agricultural production, trading, processing and transport, increases agricultural inputs and output. And also create employment opportunities in these sectors for the wider community and reduction in the prices of such products due to increased supply.

Studies conducted on microfinance activities, its impact on small businesses, co-operatives, and individuals and even its effects on the growth of the Nigerian economy, we have scholars like Akpan and Nneyi (2015), Ademola and Arogundade (2014), Nwakanma, Nnamdi and Omojefe (2014), Apere (2016) and Okpara (2010).

Studies on the impact nexus between microfinance bank performance and agricultural productivity in Nigeria are limited. Given the time lag in return to agricultural investment and the effects of climate and environmental factors from global temperature, research is vital to determine the impact of microfinance banks on agricultural productivity (Ayinde, Muchie, & Olatunji 2011). This study would be useful to economic operators, governments, bank management and farmers.

Objectives of the Study

The main objective of this study is to explore the impact of microfinance bank performance on agriculture productivity. The specific objectives include to:

1. Examine the effect of microfinance credit on crop output in Nigeria.
2. Evaluate the effect of microfinance credit on livestock output in Nigeria.
3. Determine the causal nexus between livestock and crop output in Nigeria.

Hypothesis

H₁: Microfinance bank credit has no significant effect on crop output in Nigeria.

H₁: Microfinance bank credit has no significant on effect livestock output in Nigeria.

H₁: Microfinance bank credit has no causal nexus with livestock and crop output in Nigeria.

Theoretical Literature Review



The Bank Capital Channel Theory

This theory posits that bank lending behaviours to farmers are determined by its capital adequacy requirement. Obamuyi (2007) revealed that a unit change in interest rate as a factor affecting the bank lending channel is explained through the bank's capital, particularly when banks' lending is constrained by a capital adequacy requirement. A unit increase in interest rates increases the cost of banks' external funding but diminishes its profits and capital. However, banks are more willing to lend during certain periods owing to improvements in their underlying financial condition.

The Nigerian banks are expected to maintain a minimum of 40% liquidity ratio of total deposits. The ability of banks to grant loans is constrained by their capital requirements. This condition as purported by this theory is seen in the relationship between banks and resource-constrained smallholder farmers as they suffer a lack of financial assistance as a result of this backward phenomenon.

Information Asymmetry Hypothesis

The information asymmetry hypothesis was propounded by Eugene Fama in 1970. The theory is applied in line with Akerlof, Spence, and Stiglitz (1970) argument that only a few persons involved in a transaction have precise information, whereas the other parties have residual information. The parties in this context are farmers. Information asymmetry originates among farmers who conceal information on the effective purpose of their activities and the intended use of borrowed funds. It could also emanate from the stock market dealers when they forecast lucrative returns from agricultural output and lure the farmers into future or forward contracts with credit. However, banks sometimes lend money to agricultural investors at high-interest rates to alleviate the problem of information asymmetry.

Theory of Moral Hazard

This theory was propounded by Akerlof (1970) and subsequently advanced by Rothschild and Stiglitz (1976). The theory postulates a situation where the possibility of loan default increases when borrowers fail to reveal the genuine purpose for borrowing. The theory also stipulates that most farmers intentionally conceal the purpose of their borrowing from the banks. Moral hazard occurs due to the supremacy of wealthy proprietors who borrow cheaper credit given the collateral security they possess while the poor borrowers are given limited loans (Simtowe Zeller. & Phiri, 2006). Arrow (1963) revealed that moral hazard is the phenomenon of



manipulating private information to gain an advantage in an incomplete contract during information asymmetry. Musara and Olawale (2012) equally posited that moral hazard manifests when bank borrowers take actions that negatively impact the banks' returns.

Adverse Selection Theory

This theory was propounded by Akerlof (1970) and later upgraded by Rothschild and Stiglitz (1976); the theory demonstrates a situation where loan default increases when the interest rate increases. Also, the quality of borrowers gets worsened with the increase in borrowing costs (Musara and Olawale, 2012). This occurs in the credit markets where the formal credit institutions are not fully aware of the borrower's creditworthiness. Therefore, some credits worthy borrowers are left out when the credit market tries to mitigate the risk of default by raising the rate of interest (Klonner and Rai, 2005).

The theory revealed that lenders can underestimate the activities of agricultural investors and farmers, hence financing the wrong person instead of the right one. The trustworthy clients are disfavoured at the expense of the unscrupulous ones (Stiglitz, 1998).

Conceptual Review

Micro Credit in Agricultural Productivity

Credit facility from any source is one of the essential prerequisites for agricultural development, as funds are required to employ labour, and improve farming techniques and tools such as the use of fertilizers, pesticides, farm supply, storage, marketing and processing (Canty, 2017). Empirical findings revealed that the availability and accessibility of credit facilities by the Agric sector in Nigeria will stimulate its growth, and actualization of its potential as farmers will be more equipped for mechanized agriculture which will lead to an increase in productivity. Increased credit could accelerate rural development, reduce income disparities and create income increases that would improve the welfare of farmers, (Rick, 2014).

Agricultural Productivity

Productivity is a relative concept considered to be the overall efficiency and effectiveness of productive units or as a ratio of output to the corresponding inputs used. The different interpretations of productivity are underscored by a common characteristic which is the ability to produce more economically and efficiently (Mohammad, 1992). In this study, therefore,



agricultural productivity is defined as the ratio of output to inputs about fertilizers, improved seeds, labour and technology (tractor and ox-plough) employed in agriculture.

The Agricultural Sector and CBN Development Policy

In a bid to transform and diversify the Nigerian economy mono-cultural and crude oil-based. The agricultural revolution has been on the front line of all government policy frameworks far back to 1975. To that effect, several large scales agricultural projects specializing in the production of grains, livestock, dairies and animal feeds were established. Sugar factories were also established at Numan, Lafiagi and Sunti (Lawal, 2017). Worthy of note is the establishment of the Nigerian Agricultural and Cooperative Bank (NACB) in 1973 as part of the government's effort to inject oil wealth into the agricultural sector through the provision of credit facilities to support agriculture and agro-allied businesses.

The hallmark of it all seems to be the establishment of the Agricultural Credit Guarantee Scheme Fund (ACGSF), by Decree 20 of 1977 by the CBN, to provide a guarantee for loans granted by banks for agricultural production and agro-allied processing. The ACGSF was primarily established to provide micro-credit to Nigerian small-holder farmers. According to CBN (2020), out of the total loans guaranteed under the scheme as of December 2020; 89 percent were loans of ₦100,000 and below, showing that the scheme has largely catered for small-holder farmers since its inception. This translated to 184,574 in number and N5.48 billion in value per annum for the 31 years that the scheme had existed. According to CBN (2020), agriculture contributed about 42.0 percent to the GDP and accounted for 58.3 per cent of total non-oil export earnings in 2019. It has provided occupation and employment to the majority of the population in Nigeria.

Empirical Literature

Igwilo and Benson (2015) examined the impact of rural credits on crop farming enhancement in Nigeria. Findings revealed a non-significant nexus between rural credits and crop output over the period studied. Aminu and Awal (2016) revealed that microfinance credit has a non-significant impact on the growth of crop output. Osagimu (2017) in Nigeria examined the role of government credit incentives on livestock production in the Northern part of Nigeria. Findings revealed that government credit incentive has not significantly impacted livestock production in the region. Ozioko (2019) examined the impact of micro-finance on crop output growth in Nigeria, and the result established that there is microfinance had no positive impact



on the growth of crop output through proactive programmes and strategies in developing and advancing the growth of Entrepreneurship.

Jayson and Amanda (2021) studied the effect of COVID-19 on Agricultural production including Food Away from Home (FAFH), unemployment and GDP. The result showed that COVID-19 led to a decrease in GDP from Agriculture and an increase in FAFH expenditures. Again, changes in Agriculture due to COVID-19 had a greater effect on the U.S. economy than the share of Agriculture in the economy at the beginning of COVID-19.

Orji, Ogbuabor, Anthony-Orji, and Alisigwe (2020) evaluated the causal nexus between agricultural credit and agricultural output in Nigeria using the Pairwise Granger causality test. The finding shows a non-causal nexus between agricultural financing and agricultural output. Reuben, Nyam, and Rukwe (2020) examined ACGSF on agricultural output in Nigeria from 1998-2017. Using the OLS. The findings unveiled that ACGSF significantly and positively affected Nigerian agricultural output.

Okafor (2020) investigated the effect of bank credit on Nigerian agricultural development using the ordinary least square approach. The findings showed that banks' credit and ACGSF significantly and positively affected agricultural output.

Mubaraq (2021) evaluated the threshold effect of ACGSF on Nigerian agricultural performance from 1981 to 2019 using threshold regression. Agricultural performance was measured by real agricultural GDP. The findings revealed an insignificant U-shaped association between ACGSF and real agricultural GDP. The ACGSF significantly and positively affected real agricultural GDP with ₦1,060,389 and ₦5,951,809 thresholds. The results suggested that a sustained increase in agricultural loans is guaranteed and inclusion of smallholder farmers in the Nigerian agricultural space promoted agricultural performance.

Osabohien, Osuagwu, Osabohien, Uche, Oluwatoyin, and Gershon, (2020) evaluated the relationship between access to bank credit and agricultural performance in Nigeria from 1998 to 2018 applying the autoregressive distributed lag model. The findings indicated that bank credit had a short- and long-run significant positive effect on agricultural performance.

Chi et al. (2020) investigated the long-term causal relationship between banking sector development and agricultural productivity in the CEMAC nations from 1990 to 2018 using autoregressive distributed lag and vector error correction model techniques. The findings indicated that the banking sector and agricultural productivity in the CEMAC region are related in the long run. The results revealed bidirectional causality between domestic credit to the



private sector by banks (DCPSB) and agricultural value added (AGRVA) to the GDP. This insinuated that in the CEMAC region, agricultural productivity and banking sector development operated in mutualism.

Chi and Kesuh (2020) examined the long-run causal link between banking sector development and real estate growth in the Nigerian emerging economy from 1990 to 2018, applying the autoregressive distributed lag and vector error correction model. The study hypothesized no causal link between banking sector development and real estate growth. The results showed that banking sector development and Nigerian real estate sector growth are related. This implied that a long-run relationship existed between the banking sector and real estate growth. The results revealed no direction of causality between banking sector development and Nigerian real estate growth.

Anh, Gan, and Anh (2020) investigated the impact of bank credit on Vietnamese agriculture performance from 2004Q4 to 2016Q4 applying the indicator saturation break test, autoregressive distributed lag bounds test alongside the Toda-Yamamoto Granger causality test.

The results unveiled a short- and long-run positive impact of agricultural credit on agricultural output. Moreover, a unidirectional causality flowed from agricultural credit to agricultural output. Bahsi and Cetin (2020) examined the impact of agricultural credit on Turkish agricultural production from 1998 to 2016 applying the OLS approach. The findings revealed that agricultural credit significantly and positively impacted agricultural output.

Literature is conflicting on the impact of bank credit on agricultural productivity. There are studies which show that bank credit significantly impacts agricultural productivity positively (Anh et al., 2020; Bahsi and Cetin, 2020; Chisasa and Makina, 2013; Onder and Ozyildirim, 2013). Others indicate that bank credit has a negative impact on agricultural productivity (Dhrifi, 2014; Ikenna, 2012). Some studies indicate bidirectional causality between bank credit and agricultural productivity (Chi, Kesuh & Onwumere., 2020; Tamga, 2017). Others show unidirectional causality between bank credit and agricultural productivity (Osuji and Chigbu, 2012). Zakaria, Jun, and Khan (2019) results showed an inverted U-shaped effect of bank credit on agricultural productivity.

Data and Methodology



This study employed the ex post facto (after the event) research design utilizing secondary data gleaned from the CBN statistical bulletin. The study covers from 2005 to 2021. The based year 2005 marks the legal establishment of the Microfinance Bank in Nigeria. The necessary pre- and post-diagnostic are performed to justify the properties of variables, while the formulated hypotheses were tested using the granger Causality test.

Model Specification

The model for this work is stated as

Model 1 $LogTCO_t = \beta_0 + \beta_1 LogMFC + \mu \dots\dots\dots eq1$

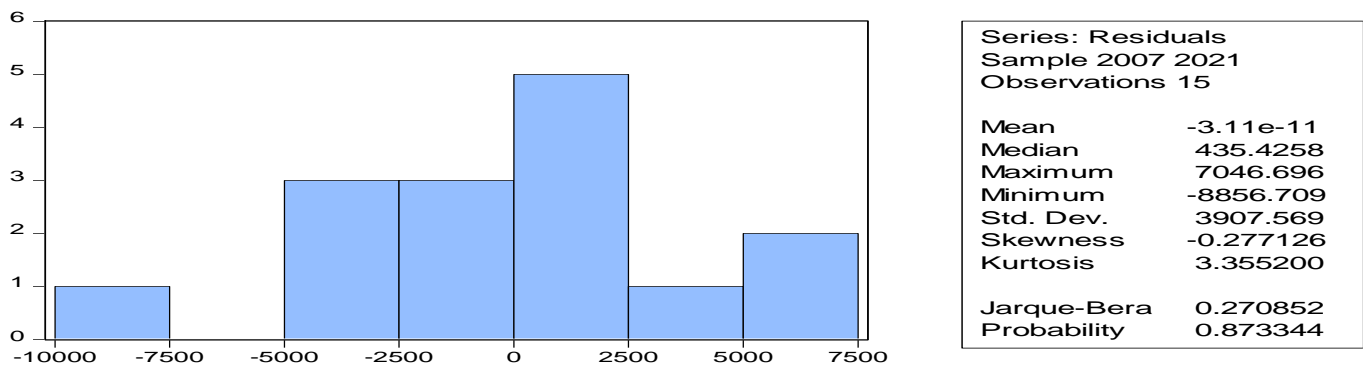
Model 2 $LogTLO_t = \beta_0 + \beta_1 LogMFC + \mu \dots\dots\dots eq2$

TCO = Total Crop Output; TLO= Total Livestock Output; MFCR = Microfinance Credit;
 μ = Stochastic Error Term.

Data Analysis

Pre-Test

Figure 1: Descriptive Statistics



Source: Author (2022)

Figure 1 describes the aggregated averages of the mean and median of the series understudy. The standard deviation, measures the of spread and variation in the series. Skewness measured the symmetry and kurtosis, the peakedness and Jarque-Bera measure the normality. The series is Mesokurtic in nature, since the Kurtosis equal (3). The Jarque–Bera statistic which combines both skewness and kurtosis statistics shows that the normality assumption cannot be rejected. The JB P-value is >5%.

Unit Root Test

From the results of the augmented Dickey-Fuller test (ADF) in Table 1, it can be deduced that the series are non-stationary at level I (0), but they are stationary and integrated at first difference I(1) see Table 1. The statistical value for each of the dimensions of the test must be



less negative than the critical value, for the null hypothesis of no unit root to be convincingly rejected. Having confirmed that all the series have the same stationarity properties. The requirement for adopting the Johansen co-integration model to estimate the long-run equilibrium nexus is satisfied.

Table 1: Augmented Dickey-Fuller Unit Root Test for Stationarity

Variable	T-stat 5%	Critical Value	Order of Integration
MFC	-7.980	-3.82	I (1)
TCO	-7.981	-3.81	I (1)
TLO	-4.027	-2.96	I (1)

Source: Author (2022)

Test of Hypotheses

Co-Integration Analysis

A minimum of (1) co-integrating vector is required to established co-integration between variables.

$$y_t = \mu + A_1 y_{t-1} + \dots + A_p y_{t-p} + \varepsilon_t \text{ for } t=1, \dots, T$$

Where: $y_t, y_{t-1}, \dots, y_{t-p}$ = Vectors of Level and Lagged Values of P variables with the same stationarity properties;

A_1, \dots, A_p = coefficient matrices with (PXP) dimensions;

μ = intercept vector, ε_t = vector of random errors.

Johansen (1988) and Johansen and Juselius (1990) noted that, trace statistics are obtained by using the Eigenvalues.

$$\text{The trace statistic } (\lambda \text{ trace}) =; \lambda_{\text{trace}} = -T \sum_{i=r+1}^p \ln(1-\lambda_i),$$

$$\text{Maximum Eigenvalue} = \lambda_{\text{max}} = -T \ln(1-\lambda_{r+1})$$

Where: T = the number of observations in the sample study; r = the number of individual series and λ = the Eigenvalues.

The underline assumption is that the series has a linear deterministic trend. The critical values were derived assuming no exogenous series.

Table 2: Cointegration Test Results

Hypothesis One				
Hypothesized Coefficients	Eigenvalue Statistic (λ_{max})	Trace Statistic (λ_{Trace})	Critical Value (%5)	Prob.**
None *	0.726059	19.78385	15.49471	0.0106
At most 1	0.023793	0.361204	3.841466	0.5478
Hypothesis Two				
None *	0.603189	17.68244	15.49471	0.0231



At most 1	0.224723	3.818020	3.841466	0.0507
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Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

Source: Author (2022)

The cointegration test results is reported in Table 2: The results show cointegration nexus among the variables in both models. The Eigenvalue statistics indicate (1) cointegrating equations at a 95% confidence level for TCO and TLO models. Since the λ_{Trace} value is higher than the 5% critical value, the λ_{Trace} test statistic rejects the null hypothesis of $r = 0$ and accept the alternative hypothesis of $r > 0$. The λ_{max} test statistic results, rejects the null hypothesis of $r = 0$ and accept $r = 1$. The results imply a unit (1%) increase in micro finance credit to agricultural sector significantly impact on crop production in Nigeria. The long-run result also reveals that crop output in model 1 and livestock output in model 2 positively impact and determined the level of agricultural sector performance. In addition, the cointegration nexus in consideration explains the positive impact of micro finance credit towards the agricultural sector growth. The result of this study collaborates the long-run nexus among the variables as established in the studies Osabohien, Osuagwu, Osabohien, Uche, Oluwatoyin, and Gershon, (2020); Okafor (2020); Sahu, Agarwala, and Maity, (2021), among others.

Vector Error Correction Model Estimation

The presence of co-integration indicates divergence in the short run that may influence the individual series speed of convergence with time in the long run. On the premise of the presence of cointegration. The short-run interrelationship between the variables, was conducted using the Vector Error-Correction Model (VECM), which is a controlled form of VAR with the inbuilt specification. The VECM for the short-run nexus is express as:

$$\Delta \ln MFCR_{t-1} = \beta_0 + \alpha_1 \Delta \ln MFCR_{t-1} + \alpha_2 \Delta \ln TCO_{t-1} + \beta_1 + \sum_{k=1}^p \Delta \ln TCO_{t-k} + \sum ECT_t + \xi_t \quad (2)$$

$$\Delta \ln MFCR_{t-1} = \beta_0 + \alpha_1 \Delta \ln MFCR_{t-1} + \alpha_2 \Delta \ln TLO_{t-1} + \beta_1 + \sum_{k=1}^p \Delta \ln TLO_{t-k} + \sum ECT_t + \xi_t \quad (3)$$

The parameters $\alpha_1 - \alpha_2$ = the long run equilibrium coefficients.

The parameters $\beta_1 - \beta_2$ = corresponding short run dynamic coefficients.

ECT= Error correction term

ξ_t = the white noise random term.

Table 3: Vector Error Correction Model Estimation

Models	TCO		TLO	
	D(LOGMFCR)	D(LOGTCO)	D(LOGMFCR)	D(LOGTLO)
CointEq1	-1.670823	2.58006	-1.567051	-5.05007
	[-3.61377]	[0.70842]	[-4.72562]	[-0.24707]



R-squared	0.787566	0.475534	0.812823	0.822127
Adj. R-squared	0.654795	0.147742	0.695837	0.710956
F-statistic	5.931763	1.450721	6.948043	7.395186
Akaike AIC	19.90547	-3.597096	-132.4523	35.50711
Schwarz SC	20.17935	-3.323214	19.77890	-4.215301

Source: Author (2022)

The VECM results presented in Table 3: Revealed a negative and statistically significant value of the error correction term (ECt-1). The implication of the negative nexus in the short-run between the variables demonstrates the tendency for the variables which currently deviate from the mean position to converge in the long-run to the point of equilibrium, ceteris paribus. The fitting degree of VECM model $R > 0.5$, and AIC and SC criteria values are relatively small, indicating model stability. The fluctuational shocks show that the short-term fluctuation within the period significantly deviated from the long-term equilibrium relationship.

The short-term fluctuation effect shows a sharp drop in the amount of credit made available for agricultural activities. The models also reveal credit as source income for stakeholders in the agricultural sector in Nigeria. The (ECt-1) are rightly signed and significant.

Hypothesis Three

This study adopted the Augmented Granger Causality Test developed by Toda and Yamamoto, (1995). The microfinance banks performance and agricultural productivity model is presented in the following VAR system:

$$MFCR_t = \alpha_0 + \sum_{j=1}^{k+d_{max}} \alpha_{1j}MFCR_{t-j} + \sum_{j=1}^{k+d_{max}} \alpha_{2j}TCO_{t-j} + \varepsilon_{1t} \dots \dots \dots (eq12)$$

$$MFCR_t = \alpha_0 + \sum_{j=1}^{k+d_{max}} \alpha_{1j}MFCR_{t-j} + \sum_{j=1}^{k+d_{max}} \alpha_{2j}TLO_{t-j} + \varepsilon_{1t} \dots \dots \dots (eq12)$$

To investigate the Granger causality (1961), Toda and Yamamoto (1995) developed a method based on the estimation of augmented VAR model ($k+d_{max}$) where k is the optimal time lag on the first VAR model and d_{max} is the maximum integrated order on the system's variables (VAR model). Toda and Yamamoto (1995) was adopted in comparison to the Granger test for the following reasons: Granger testing can give spurious regressions on functions with time lags on integrated variables. F-statistic can be used only when variables are cointegrated. Toda and Phillips (1993) argued that Granger causality with the error correction model can lead to wrong conclusions due to the dependence of parameters which might be asymptotic in some cases. The Toda–Yamamoto procedure is applicable regardless of whether a series is $I(0)$, $I(1)$, or $I(2)$, non-cointegrated or cointegrated of any order. This implies that it avoids the potential bias



associated with unit root and cointegration tests (Rambaldi & Doran 1996). Results for the Toda–Yamamoto augmented Granger causality test are reported in Table 4.

Table 4: VAR Granger Causality/Block Exogeneity Wald Tests

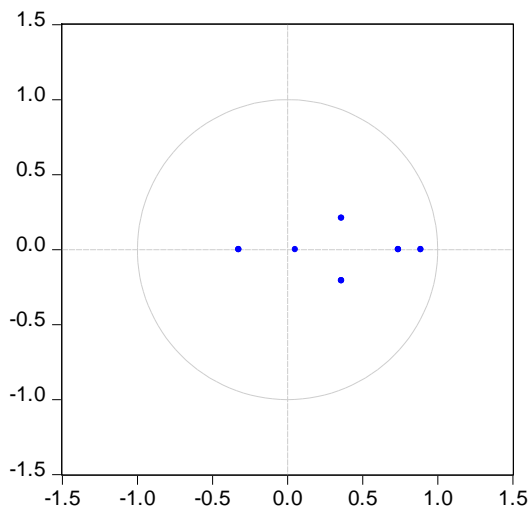
Dependent variable: LOGMFCR			
Excluded	Chi-sq	df	Prob.
LOGTLO	0.102930	2	0.9498
LOGTCO	3.320526	2	0.1901
All	15.35596	4	0.0040
Dependent variable: LOGTLO			
Excluded	Chi-sq	df	Prob.
LOGMFCR	0.115083	2	0.9441
LOGTCO	15.85898	2	0.0000
All	16.56195	4	0.0024
Dependent variable: LOGTCO			
Excluded	Chi-sq	Df	Prob.
LOGMFCR	2.214618	2	0.3304
LOGTLO	4.373498	2	0.1123
All	6.527208	4	0.1631

Source: Author (2022)

At a 5% level of significance, the augmented Granger causality test reveals a no causal nexus between microfinance bank and agricultural productivity. In the model the variables jointly have a causal nexus and individually it has a non-causal effect. Further assessment reveals that the TCO and TLO has a chi square (X^2) value of 0.102930 and 3.320526 with a probability values of 0.9498 and 0.1901 suggest non-rejection of the null hypothesis of no Granger causality. However, there is a causal nexus and an evidence of feedback, which means that micro finance bank credit Granger-cause agricultural productivity at 5% level in the models with TLO as the dependent variables. The Roots of Characteristic Polynomial presented in Figure 2 reveal that no root lies outside the unit circle, indicating that the model satisfies the stability condition and exhibits good fit



Inverse Roots of AR Characteristic Polynomial



Conclusion and Policy Implications

This paper investigates the impact of bank performance on agricultural productivity in Nigeria from 2005-2020. Annual secondary data sourced from CBN statistical bulletin. Agricultural productivity is measured by Total Crop Output and total livestock output; as the endogenous variables. The exogenous variables comprise microfinance credit. The findings reveal that microfinance credit has a non-significant causal nexus with crop output and livestock output in Nigeria. Implying that crop and livestock farmers in Nigeria are self-sponsored, as such lack access to microfinance bank credit facilities and government agricultural intervention funds.

Theoretical findings also revealed that information asymmetry contributes to the negative nexus where farmers obtain credit facilities for agricultural purposes but into diverted non-economic activities and agricultural productivity. Conclusively, the results trace the issue of the high cost of food in the country, to low food production. The results suggest that for economic diversification and improve export capacity.

Governments must encourage microfinance banks through effective channels to increase bank credit flow to private enterprises in the agricultural sector through efficient bank intermediation that will boost agricultural productivity. The governments should create more agricultural banks and improve the operation of existing ones to monitor the disbursement of credit directed to agricultural activities effectively and efficiently utilized. Also, operational bottlenecks undermining credit flow to the private sector especially credit that mutually benefits the agricultural productivity and banking sector must be eliminated.

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Appendices

Null Hypothesis: LOGMFCR has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 3 (Automatic - based on SIC, maxlag=3)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-7.980903	0.0002
Test critical values:		
1% level	-4.886426	
5% level	-3.828975	
10% level	-3.362984	

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

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 13

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(LOGMFCR)
 Method: Least Squares
 Date: 10/17/22 Time: 15:01
 Sample (adjusted): 2009 2021
 Included observations: 13 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGMFCR(-1)	-2.666161	0.334068	-7.980903	0.0001
D(LOGMFCR(-1))	1.067940	0.196352	5.438908	0.0010
D(LOGMFCR(-2))	0.568436	0.140453	4.047156	0.0049
D(LOGMFCR(-3))	0.425225	0.125636	3.384585	0.0117
C	68055.56	7589.809	8.966703	0.0000
@TREND("2005")	10406.77	1355.611	7.676810	0.0001



R-squared	0.922637	Mean dependent var	4054.458
Adjusted R-squared	0.867378	S.D. dependent var	6387.245
S.E. of regression	2326.058	Akaike info criterion	18.64578
Sum squared resid	37873827	Schwarz criterion	18.90652
Log likelihood	-115.1975	Hannan-Quinn criter.	18.59218
F-statistic	16.69661	Durbin-Watson stat	2.359163
Prob(F-statistic)	0.000911		

Null Hypothesis: LOGTCO has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 2 (Automatic - based on SIC, maxlag=3)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-7.981903	0.0002
Test critical values:		
	-4.886426	-4.800080
	-3.828975	-3.811172
	-3.362984	-3.342253

*MacKinnon (1996) one-sided p-values.
 Warning: Probabilities and critical values calculated for 20 observations
 and may not be accurate for a sample size of 14

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(LOGTCO)
 Method: Least Squares
 Date: 10/17/22 Time: 15:03
 Sample (adjusted): 2008 2021
 Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGTCO(-1)	-0.488046	0.149505	-3.264407	0.0098
D(LOGTCO(-1))	0.539191	0.243486	2.214466	0.0540
D(LOGTCO(-2))	0.351269	0.201482	1.743422	0.1152
C	4.238339	1.289526	3.286740	0.0094
@TREND("2005")	0.050974	0.015300	3.331604	0.0088

R-squared	0.683811	Mean dependent var	0.111280
Adjusted R-squared	0.543282	S.D. dependent var	0.037391
S.E. of regression	0.025269	Akaike info criterion	-4.245993
Sum squared resid	0.005747	Schwarz criterion	-4.017758
Log likelihood	34.72195	Hannan-Quinn criter.	-4.267120
F-statistic	4.865991	Durbin-Watson stat	2.470993
Prob(F-statistic)	0.022915		

Null Hypothesis: D(LOGTLO) has a unit root
 Exogenous: None
 Lag Length: 0 (Automatic - based on SIC, maxlag=3)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.027946	0.0442
Test critical values:		
	1% level	-2.728252
	5% level	-2.966270



10% level

-1.605026

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

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 15

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LOGTLO,2)

Method: Least Squares

Date: 10/17/22 Time: 15:05

Sample (adjusted): 2007 2021

Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGTLO(-1))	-0.112587	0.055518	-2.027946	0.0620
R-squared	0.134613	Mean dependent var		-0.008745
Adjusted R-squared	0.134613	S.D. dependent var		0.026173
S.E. of regression	0.024348	Akaike info criterion		-4.528407
Sum squared resid	0.008299	Schwarz criterion		-4.481204
Log likelihood	34.96305	Hannan-Quinn criter.		-4.528910
Durbin-Watson stat	2.200521			

Vector Error Correction Estimates

Date: 10/17/22 Time: 15:36

Sample (adjusted): 2008 2021

Included observations: 14 after adjustments

Standard errors in () & t-statistics in []

Cointegrating Eq:	CointEq1	
LOGMFCR(-1)	1.000000	
LOGTCO(-1)	-39704.03 (1411.76) [-28.1238]	
C	319797.7	
Error Correction:	D(LOGMFCR)	D(LOGTCO)
CointEq1	-1.670823 (0.46235) [-3.61377]	2.58E-06 (3.6E-06) [0.70842]
D(LOGMFCR(-1))	0.675817 (0.26345) [2.56530]	-7.69E-07 (2.1E-06) [-0.37055]
D(LOGMFCR(-2))	0.332994 (0.23721) [1.40382]	-2.73E-06 (1.9E-06) [-1.45824]
D(LOGTCO(-1))	-84574.89 (46561.4) [-1.81642]	0.516383 (0.36687) [1.40755]



D(LOGTCO(-2))	7582.961 (38700.0) [0.19594]	0.270719 (0.30492) [0.88782]
C	8979.634 (4823.93) [1.86148]	0.035234 (0.03801) [0.92701]

R-squared	0.787566	0.475534
Adj. R-squared	0.654795	0.147742
Sum sq. resids	1.54E+08	0.009532
S.E. equation	4381.006	0.034519
F-statistic	5.931763	1.450721
Log likelihood	-133.3383	31.17967
Akaike AIC	19.90547	-3.597096
Schwarz SC	20.17935	-3.323214
Mean dependent	5186.487	0.111280
S.D. dependent	7456.509	0.037391

Determinant resid covariance (dof adj.)	12313.96
Determinant resid covariance	4020.884
Log likelihood	-97.82508
Akaike information criterion	15.97501
Schwarz criterion	16.61407
Number of coefficients	14

Year	MFCR	TCO	TLO	
2005	28,504.80	5,372.20	463.42	
2006	16,450.20	6,723.22	560.25	
2007	22,850.20	7,654.22	642.28	
2008	42,753.06	9,039.63	758.84	
2009	58,215.66	10,419.60	863.40	
2010	52,867.50	11,683.90	979.56	
2011	53,319.90	12,484.85	1,115.60	
2012	58,651.89	14,071.24	1,251.93	
2013	54,517.08	14,862.32	1,399.48	
2014	70,968.79	15,812.57	1,573.05	
2015	72,523.10	17,189.97	1,748.03	
2016	73,456.60	18,883.08	1,875.78	
2017	77,540.34	21,096.11	1,974.45	
2018	78,950.78	24,207.80	2,048.60	
2019	84,160.00	28,296.93	2,108.95	
2020	91,576.00	33,177.54	2,121.37	
2021	95,461.02	36,349.41	2,249.34	