AN ANALYTICAL STUDY OF FINANCIAL INCLUSION AND AGRICULTURAL PRODUCTIVITY IN ADAMAWA STATE, NIGERIA

Mohammed Arabo Nuru
Economics Department,
Faculty of Social Sciences,
Adamawa State University Mubi,
Adamawa State-Nigeria
arabo756@adsu.edu.ng

Babangida Adamu
Economics Department,
Faculty of Social Sciences,
Adamawa State University Mubi,
Adamawa State-Nigeria
adamubabangida92@gmail.com

*Corresponding author:
Mohammed Arabo Nuru
Economics Department,
Faculty of Social Sciences,
Adamawa State University Mubi,
Adamawa State-Nigeria
arabo756@adsu.edu.ng

Abstract

Agriculture remains the backbone of Nigeria's economy, contributing significantly to employment and non-oil foreign exchange earnings. However, despite Nigeria's vast arable land and agricultural potential, the sector has recorded low productivity, primarily due to financial exclusion. Limited access to formal financial services, including credit, insurance, and digital banking, has hindered farmers from adopting modern technologies and expanding their production capacity. This study examines the extent of financial inclusion among farmers in Adamawa State and its impact on agricultural productivity. A multi-stage sampling technique was used to collect data, which was then analyzed using stepwise regression. The findings show that while 65% of farmers have formal accounts, access to loans (13%) and insurance (6%) remains low. The results of the regression analysis confirm that having a formal account and access to loans positively impact agricultural productivity. However, although access to insurance is statistically significant, it negatively affects productivity possibly due to inadequate coverage, high costs, or moral hazards. The findings highlight the need for increased financial access through targeted policies and financial products tailored to the needs of small-scale farmers. Strengthening financial inclusion will not only enhance agricultural productivity but also contribute to economic stability and poverty reduction.

Keywords: *Financial inclusion, financial exclusion, Agricultural productivity, Rural Farmer*

Introduction

Agriculture plays a critical role in Nigeria's economy, serving as the largest employer of labor and a significant contributor to non-oil export earnings. The sector accounts for 88% of non-oil foreign exchange earnings and employs approximately 70% of the active labor force. However, despite the country's vast arable land and large agricultural workforce, Nigeria's agricultural productivity remains low, exacerbated by limited access to financial services (Nnamocha & Eke, 2015). The sector, which is dominated by small scale famers, has suffered neglect, particularly following the oil boom, with successive governments failing to invest adequately in infrastructure, input supply, and financial services for farmers.

Financial inclusion, defined by the Central Bank of Nigeria (CBN, 2012) as access to a broad range of affordable formal financial services, is crucial for boosting agricultural productivity.

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Compared to other African nations, Nigeria has one of the highest rates of financially excluded adults, exceeding figures from countries such as South Africa and Rwanda. Studies indicate that countries with high financial inclusion rates experience increased economic growth, with farmers benefiting from credit, insurance and digital banking services that enable them to adopt modern farming techniques and expand production (Demirguc-Kunt et al., 2015). However, financial exclusion remains a pressing issue in Nigeria, particularly in Adamawa State where an estimated 44% of adults lack access to financial services, predominantly in rural areas where agriculture is the primary occupation (EFInA, 2023).

Financial exclusion has severe consequences for the agricultural sector. Farmers often lack access to formal credit, which limits their ability to invest in improved seeds, fertilizers and mechanization. Additionally, the absence of agricultural insurance exposes them to risks such as climate shocks, pest infestation and market fluctuations. The reliance on informal lenders, who charge exorbitant interest rates, further aggravates financial challenges.

Recognizing the adverse impact of financial exclusion, the Central Bank of Nigeria introduced the National Financial Inclusion Strategy (NFIS) in 2012, aiming to reduce financial exclusion to 25% by 2025. Financial institutions also play a critical role in agricultural development by providing credit facilities that enable farmers to scale up production. The establishment of institutions such as the Nigerian Bank of Agriculture and specialized schemes like NIRSAL aims to address financing gaps in the sector. Despite these initiatives, financial exclusion remains prevalent among Nigerian farmers, necessitating further research and targeted policy interventions. This study seeks to analyze the degree of financial inclusion among farmers in Adamawa State and its impact on agricultural productivity with a focus on access to bank account, credit, insurance and digital financial tools such as ATM and mobile/internet banking. The research will provide valuable insights for policymakers, financial institutions and agricultural stakeholders to develop strategies that enhance financial access and promote inclusive economic growth.

Following this introduction, the remaining part of the work is organized as follows. The second part comprises of theoretical and empirical literatures followed by methodology in the third part. The fourth part comprises results and discussion. Finally, the last part will be conclusion and recommendations.

Empirical Literature and Theoretical Framework

Financial inclusion has gained prominence as a key policy tool for enhancing agricultural productivity, particularly in developing countries like Nigeria. Several empirical studies have examined the relationship between financial access, agricultural output and economic growth, highlighting the role of financial institutions, rural banking and credit availability in fostering agricultural development.

Some studies examined the impact of financial inclusion on economic growth across different regions. Michael and Sharon (2014) investigated the link between the financial system, financial inclusion and economic development in Nigeria from 1992 to 2007, finding a positive impact of financial inclusion on economic development. Babajide et al. (2015) further explored this relationship in Nigeria from 1981 to 2012, using commercial bank deposits as a proxy for financial inclusion. Their results indicated that financial inclusion is a

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significant determinant of total factor productivity and capital per worker, ultimately affecting overall economic output.

Migap et al. (2015) emphasized the necessity of financial inclusion for inclusive growth in Nigeria, revealing that financial depth remains shallow even among emerging African economies. They suggested that restructuring financial services through mobile banking, microfinance institutions and financial literacy could enhance inclusion. Similarly, Inoue and Hamori (2016) used panel data from 37 sub-Saharan African countries (2009–2012) and found that increased financial access and financial deepening significantly contribute to economic growth. Kim (2016) analyzed financial inclusion across 40 OECD and EU countries (2004–2011), finding that it reduces income inequality and enhances economic growth, particularly in developing economies with weaker financial systems. Omojolaibi (2017) explored the role of financial inclusion and governance in economic progress in Nigeria (1980–2014) and concluded that financial inclusion helps bridge income inequality and poverty while fostering investment in infrastructure.

A subset of studies specifically examined the role of financial inclusion in agricultural productivity. Akhtar and Parveen (2014) analyzed how rural finance within the framework of financial inclusion can link agricultural growth with inclusive growth in India. Their findings emphasized the role of financial institutions in increasing productivity among smallholder farmers by providing credit and liquidity. In the Nigerian context, Agunuwa, Inaya and Proso (2015) examined the impact of commercial banks' credit on agricultural productivity using secondary data (1980–2013). Their study found a positive effect of commercial banks' credit and interest rates on agricultural productivity. Similarly, Michael (2016) employed a survey-based approach in Ogun State and concluded that financial inclusion in agriculture contributes to sustainable development, recommending the expansion of financial institutions in rural areas.

Onoja (2017) provided a broader perspective by analyzing data from 115 countries (1991–2013) and found that financial sector development positively contributes to agricultural productivity. However, while agriculture credit had a significant impact on productivity in developing countries, it was insignificant in developed economies. He emphasized the need for quality institutions and increased agricultural credit to drive productivity improvements.

Fowowe (2020) examined the effect of financial inclusion on agricultural productivity using the Living Standards Measurement Study–Integrated Surveys on Agriculture (LSMS-ISA) data. The study found that access to financial services significantly enhances agricultural productivity, reinforcing the importance of financial inclusion in rural economies. In a long-term analysis, Okuma et al. (2022) explored the relationship between financial inclusion and agricultural output in Nigeria from 1981 to 2022. Their results indicate that financial inclusion exerts a significant and positive effect on agricultural sector performance, emphasizing the necessity of sustained financial accessibility initiatives to boost productivity. Olaniyi (2017) adopted the Autoregressive Distributed Lag (ARDL) bounds testing approach to examine the short- and long-run effects of financial inclusion on agriculture. The findings reveal that increased financial service usage leads to higher agricultural productivity, both in the short and long term.

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The theoretical foundation of this study is the Financial Intermediation Theory, which is rooted in the finance-led growth hypothesis initially proposed by Bagehot (1873) (Bagehot, 1873). Theories examining the finance-growth nexus suggest that financial intermediaries foster an environment conducive to economic growth and sustainability through either a supply-leading or demand-following effect (Schumpeter, 1911; McKinnon, 1973; Shaw, 1973).

The demand-following hypothesis posits that the financial system does not independently drive economic growth but instead responds to and influences developments within the real sector. In contrast, the supply-leading hypothesis argues that the financial system plays a proactive role in shaping economic growth (Patrick, 1966). The debate surrounding the role of financial intermediation in economic growth remains contentious. While some scholars regard financial intermediaries as having an insignificant impact on economic development, others emphasize their critical role in fostering economic activities and growth (King & Levine, 1993; Levine, 1997).

Furthermore, the Financial Intermediation Theory highlights the adverse effects of limited access to financial services, identifying it as a key factor contributing to persistent income inequality and sluggish economic growth (Beck, Demirguc-Kunt & Levine, 2007; Honohan, 2008). This perspective underscores the necessity of providing safe, accessible and affordable financial services as a fundamental prerequisite for stimulating economic activity, promoting growth, reducing income disparities, alleviating poverty, integrating economically and socially marginalized groups into the economy, and, shielding financially excluded populations from economic shocks (Demirguc-Kunt & Klapper, 2012; Allen et al., 2016; Babajide et al., 2015).

The theory provides a strong theoretical foundation for analyzing the effect of financial inclusion on agricultural productivity. Financial inclusion, which ensures access to affordable and reliable financial services, plays a crucial role in enhancing agricultural productivity by enabling farmers to access credit, savings, insurance, and payment services. The supply-leading argument suggests that a well-developed financial system can proactively drive agricultural growth by providing the necessary financial resources for investment in modern farming techniques, improved inputs and infrastructure. Conversely, the demand-following perspective implies that financial services respond to the needs of the agricultural sector, evolving as agricultural productivity increases.

Limited access to financial services, as highlighted by the theory, can hinder agricultural productivity by restricting farmers' ability to invest in advanced farming technologies, mitigate risks, and manage financial shocks. This can perpetuate income disparities and slow down economic growth, particularly in rural areas where agriculture is a primary livelihood. Therefore, enhancing financial inclusion in the agricultural sector can facilitate economic empowerment, increase productivity and contribute to overall economic development by integrating previously excluded farming communities into the formal financial system.

Methodology

The research is a survey study in which primary data were collected via administering questionnaires to the respondents who are agricultural farmers from the 21 local government areas of the State. Nine (9) local governments were sampled from the population based on the four agricultural zones of the State known as

Agricultural Development Programs (ADP) Zones. Two local government areas were selected from Zones I, II and IV while three Local Governments were selected from Zone III, being the largest among the zones. From each of the local government sampled, sixty (60) farmers were randomly selected and this gave a total sample of 540 respondents. The data collected were hence analyzed using descriptive Statistics and Step-wise Regression analysis.

Model Specification

Onaolapo (2015) model which examined the relationship between financial inclusion and economic growth was adopted in modeling the effect of financial inclusion on agricultural productivity. The model is as follows:

$GDP = \alpha + \beta_1 FD_1 + \beta_2 FD_2 + \beta_3 LDR + \beta_4 LQRT + \mu t$..... (3.1)

His model proxied financial inclusion using two financial deepening indicators Broad Money to GDP ratio (FD_1) and Credit to Private Sector to GDP ratio (FD_2). Additionally, the model includes other financial ratios such as loan-to-deposit ratio (LDR) and Liquidity ratio (LQR) of commercial banks.

The model was therefore modified for its suitability for this research in which economic growth is replaced with agricultural productivity and the independent variables with access to the five components of financial inclusion i.e., access to formal account, access to ATM, access to Mobile/internet banking, access to formal credit/loan and access to farm insurance. Thus, the modified model is expressed as:

$$\text{LOG}AGP = \beta_0 + \beta_1 ACC + \beta_2 ATM + \beta_3 MIB + \beta_4 CRD + \beta_5 INS + \mu_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.2)$$

Where,

AGP = Agricultural productivity proxied by monetary value of farm harvest

ACC = Access to Formal account: 1 if the respondent is an account holder, 0 if otherwise

ATM = Access to ATM: 1 if the respondent is an ATM user, 0 if otherwise

MIB = Access to Mobile/Internet banking: 1 if the respondent is a user of mobile/internet banking, 0 if otherwise

CRD = Access to Access to Formal Credit: 1 if the respondent has accessed formal credit/loan, 0 if otherwise

INS = Access to Farm Insurance: 1 if the respondent has farm insurance, 0 if otherwise

Since Agricultural Productivity (AGP) is a large value, its logarithm has been taken so as to normalize it and bring it at the same units with the independent variables.

Apriori Expectations

$$\beta_1 > 0;\ \beta_2 > 0;\ \beta_3 > 0;\ \beta_4 > 0;\ \beta_5 > 0$$

In equation 3.2, financial inclusion expressed by its components is expected to have positive relationship with agricultural productivity. This is because access to any of these components by a farmer will likely lead to access to agricultural financing that will increase agricultural productivity. Therefore, all the coefficients of the variables are expected to be positive.

Ordinary Least Square regression was used to analyze the equation since it satisfies the assumptions of OLS. Because there are five independent variables representing different components of financial inclusion, there may be problem of multi-collinearity in the model. In order to avoid that, forward selection method of step-wise regression was applied to select the variables that best fit the model, and analyze the model

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Results and Discussion

Table 4.1: Socioeconomic and Farming Characteristics of Farmers

		Frequency	Percentage (%)
SEX	Male	231	64.7
	Female	126	35.3
	TOTAL	**357**	**100**
AGE	18 – 33	126	35.3
	34 – 49	171	47.9
	50 and above	60	16.8
	TOTAL	**357**	**100**
Highest Qualification	Informal	49	13.7
	Primary School	27	7.6
	Secondary School	87	24.3
	High Institution	194	54.3
	TOTAL	**357**	**100**
Farming Type	Commercial only	70	19.6
	Subsistence only	47	13.2
	Both	240	67.2
	TOTAL	**357**	**100**
Farming Experience	Less than 5 years	175	49
	5 – 10 Years	103	28.9
	11 – 20 Years	30	8.4
	More than 20 Years	49	13.7
	TOTAL	**357**	**100**
Farm Size	Below 1 hectare	164	45.9
	1 – 2 hectares	117	32.8
	Above 2 hectares	76	21.3
	TOTAL	**357**	**100**

Source: Field Survey (2023)

The results from the survey provide valuable insights into the demographic and farming characteristics of respondents in the state. Table 4.1 reveals the gender composition of the farmers, with 64.7% of respondents identifying as male and 35.3% as female. This demonstrates that male participation in agriculture is notably higher than female involvement in farming activities.

Age variation of respondents is also illustrated in Table 4.1, which categorizes respondents into three age groups. A significant 47.9% of the respondents fall within the youth age group (34 - 49 years), while 35.3% are within the age group (18 - 33 years). This indicates a dominant involvement of younger individuals in farming, suggesting that youthful, energetic labor is a significant factor in the agricultural sector of the state.

Table 4.1 further presents the educational qualifications of the farmers. The largest proportion, 54.3%, holds a High Institution qualification, followed by 24.3% with Secondary School qualification, and 13.7% with no formal qualification. A small percentage, 7.6%, has Primary School qualifications. This highlights a significant

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portion of the farming population with at least a secondary school education, suggesting a relatively high level of educational attainment among the state's farmers.

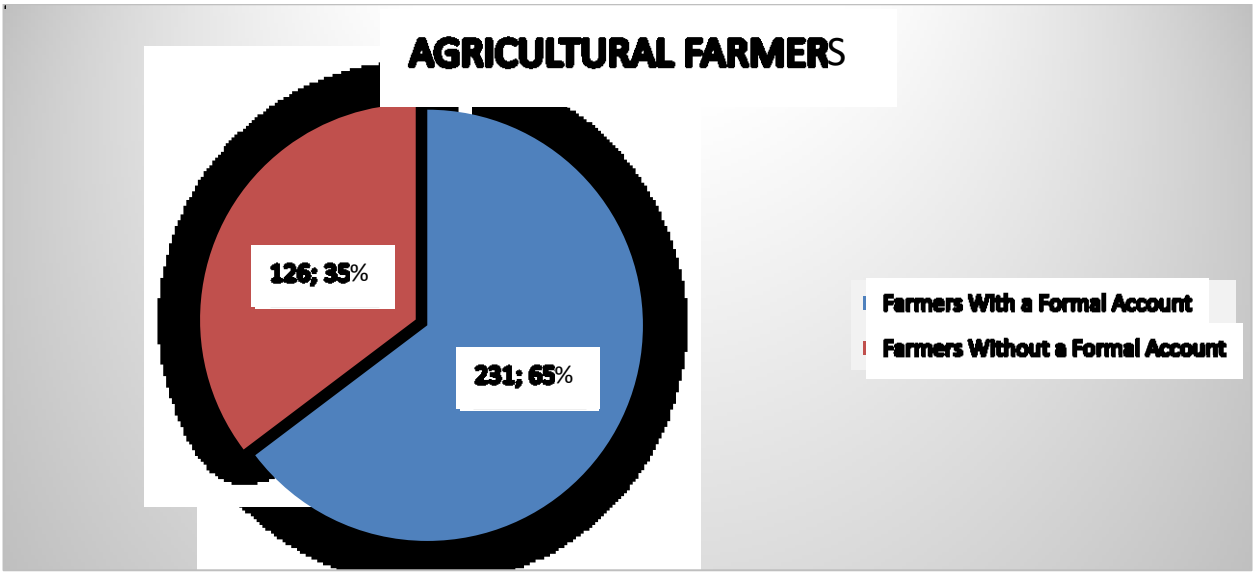
The type of farming engaged by the respondents, classified into commercial and subsistence farming is highlighted as well. Among the farmers, 19.6% are involved in commercial farming only, while 13.2% focus on subsistence farming only. A significant number of farmers, however, engage in a mix of both commercial and subsistence farming, indicating that many respondents balance both income generation and household sustenance through their farming activities.

The farming experience of respondents is shown in Table 4.1. The majority, 49%, have been engaged in farming for less than five years, reflecting a relatively new generation of farmers entering the occupation. A further 28.9% of farmers have 5 to 10 years of experience, while 13.7% have over 20 years of farming experience. Only 8.4% of respondents have been involved in farming for 11 to 20 years. This pattern reveals a predominant presence of less experienced farmers, potentially indicating an evolving agricultural landscape in the state.

Table 4.1 presents the farm sizes of the respondents. The largest proportion, 45.9%, operates on farm land smaller than one hectare, while 32.8% manage farms ranging from 1 to 2 hectares. Only 21.3% of farmers own farms larger than 2 hectares. This suggests that small-scale farming dominates in the state, with most farmers working on relatively small plots of land.

Conclusively, the data reveals that agriculture in the state is primarily youth-driven, with a substantial portion of the farming population holding post-secondary education. The farming practices are mainly small-scale, with many farmers balancing subsistence and commercial farming. Despite a relatively high number of new entrants into farming, the sector continues to be dominated by small farm sizes, indicating that smallholder farming remains prevalent.

Fig. 4.1: Account Holders among Agricultural Farmers in Adamawa State



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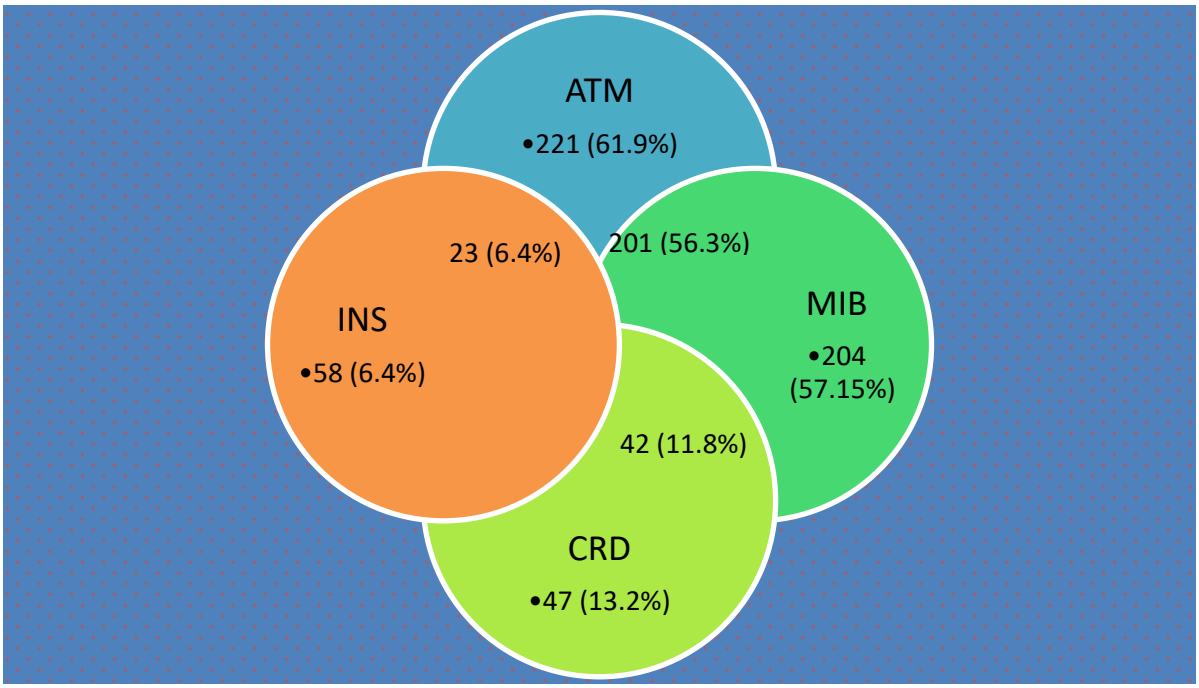
Source: Field Survey (2023)

Figure 4.1 shows the analysis of financial inclusion among agricultural participants in Adamawa State. It reveals significant insights into the accessibility of formal account. The findings indicate that 65% of the sampled respondents possess formal bank accounts, demonstrating a relatively high level of financial inclusion. However, the remaining 35% lack formal accounts which may be due to barriers to financial access, limiting their ability to leverage financial services for agricultural investments.

Fig. 4.2: Degree of Financial Inclusiveness of Agricultural Farmers in Adamawa State



Source: Field Survey (2023)

Furthermore, Figure 4.2 reveals significant insights into the accessibility and utilization of formal financial services. The accessibility of financial inclusion components shows varying degrees of penetration. The accessibility of ATMs to 62% of the respondents suggests that a majority can access cash conveniently, facilitating agricultural transactions. Additionally, 57% of the sample has access to mobile/internet banking (MIB), highlighting a growing adoption of digital financial services, which can enhance financial efficiency and reduce transaction costs. Notably, 56% of the respondents have access to both ATMs and mobile/internet banking, indicating a strong synergy between these financial components.

Despite these advancements in financial inclusion, critical financial services such as credit/loan (CRD) and insurance (INS) remain underutilized. Only 13% of respondents have access to credits/loans (CRD), suggesting that financial institutions may have stringent lending criteria or that farmers perceive borrowing as risky. The particularly low access to insurance (INS) (6%) raises concerns about the vulnerability of agricultural activities to risks such as climate shocks, pest infestations and price volatility. Furthermore, the overlap of such financial

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services is relatively limited - only 11% of respondents access both mobile/internet banking and loans, while 6% utilize both ATMs and insurance.

These findings highlight the need for targeted policies aimed at enhancing financial inclusion, particularly in credit and insurance markets, to improve agricultural productivity. Addressing barriers to financial services and promoting innovative financial products tailored to agricultural needs could foster sustainable economic growth in Adamawa State.

Financial Inclusion and Agricultural Productivity in Adamawa State

The study used forward selection method to identify the variables that best fits the model. The result shows three selected variables which are access to formal credit (CRD), access to farm insurance (INS) and access to mobile/internet banking (MIB) in addition to access to formal account (ACC). The estimated result is presented below:

Table 4.2: Estimated Result of the Effect of Financial Inclusion on Agricultural Productivity in Adamawa State

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
C	10.88266	0.089889	121.068	0.0000
ACC	0.686938	0.216179	3.177639	0.0016
CRD	0.855044	0.173154	4.938044	0.0000
INS	-0.434913	0.163385	-2.661884	0.0081
MIB	0.143842	0.210219	0.684251	0.4943
R-squared	0.199589	Durbin-Watson stat		1.435907

Source: Field Survey (2023)

Table 4.2 shows the estimated result of the effect of financial inclusion (FIN) on agricultural productivity (AGP) of farmers in Adamawa state based on the four selected variables namely; formal account (ACC), mobile/internet banking (MIB), formal credit/loan (CRD) and farm insurance (INS). The variables CRD, INS and MIB are added to the model using forward selection method and analyzed using stepwise regression. From the results, the variable, ACC is statistically significant as indicated by the corresponding probability of 0.0016 and positively signed as expected indicating that having a formal account increases agricultural productivity of farmers by 69%. This is because when a farmer is financially included the more likely he will have access to agricultural financing that will lead to more agricultural productivity. Access to formal credit is also statistically significant as indicated by a probability of 0.0000 and has a positive sign as expected. Its coefficient indicates that having access to formal credit by a farmer increases agricultural productivity by 86%. That is having access to formal credit enables a farmer purchase farm inputs such as fertilizer, improved seedlings, etc., thereby leading to increased agricultural productivity. Access to farm insurance (INS) is statistically significant as indicated by the probability of 0.0081. However, the negative coefficient is not in conformity with a priori expectation: It shows that access to farm insurance (INS) reduces agricultural productivity (AGP) by 43%.

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Access to mobile/internet banking is not statistically significant as indicated by a coefficient of 0.4943. This shows that having access to mobile/internet banking does not significantly affect agricultural productivity of the farmer.

The R^2 of 0.20 implies that 20% of the variation in agricultural productivity (AGP) is explained by the model. This is not surprising as cross sectional data are associated with low R^2 values. The Durbin-Watson statistics of 1.4 indicates a positive serial correlation in the model.

Conclusion and Recommendations

This study analyzed the relationship between financial inclusion and agricultural productivity in Adamawa State, using the financial intermediation theory as its theoretical framework. The findings indicate that while financial inclusion among farmers is relatively high, with 65% holding formal accounts, there are significant gaps in access to essential financial services such as loans (13%) and insurance (6%). The statistical analysis revealed that access to a formal account and loans positively influence agricultural productivity, supporting the notion that financial inclusion enhances farmers' economic activities. However, access to insurance, despite being statistically significant, exhibited a negative relationship with productivity, suggesting potential issues such as inadequate coverage, high premium costs, or inefficiencies in claims processing. Mobile and internet banking, though widely adopted, did not show a significant impact on agricultural productivity, possibly due to limited usage for productive financial transactions.

1. These findings highlight both the progress made in financial inclusion and the challenges that must be addressed to enhance its impact on agricultural productivity. Based on the findings the following recommendations were made.
2. Financial institutions should develop tailored loan products with flexible repayment terms to encourage greater access to credit for farmers. Government intervention in providing credit guarantees or interest rate subsidies can improve loan accessibility and affordability.
3. Policymakers and insurance providers should investigate the reasons behind the negative relationship between insurance and productivity. Affordable and well-structured agricultural insurance products should be introduced to protect farmers against risks without imposing excessive financial burdens.
4. Awareness campaigns and training programs should be organized to educate farmers on leveraging mobile and internet banking for productive financial transactions, such as input purchases, savings, and market access. Mobile money services should be integrated with agricultural value chains to enhance efficiency in financial transactions.
5. There is need to expand financial infrastructure in rural areas. Banks and other financial service providers should extend their physical presence and digital services to rural areas where many farmers reside. Investment in agent banking and mobile banking solutions should be prioritized to bridge the financial access gap.

By implementing these recommendations, financial inclusion can be further strengthened, leading to increased agricultural productivity and improved economic outcomes for farmers in Adamawa State.

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