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Socio-Economic Determinants of Smallholder Farmers' Access to Credit in Ondo State, Nigeria: Evidence from a Heckman Selection Model

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Abstract

Limited access to agricultural credit continues to limit the productivity of smallholder farmers in Nigeria, despite the sector's vital role in food security and rural livelihood development. This study examined the socio-economic factors influencing access to credit among smallholder farmers in Ondo State, Nigeria. Specifically, the study described farmers' socio-economic characteristics, and identified the key factors affecting access to credit facilities. A multistage sampling technique was used to select 240 smallholder farmers from nine farming communities across the three agricultural zones of the state. Primary data were collected through semi-structured questionnaires complemented with oral interviews. Descriptive statistics were employed to analyze farmers' socio-economic characteristics, while Pearson Product-Moment Correlation, and the Heckman Two-Step Regression Model were applied to examine the determinants of credit access and to address possible sample selection bias. The findings showed that most farmers were within the economically active age group, and a large proportion were married with at least a basic education. Cooperative membership and regular contact with extension agents were common among respondents. The results show that level of education ($p = 0.028$) and cooperative membership ($p = 0.051$) significantly influence farmers' access to credit. Furthermore, the Heckman selection model revealed that age ($p < 0.01$), farm size ($p < 0.01$), education ($p < 0.01$), access to collateral ($p < 0.01$), cooperative membership ($p < 0.05$), and extension training on credit ($p < 0.01$) significantly affect the likelihood of accessing credit. However, small farm size, gender-related constraints, and limited capital

base reduced access to formal credit. The study concludes that socio-economic characteristics play a major role in shaping smallholder farmers' participation in rural credit schemes. It therefore emphasizes the need to strengthen cooperative societies, expand extension services, and promote inclusive and gender-sensitive credit policies to enhance agricultural financing and rural livelihoods in Ondo State.

Keywords: Smallholder Farmers, Agricultural Credit, Socio-Economic Determinants, Credit Access, Rural Finance, Financial Inclusion, Heckman Regression, Nigeria

Introduction

Agriculture remains the backbone of Nigeria's economy, providing employment for over 70% of the rural population and playing a major role in food security, rural livelihoods, and non-oil export earnings (Akpabio et al., 2024). Despite its importance, productivity among smallholder farmers is still relatively low. One of the major reasons for this challenge is inadequate access to agricultural credit. Credit is an essential resource that allows farmers to purchase improved inputs, hire labour, expand their farm operations, and manage the risks associated with production and marketing (Masuka et al., 2025). Unfortunately, most smallholder farmers in Nigeria operate under severe financial constraints, with limited capital, poor access to formal financial institutions, and heavy dependence on informal sources of finance (Balana & Oyeyemi, 2022).

Smallholder farmers, who typically cultivate less than two hectares of land, constitute the foundation of Nigeria's agricultural sector (Bashir et al., 2017). However, their ability to access credit is restricted by several socio-economic and institutional factors, including low levels of education, lack of acceptable collateral, small farm sizes, gender-related limitations, and inadequate contact with extension services (Chiaka et al., 2022). When farmers are unable to obtain timely and sufficient credit, their capacity to adopt modern farming technologies, increase productivity, and improve income is greatly reduced. As a result, improving smallholder farmers' access to credit remains a key priority in Nigeria's agricultural development and poverty reduction efforts (Peter et al., 2025).

Although several studies have examined the factors influencing access to agricultural credit in developing countries, the findings often differ across locations. Variables such as age, gender, level of education, household size, cooperative membership, and access to extension services have been shown to affect farmers' credit access (Romanus et al., 2020; Amegnaglo et al., 2024). However, these determinants vary depending on regional characteristics, institutional arrangements, cultural practices, and the level of rural financial development. In Ondo State, where agriculture serves as a major source of livelihood, there is still limited empirical evidence on how farmers' socio-economic

characteristics shape their access to credit, especially in the context of evolving financial inclusion policies and rural development programmes.

Despite the recognized importance of agricultural credit, the constraints to accessing credit among smallholder farmers are often viewed primarily from the supply side, focusing on the reluctance of financial institutions to lend. However, less attention has been paid to demand-side constraints, which relate to farmers' ability, willingness, and preparedness to access credit. These include socio-economic limitations such as low education, lack of collateral, weak social networks, and limited awareness of available credit opportunities.

Therefore, this study specifically focuses on identifying the socio-economic determinants of credit demand among smallholder farmers by examining factors influencing both the decision to access credit and the level of credit obtained. This distinction is important for designing policies that address not only institutional lending constraints but also the underlying limitations faced by farmers themselves.

Methodology

Study Area

The study was carried out in Ondo State, which is located in the southwestern region of Nigeria, between latitudes 5°45′ and 7°52′ North and longitudes 4°20′ and 6°05′ East. The state shares boundaries with Ekiti and Kogi States to the north, Edo State to the east, Osun State to the west, and the Atlantic Ocean to the south. According to the National Bureau of Statistics (NBS, 2023), Ondo State has an estimated population of about 4.2 million people and covers a land area of approximately 15,500 km².

The state experiences a tropical climate characterized by two distinct seasons: the wet season, which lasts from April to October, and the dry season, from November to March. Agriculture remains the main occupation of the people, with farming serving as a primary source of livelihood, especially in rural communities. Major crops grown in the state include cassava, maize, yam, cocoa, and oil palm. Agricultural activities are largely rain-fed and are predominantly carried out by smallholder farmers who typically cultivate between one and two hectares of land.

Sampling Procedure and Sample Size

A multistage sampling technique was adopted for this study due to the administrative division of Ondo State into three agricultural zones (Zone I, Zone II, and Zone III). In the first stage, one Local Government Area (LGA) was randomly selected from each agricultural zone. The selected LGAs were Owo (Zone I), Ondo East (Zone II), and Okitipupa (Zone III).

In the second stage, three farming villages were randomly selected from each selected LGA based on the predominance of smallholder farming activities. The villages selected were Upenmen, Ipele, and Igbe in Owo LGA; Bolorunduro, Kajola, and Oboto in Ondo East LGA; and Ode-Aye, Erinje, and Igbotako in Okitipupa LGA.

In the third stage, the Yamane (1967) formula was used to determine the sample size from the sampling frame obtained from the Ondo State Agricultural Development Project (ADP). The formula is expressed as:

$$n = \frac{N}{1 + N(e)^2}$$

Where:
n = sample size
N = finite population
e = level of precision (0.05)

Table 1: Sampling procedure of the respondents in the study area

Zone	Selected LGA	Selected Villages	Sampling frame	Sampling size
I	Owo	Upenmen	65	26
		Ipele	68	27
		Igbe	68	27
II	Ondo-East	Bolorunduro	68	27
		Kajola	68	27
		Oboto	68	27
III	Okitipupa	Ode-Aye	68	27
		Erinje	65	26
		Igbotako	65	26
Total	**3**	**9**	**603**	**240**

Source: (Ojo, 2025; OSAEC, 2024; Anyanwu, 2025).

NOTE: The values on the sample size column were calculated based on the total number of farmers found on the sampling frame column total. Based on this procedure, a total of 240 smallholder farmers were selected.

Data Collection

Instrument of Data Collection

Primary data for the study were obtained through the use of a semi-structured questionnaire consisting of both open- and close-ended questions.

Data collection was carried out through the administration of structured questionnaires. The questionnaire was designed to elicit information on the socio-economic characteristics of respondents, including age, sex, marital status, level of education, household size, farm size, source of labour, and farming experience, etc, access to credit facilities and other required information.

To ensure accuracy and reliability of the data, trained enumerators who were conversant with the local languages assisted in administering the questionnaires.

Analytical Techniques

Descriptive statistics such as frequency counts, percentages and means were used to analyze the socio-economic characteristics of the farmers and their patterns of access to credit facilities.

Inferential statistics, including the Heckman Two-Step Regression Model, was employed to analyze the factors influencing smallholder farmers' access to credit facilities. The model was adopted to correct potential sample selection bias arising from non-random access to credit.

In addition, the Pearson Product-Moment Correlation (PPMC) was used to examine the relationship between selected socio-economic characteristics and access to credit facilities. The Heckman Two-Step model consists of two equations: the selection equation and the outcome equation.

The selection equation (Probit model) estimates the probability that a farmer accesses credit (i.e., participation decision). Variables such as age, farm size, education, cooperative membership, access to collateral, and extension training were included to explain the likelihood of accessing credit.

The outcome equation examines the determinants of the amount or utilization of credit, conditional on access. This equation incorporates the Inverse Mills Ratio (λ) derived from the selection equation to correct for potential selection bias. Variables such as farming experience, gender, income, and extension training influence how much credit is utilized after access is granted. This distinction allows the model to separately identify factors influencing initial credit access (demand decision) and those affecting the subsequent level of credit utilization.

Results and Discussion

Socio-Economic Characteristics of Smallholder Farmers

The socio-economic profile of the smallholder farmers provides essential insights into the determinants of credit access in Ondo State. The variables analyzed—age, sex, marital status, education, farm size, source of labour, and farming experience, and credit access—highlight the demographic and economic realities influencing farmers' ability to obtain agricultural credit.

Table 2: Socio-economic characteristics of respondents

Variable	Frequency	Percentage	Mean
Age			
30 years and below	68	28.7	39 years
31-40 years	82	34.2	
41-50 years	35	14.6	
Above 50 years	54	22.5	
Sex			
Male	169	70.4	
Female	71	29.6	

Variable	Frequency	Percentage	Mean
Marital status			
Widow(er)	16	6.7	
Divorced	47	19.6	
Single	27	11.3	
Married	150	62.5	
Household size			
1-5 persons	141	58.8	5 members
6 – 10	76	31.7	
Above 10	23	9.6	
Formal education			
Yes	209	87.1	
No	31	12.9	
Level of education			
Non-formal education	31	12.9	9 years
Primary education	150	62.5	
Secondary education	38	15.8	
Tertiary education	21	8.8	
Farm size			
<1.0 ha	59	24.6	2.08ha
1.0ha – 2.0ha	170	70.8	
>2.0ha	11	4.6	
Source of farm labour			
Family labour	116	48.3	
Hired labour	21	8.8	
Both family and hired	103	42.9	
Farming experience			
1 – 10 years	121	50.4	13 years
11 – 20 years	92	38.3	
Above 20 years	27	11.3	
Access to credit facility			
Yes	215	89.6	
No	25	10.4	

Source: Field Survey, 2025

Table 3: Institutional variables of respondents

Variable	Frequency	Percentage	Mean
Access to extension			
Yes	177	73.8	
No	63	26.2	
Frequency of extension visits			
Not visited	63	26.2	
Weekly	39	16.3	
Bi-weekly	21	8.8	

Variable	Frequency	Percentage	Mean
Monthly	71	29.6	
Quarterly	42	17.5	
Yearly	4	1.7	
Cooperative society			
Yes	210	87.5	
No	30	12.5	
Number of cooperatives			
Not a member	30	12.5	2 members
1-2	199	82.9	
Above 2 cooperatives	11	4.6	
Off-farm income			
<100,000	117	48.8	₦125,404.67
100,000 – 200,000	120	50.0	
>200,000	3	1.3	
Farm income			
<200,000	2	0.8	₦641,166.67
200,000 – 400,000	59	24.6	
>400,000	179	74.6	

Source: Field Survey, 2025

Age Distribution

The majority of respondents (82) fall within the 31–40 years age bracket, followed by those aged ≤30 years (68). This indicates that most farmers are within their economically active age range, implying higher productivity and risk-taking capacity, which enhances creditworthiness. Younger farmers are often more receptive to innovation and credit utilization for improved productivity, though they may lack collateral compared to older farmers (Amegnaglo et al., 2024).

Sex Distribution

The data show that male farmers (169) outnumber their female counterparts (71), suggesting that agricultural production and access to credit remain male-dominated in the study area. Gender disparity in credit access has been widely reported, often attributed to socio-cultural and institutional constraints that limit women's access to land, collateral, and financial services (Smidt, 2021).

Marital Status

A large proportion of respondents are married (150), while 47 are divorced, 27 single, and 16 widowed. Married farmers often have greater household responsibilities, which may increase their need for agricultural financing (Etonihu et al., 2013). Marriage may also enhance creditworthiness due to perceived stability and household labour availability.

Educational Attainment

Most respondents possess at least primary education (150), followed by those with secondary (38), non-formal (31), and tertiary (21) education. Education enhances farmers' ability to understand credit procedures, maintain records, and engage effectively with financial institutions (Kiplimo et al., 2015). Thus, higher educational attainment is positively associated with credit access.

Farm Size

The majority of farmers (170) cultivate between 1.0–2.0 hectares, while 59 farm less than 1 hectare and only 11 cultivate above 2 hectares. This confirms that the respondents are predominantly smallholders. Small farm size is often linked to limited capital accumulation and collateral, which may restrict access to formal credit (Damilola, 2022).

Source of Labour

Most farmers (116) depend on family labour, 103 use both family and hired labour, while 21 rely solely on hired labour. The predominance of family labour reflects the small-scale nature of operations. Family labour reduces cash expenses, but may limit farm expansion, thus influencing the scale of credit demand (Balana & Oyeyemi, 2022).

Access to Extension Services

A total of 177 respondents had access to agricultural extension services, while 63 did not. Extension contact improves farmers' knowledge of modern production practices and available credit opportunities (Owolabi & Yekinni, 2022). Farmers with regular extension contact are more likely to access institutional credit due to increased awareness and technical capacity.

Cooperative Membership

Cooperative membership is high among respondents, with 210 belonging to cooperatives compared to 30 non-members. Cooperatives facilitate collective access to credit and inputs and enhance members' credibility before lending institutions (Ibrahim and Aliero, 2012). This strong participation rate may explain the relatively high credit access recorded in the study.

Access to Credit

Out of all respondents, 215 farmers reported access to credit, while 25 did not. This high level of access may be associated with active cooperative participation, exposure to extension services, and relatively high literacy levels. Nonetheless, disparities in farm size and gender may still constrain equitable credit distribution.

Goal of Farming of the Respondents

Furthermore, the results in Figure 1 show that respondents in the study area were actively involved in livelihood activities to cater for the household needs since majority (67.1%) of the

small-holder farmers in the study area produced food for both sales and family consumption while only few produced mainly for family consumption. This is because most of them are married and there is a need to meet up with household food demand. With large household size their economic implications on the household head to provide the basic necessity for the family member in the study area.

Factors Influencing Access to Credit

The coefficient of age of the farmers which is positive and significant at 1% and 5% level of probability in the access of credit facilities indicates that increase in age of the farmers tend to increase the access of credit facility in the study area. This implies that older farmers are significantly more likely to access credit, possibly due to better networks, trustworthiness, and longer tenure in farming, which lenders might consider favorably.

The coefficient of farm size was negative and significant at 1% level of probability. This implies that the larger the farm size of the respondents the lower their level of access to credit facility in the study area. Indicating that larger farm size negatively affects credit access. This could reflect perceptions that larger farms are wealthier and may not need credit, or possibly that land size does not translate into creditworthiness without formal documentation. Gender did not attain statistical significance in the access (selection) equation, implying no effect on the likelihood of obtaining credit. This may relate to different spending priorities or roles in household decision-making. The coefficient of level of education was positive and significant at 1% and 10% level of probability in access and utilization of credit respectively. Education has a strong positive influence on access, indicating that literate farmers are more capable of navigating formal loan application processes and understanding loan conditions. This is in line with the findings of Balana and Oyeyemi, (2022) who showed that level of education has a positive influence on farmers' access to credit facility.

The coefficient of access to collateral was positive and significant at 1% level of probability, indicating that farmers with collateral are significantly more likely to access credit, as expected. This aligns with standard banking practices where collateral is a prerequisite. Furthermore, Positive perceptions of credit significantly increase the likelihood of access. This may reflect higher motivation to seek credit among those who view it as beneficial. The coefficient of cooperative society was positive and significant at 5% level of probability. This implies that participation in cooperatives increases access. Cooperatives often serve as intermediaries, provide guarantees, and facilitate group lending among the small-holder farmers in the study area. This agrees with the result of Adegbite and Machethe, (2020) who revealed that cooperative society provide loans and access to inputs to it members at lower interest rate.

However, the coefficient farming experience was positive and significant 1% level of probability. showing that experienced farmers are more adept at utilizing credit effectively for productive activities due to the accumulated experience on good agronomic practices adopted

in crop production. This substantiates the findings of Osabohien *et al.* (2020) who revealed that experience farmers utilize credit more in farming activities in the study area.

The coefficient of extension training on credit was positive and significant at 1% and 5% level of probability on access of credit facilities. This implies that credit-related extension services significantly improve access, suggesting that training helps farmers understand and meet credit requirements. This again highlights the importance of technical support. Training ensures that farmers understand the terms and best practices for using credit.

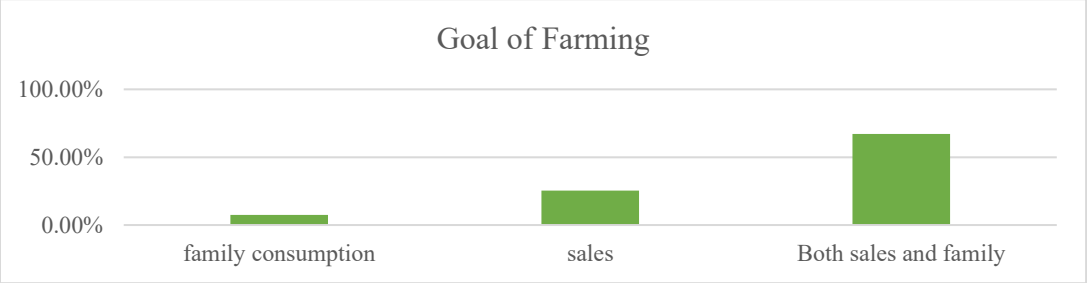


Figure 1: Goal of farming of the respondents

Table 4: Farmers perception of credit facility

Perceptions	Mean	SD	Remark
Credit facilities are essential for improving agricultural productivity	3.48	0.73	Agree
Subsidized or government-backed credit schemes are often politicized or mismanaged	3.18	0.98	Agree
Women and youth farmers face more difficulty accessing formal credit than men	3.12	0.76	Agree
The loan application process is often too complex and bureaucratic	3.03	0.96	Agree
Cooperative societies and informal groups are more accessible and farmer-friendly	3.00	1.11	Agree
There is inadequate awareness about available credit schemes	2.95	1.12	Agree
Access to credit improves farm input use (fertilizers, seeds, machinery)	2.85	0.98	Agree
Farmers feel excluded from decision-making regarding credit program design	2.84	1.16	Agree
Repayment terms are not flexible and don't align with farming seasons	2.77	1.20	Agree
Some farmers distrust formal financial institutions due to past negative experiences	2.73	1.21	Agree
Most financial institutions do not understand the unique needs of farmers	2.69	1.14	Agree
Disbursement of credit is often delayed, affecting timely farming activities	2.23	0.99	Disagree
Interest rates are perceived as too high and unaffordable	2.12	1.10	Disagree
Collateral requirements are too stringent and exclude many smallholder farmers	2.11	0.91	Disagree

Source: Field survey, 2025

Table 5: Heckman two-step selection model on factors influencing access to credit

Variables	Access to Credit (Selection)		Credit Utilization (Outcome)	
	Coefficient	Z-value	Coefficient	Z-value
Age	0.0676	3.43***	0.0166	2.34**
Farm size	-0.5962	-2.76***	-0.0983	-1.60
Goal of farming	-0.0875	-1.42	-0.0094	-0.53
Gender	0.0228	1.31	0.0235	3.38***
Level of education	0.3369	4.27***	0.0280	1.76*
Access to collateral	0.3897	3.77***	0.0196	0.68
Farmers perception on credit	0.5461	2.12**	-0.0285	-0.38
Annual income	0.0203	0.97	-0.0109	-1.92*
Cooperative society	0.0014	2.23**	0.0428	0.39
Farming experience	0.1270	0.52	0.4811	6.76***
Extension training on credit	0.3496	4.63***	0.0649	2.29**
Constant	-3.7417	-4.19***	-0.3870	-1.16
Diagnostics				
Rho	0.4800			
Lambda	0.4169	1.72*		
Wald chi^2	91.91			
Prob>chi^2	0.0000***			
Number of obs	240			
Censored obs	138			
Uncensored obs	102			

Source: Field survey, 2025.

Table 6: Relationship between socio-economic characteristics and access to credit

Variables	Coefficient	P-value	Decision
Age	-0.074	0.126	NS
Marital status	-0.029	0.327	NS
Household size	0.017	0.399	NS
Cooperative membership	0.014	0.051**	S
Level of education	0.040	0.028**	S
Farm size	-0.101	0.032**	S
Farming experience	0.096	0.019**	S

Source: Field survey, 2025; NS=not significant, **S=**significant

*** Significant at 1%, **=Significant at 5%, and *=Significant at 10% level of probability.

The coefficient of level of education and cooperative membership (0.040 and 0.014) was positive and significant at 5% level of probability among the small-holder farmers respectively; suggesting that increase in education and membership of cooperative society of the farmers will lead to increase in farmers' access to credit facility in the study area.

Beyond statistical significance, the results provide important socio-economic insights into credit access behavior among smallholder farmers. The positive and significant effect of

marital status on credit access suggests that married farmers may possess higher social capital and perceived stability, which can enhance their credibility in the eyes of lenders and cooperative societies. Marriage may signal responsibility, access to family labour, and shared economic commitment, all of which can reduce perceived lending risk.

Similarly, the strong influence of education reflects the role of human capital in financial inclusion. Educated farmers are more likely to understand loan procedures, complete required documentation, and engage effectively with formal financial institutions. They are also better positioned to evaluate the benefits and risks associated with borrowing, thereby increasing their likelihood of seeking and obtaining credit.

Cooperative membership also plays a critical role by serving as a form of social collateral. Cooperatives facilitate group lending, reduce information asymmetry, and enhance trust between farmers and financial institutions. This explains why cooperative participation significantly improves access to credit.

These findings suggest that access to credit is not determined solely by economic need, but also by social structure, institutional linkages, and individual capacity. For rural development practitioners, this implies that policies aimed at improving credit access should go beyond increasing credit supply to strengthening farmers' social networks, educational capacity, and institutional participation.

Conclusion

The findings of the study indicate that socio-economic characteristics play a crucial role in determining smallholder farmers' access to credit. Factors such as level of education, cooperative membership, contact with extension agents, and marital status were found to enhance farmers' likelihood of obtaining credit. These factors improve awareness, strengthen social networks, and increase farmers' credibility in the eyes of lending institutions.

However, challenges such as small farm size, gender-related inequalities, and limited capital base continue to restrict access to credit for many smallholder farmers. These constraints limit their ability to meet lending requirements and reduce their participation in formal financial systems. Overall, the results support existing empirical evidence that socio-economic conditions significantly shape smallholders' involvement in rural credit schemes (Chete & Bukola, 2025; (Adewale et al., 2022). The study therefore highlights the need for inclusive credit policies and targeted financial interventions that address these structural barriers in order to improve agricultural productivity and rural livelihoods.

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