Agricultural Credit Accessibility Determinants: Evidence from Ghanaian Smallholder Farmers

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Abstract

Agricultural credit is an essential input along with modern technology for increased in farm productivity hence serves as an intervention to eradicate rural poverty and increase in agricultural growth. It is believed that smallholder farmers growth in farm production will depend on the availability of agricultural credit. The study assessed on the heterogeneous effect of the factors on the source of agricultural credit (formal and informal) and the gender composition. The study utilized the quantitative research design, a total of four hundred (400) participants were randomly sampled from 4 selected districts and municipalities in the Eastern region of Ghana (Asuogyaman, West-Akim, Suhum and Birim South). A statistical test like the binary logistics regression model was used to predict whether or not smallholder farmers' access to agricultural credit in the formal and informal source of credit and the gender composition is influenced by the determinants considered for the study. According to the findings of this study, it can be concluded that a lot of factors influence the smallholder accessibility to agricultural credit.

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The model showed a significant relationship between the determinant and accessibility of agricultural credit. This asserts that smallholder farmers' accessibility of agricultural credit depends on these determinants for the purpose and the study area. The study, therefore, suggests that suppliers, borrowers and other interested stakeholders should be able to improve and intervene in the financial inclusion as well as that stakeholders in the agricultural industry such as MOFA, NGOs, FAO etcetera should include in their sensitization programs ways of enhancing farmers to adopt better farm management practices since they are variables influencing farmers used of agricultural credit.

Keywords: Smallholder Farmer; Agricultural Credit; Binary Logistic Model.

1. Introduction

The agricultural sector is integral to developing and some developed countries that create major employment for the rural population. The agriculture sector activities have the utmost potential as a source of income to lessen poverty in such economies as a whole and in small scale farmers and provision of food and raw materials to boost the economic growth and food security. In the Ghanaian Agricultural sector, the smallholder farmers produce about 80% of the sector's output on a small-scale basis. This menace leads to agricultural productivity in developing and some developed economies remaining low. Numerous researchers stated that increasing agricultural productivity, revenue for farmers and food security assurances are been influenced by agricultural credit [1,2,3,4] Inadequate use of advanced technologies thereby has been acknowledged as one of the main factors contributing to small agricultural efficiency in many countries [5]. The establishment of the use of high-quality inputs, such as improved fertilizer, high mechanized services, and improved seeds, are seldom used in the agricultural sector [6]. Access to improved inputs generally depends highly on whether or not there is readily available adequate timely credit. The inadequate access to credit for farmers to acquire better inputs remains a key challenge in the agricultural production sector [7]

The problem of inadequate access to credit and credit rationing in many developing countries are not new and continue to persevere. There is a wide-ranging collection of literature on credit constraints [8,9]. For example, in the study conducted by [8] it was examined that credit constraints amid market oriented farmers in Chile and it was found that most farmers are not credit constrained. [10] in another investigated the determinants of agricultural credit rationing by formal lenders in Ghana and it was proven that engagement in off-farm activities, the commercial orientation of farmers, a positive account balance, and an increase in farm size can possibly reduce rationing of loan applicants by lenders. In another study it was found out that in Malawi [11], wealthier households are less likely to report credit constraints. In spite of these important contributions, there is limited knowledge about what influences farmers' participation or lack thereof in credit programs in areas where most farmers are economically productive, such as in the Nkoranza district of Ghana. From the reviews of Literature, several studies or articles have focused on measuring the actual and potential impact on agricultural credit accessibility by smallholder farmers. Since most developing countries are witnessing the impact of agricultural credit and variability at varying degrees with levels of susceptibility and accessing mechanism. The previous studies indicated that accessibility of agricultural credit has significant influence smallholder agricultural production. Subsequent to these empirical findings, other studies in have been engaged on the determinant of

accessibility of agricultural credit [12,13,14]. Although, the studies on the accessibility of agricultural credit impact is increasing tremendously worldwide, there are merely a handful of studies on the determinants of accessibility of agricultural credit on the type of farming engaged. In Ghana most studies are focused on the smallholder farmers in the upper part of the country who are into cereal farming. In recent studies in Ghana, there have been some articles about the smallholder farmers in the southern part. Also, almost all the existing studies on accessibility of agricultural credit don't consider these determinants such as distance to the nearest financial institutions, saving with the credit suppliers, availability of extension services etcetera. The failure of previous studies creates the possibility for future studies since the gap bridging the accessibility of agricultural credit by the smallholder farmers are not solved, hence the need for further studies. This study, therefore, addresses the farming activities engaged by the smallholder farmers in the selected communities and the heterogeneous impact of the determinants of accessibility of agricultural credit in the formal and informal credit facilities as well as on the gender composition in the Eastern region of Ghana. The gender composition was considered in the study area on the basis that families cultivating on the different farm lands might contribute significantly closing the gap of gender credit accessibility. Some studies have focused on the female smallholder farmers especially in the northern part of Ghana being vulnerable and cultivate on a small piece of land to produce supplement foods to add up to what the household heads produce, thereby offering them credit [15,16]. This research examines this issue and contributes to the existing literature on credit access to small holder farmers. It furthermore aims to provide additional standpoints on factors influencing farmers' participation in credit schemes, farm households' reasons for participation and non-participation in microcredit programs, determining factors influencing farm households' participation, and to identify factors influencing the possibilities of farmers being credit rationed.

2. Theoretical Analysis

Decision making theories are termed into two main parts normative and descriptive theory. The normative theory deals with how decisions have been made, whiles descriptive theory determines how they are made [17]. Most studies similarly term these philosophies into rational and non-rational. The choice theory was popularized by Gary Becker, who was the first one to apply the rational action model more widely, in the 1992 Nobel Memorial Prize Laureate in Economic Science which was stated in [18]. The choice theory is also known as the rational action theory or model, which is an understanding theory in modeling social and economic as well as individual decision-making. According to the importance of rational choice theory, when there are several courses of action, people usually do what they believe is likely to have the best overall outcome" [19] . In the paper prepared by [20], the basic idea behind this rational choice theory is that, individuals try their best under all circumstances to achieve the objectives and emphasize the choice of consumers regarding preferences. In support to the use of this theory, a smallholder farmer decision on the access of agricultural credit depends on the smallholder farmer's preference on the basis of the rational action. This goes to say that; the individual smallholder farmers will choose a course of action to participate or access agricultural credit that is most in line with their personal preferences. The choice theory is relevant because it highlights how human decision making can be modeled, especially in the context of microeconomics, where it helps economists better understand the behavior of a society in terms of individual actions as explained through rationality, in which choices are consistent because they are made according to the farmer's willingness of having a demand for agricultural

credit based on his/her socio-economics status such as income level, farm type, off-farm income level and many others. Therefore, the choice to participate in the credit market depends on the benefit the farmer may gained by accessing credit or not.

Theoretically, credit is an instrument that can enhance market stability. The bargaining power of rural farmers can be achieved by the establishment of storage facilities and provision of transport system acquired through credit. The covering of consumption deficits of farm households depends on the credit accessibility. This will enable the farm members to accomplish the agricultural activities efficiently. Credit also serves as an income transfer device to eliminate the discriminations in income supply among the small, medium, and large-scale farmers. Additionally, credit encourages savings and these savings held by financial institutions can be distributed to the farmers to improve their agricultural production. Credit also creates employment opportunities for rural farmers. Reference [21] stated that, accessing credit to acquire for farm equipment and other agricultural inputs, the institution of modern irrigation system and other technological developments makes the agriculture sector more productive. In the views of [22] analysis to estimate the relationship between socio-economic factors of farmers and their willingness to access credit, the significant factors that influence farmers accessibility to agricultural credit are education, distance to source of credit and types of in Nigeria. Reference [23] discovered that the access is likely to be controlled by type of financial institution and its policy. They also deduced that credit duration, terms of payment, security requirement and the provision of supplementary services do not meet the target group's needs, thereby influencing the potential borrowers not to demand credit due to the borrowers being deprived of requesting for credit. Reference [24,25,26] proposed that distorted evidence, high risks, lack of collateral, lender-borrower distance, small and frequent credit transactions of rural household make real cost of borrowing differ from different sources of credit in the developing countries. However, studies on the agricultural credit accessibility by smallholder farmers in the developing country remains unattainable. To bridge the gap in the literature, the study aims to identify how the determinants of agricultural credit influence smallholder farmer accessibility. The study addresses the heterogeneous impact of the accessibility of agricultural credit from formal and informal source as well as gender composition in Eastern region of Ghana. Finally, the aftermath of the study is not only to validate present results about the determinant of agricultural credit accessibility in Ghana but will enable the smallholder farmers to maximize their willingness to access credit to enhance productivity.

3. Theoretical Analysis
3.1. Econometric Model

The study identifies the availability and the accessibility of agricultural credit facilities and factors that influence credit access by small holder farmers in some four selected municipals and district in the eastern region of Ghana by using logistic regression technique. The smallholder farmer access to agricultural credit is analyzed using the logistic regression techniques to produce a model considering the binary choice of "yes or no" type (those that have access or those do not have access credit) of the dependent variable hence avoiding ordinary least squares (OLS) been used. Probit regression is another model that gives a similar efficient parameter to the logit regression model but the main difference between them is their distribution, which is captured by cumulative distribution functions. The threshold decision making theory recommended by [27] is chosen to

examine the accessibility and availability of credit to smallholder farmers. A reaction threshold dependent on the set of factors such as the respondent's characteristics is set. The model below is used for the relationship.

$$Y_i = X_i^T \beta + \varepsilon_i \text{ ------------------------(1)}$$

Where Y_1 is one (1) when an access to credit is made and zero (0) otherwise: this goes to say that;

$Y_i = 1$ when X_i is greater than or equal to a threshold, X^T and $Y_i = 0$ if otherwise. It should be noted that X^T represent the homogenized effect of the independent variables (X_i) (responses from the smallholder farmers) at the threshold level. Equation (2) depicts a linear binary choice model that estimates the probability of adopting of a given credit access policy (Y) that is modeled as a function (F) of independent variable (X). This is mathematically represented as:

$$Prob(Y_i = 1) = F(\beta^T X_i)\text{-----------------(2)}$$

$$Prob(Y_i = 0) = 1 - P(\beta^T X_i)\text{-------------------(3)}$$

From equation (3), Y_i is the observed response for the ith observation of the response variable, Y. this means that $Y_i = 1$ (if farmers have access to agricultural credit) and $Y_i = 0$ (otherwise). X_i is a set of independent variables (responses form smallholder farmers) which are associated with the ith individual respondent that determines the probability of adopting a policy and the farmer's decision to participate such a policy, (P). The function, (F) to model X can take the form of Gaussian logistic or probability function. The logistic model uses a logistic cumulative distributive function to estimate, P as follows (Pindyick & Rubinfield, 1998):

$$Prob(Y_i = 1) = \frac{e^{\beta^T X}}{1 + e^{\beta^T X}}\text{--------------(4)}$$

$$Prob(Y_i = 0) = 1 - \frac{e^{\beta^T X}}{1 + e^{\beta^T X}} = \frac{1}{1 + e^{\beta^T X}}\text{------(5)}$$

The significance for adopting the logistics model is to model the farmer decision to access credit at a given point in time when the factors assumed to influence farmers exceed the reaction threshold. The observed model is assessed using the farmers' profiles which probably influence their credit decision based on the conceptual framework. The variables include the farm and the farmer's profile such as gender, education, number of households, the size of farm, off-farm job, marital status, farm-experience and group membership. The empirical mathematical model is below:

$$Y = (\beta_0 + \beta_1 Gender + \beta_2 Marital\ status + \beta_3 Age + \beta_4 Education + \beta_5 Farm\ Experience + \beta_6 Off-farm\ job = \beta_7 Savings + \beta_8 Group\ membership + \beta_9 Extension\ services + \beta_{10} Land\ ownership + \beta_{11} Number\ of\ household + \beta_{12} Farm\ size + \beta_{13} Distance) \text{ --------- (6)}$$

The dependent variable defined as the access to credit by smallholder farmers as Y = 1 and 0 no access to credit by smallholder farmers; β_0= constant, and β_1, β_2 β_3, β_4, β_5, β_6, β_7, β_8, β_9, β_{10}, β_{11}, β_{12}, β_{13} the intercept of the

explained variables in the equation. The description of the independent variables used in the models is shown below in table 1

Table 1: Independent Variables Measurement, Description and the Expected Sign

Variables	Definition	Expected sign
Access to credit	Whether respondent has access to credit: 1=Yes, 0= Otherwise	
Gender	Gender of respondent: 1 = Male, 0 = otherwise	+
Marital Status	Marital status of respondent: 1 = Married, 0 = otherwise	+/-
Age	Age of the respondent	-
Education	Respondent number of years of formal education	+
Farm Experience	Respondent number of years of farm experiences	+
Off-Farm Job	Whether respondent have an off-farm job: 1=Yes, 0= Otherwise	+
Savings	Whether respondent holds savings account: 1=Yes, 0= Otherwise	+
Membership	Whether respondent is an association member: 1=Yes, 0= Otherwise	+
Access to extension officers (EO)	Whether respondent have access to extension officer: 1=Yes, 0= Otherwise	+
Land ownership	Whether respondent owns a land: 1=Yes, 0= Otherwise	+
Household size	The family size of the household	-
Farm size	The size of the cultivable land in Acres	-
Distance	Distance from the farmer's home to the nearest financial services in Km	+/-
Districts		
West Akim	Whether respondent is from West Akim: 1=Yes, 0= Otherwise	+/-
Suhum	Whether respondent is from Suhum: 1=Yes, 0= Otherwise	+/-
Asuogyaman	Whether respondent is from Asuogyaman: 1=Yes, 0= Otherwise	+/-
Brim South	Whether respondent is from Birim South: 1=Yes, 0= Otherwise	+/-

Source: Researcher's construct 2020

3.2. Data source

All The targeted population of study was the rural smallholder farmers in Ghana. These farmers are in the eastern part of Ghana. The data used for the questionnaire was drafted from the existing survey [28] that aim to support the growth of the agricultural sector to eradicate poverty, provide food security and healthy living among the rural communities. The questionnaire pre-testing was performed to measure the data adequacy, validity and internal consistency. Stratified sampling was used in the case of probability sampling to group the smallholder farmers according to the type of farming (crop, livestock, logging) in the four (4) randomly selected districts in the Eastern region of Ghana. In the next stage, a random sampling was done using seemly unrelated

regression to select four (4) communities or villages from each district or municipalities to arrive at sixteen (16) villages or farming communities to avoid sample selection bias. Based on the background of the study, these four districts were chosen randomly on the basis of the convenient, accessibility and reliability of relevant data of rampant farming activity and to get an insight by the smallholder farmer accessibility of the available credit facilities in the rural communities. According to [29], sampling help the process of selecting an element to represent a population in a research study with the aim of attaining an equitably generalized account of intent with regards to the population such element represents. The sample size was measured on the population aforementioned. The estimation of the sample size is a proportion with the 95% confidence level using the following formula:

$$n = \frac{Z^2 * pq}{d^2} = \dots\dots\dots\dots \; (7)$$

Where n = required sample size, z= is the expected 95% confidence level, p= population (assumed p=0.5 representing the unknown proportion of the population), q=1-p, d= the degree of precision at 5%. The minimum sample size was estimated (95%, Z=1.96, P = 0.5 %, E = +/- .05).

$$n = \frac{1.96^2 * 0.5(0.5)}{0.05^2}$$

$$n = \frac{3.8416 * 0.25}{0.0025}$$

$$n = \frac{0.96029}{0.0025}$$

$$n = 384.166$$

Hence, at least four hundred (400) were sampled to expedite the participants' distribution mean within the selected communities to minimize the bias sampling error. The list of the selected districts/municipalities and the communities under in the Eastern region of Ghana can be seen in table 2 for clarifications.

Table 2: Selected Districts/Municipalities and Communities/Villages

Suhum Municipality	West Akim Municipality	Asuogyaman District	Birim South District
Adarkwa	Osenase	Gyekiti	Adiembra
Amenhyia	Topase	Adjena	Bebianeha
Kuano	Kobriso	Apegusu	Apoli Ningo
Akote	Mepom	Nnudu	Aduasa

Source: Researcher's construct 2020

4. Result and discussions

4.1. Descriptive analysis

References Table 3 provides the summary of the socio-economic characteristics and compares the descriptive statistics of households (respondents) selected for this study. The results show less than 50% of households participate in the demand of agricultural credit where gender, about 67% of the respondent, was male. Male had the highest percentage of respondents since farming is male-dominated with a high possibility of males becoming farmers as compared to females. The result also showed that 58% of the respondents interviewed were married. The result revealed an average age of household heads to be 44years in the study area due to the targeted population of mostly respondents were adults. In the whole sample, only 16 of the household heads have had formal education on the average lower education level (5.63years). Further findings revealed that on average, farmer's number of years' experience was about 10 years, 43% of the participants (respondents) engaged in off-farm jobs to generate income and 39% save with the credit facilities. Less than 40% of the farmers participate in group activities and only 26% have access to extension office services. On average, 11 smallholder farmers have 1.5 acres of land. Finally, almost 52% of the farmers owned the total landholding which is very encouraging and crucial in accessing credits and the average distance from the farming area to the credit facilities was 2.5km. In terms of the districts selected for the study, 25% (100) of each the sample size was taken from every district.

The figure 1 shows the type of farming activities engaged in by these smallholder farmers. The majority of the respondents, 235 (59%) are into crop farming, such as cassava, maize, plantains, beans, pepper, garden eggs and yam. The reasons behind the majority of farmers venturing into crop farming are due to the relatively ease of accessing the market for these cropping products. Furthermore, these products are the traditional staple foods highly consumed by the citizens of Ghana. Livestock farming was recorded for the second position. A total number of 105 (26%) of the respondents, raise farm animals such as cows, goat, sheep, poultry, fish and pigs. The smallholder farmers raised these animals because of the high demand, availability of the natural feeds, and aquatic environment, especially in the Asuogyaman district. Lastly, logging recorded 60 (15%) respondents that plant teak. The purpose of the smallholder farmers engaging in this logging farming is because these plants are durable timber for shipbuilding and for making furniture. Also, it is used by the electricity generating companies as electrification poles, generating more revenues for the smallholder farmers.

Table 3: Socio-Economic Characteristics of Smallholder Farmer

Variables	Min	Max	Mean	Standard deviation
Access to credit	0	1	0.45	0.41
Gender	0	1	0.67	0.49
Marital Status	0	1	0.58	0.47
Age	22	73	44.42	11.43
Education	0	16	5.63	2.65
Farm Experience	5	21	10.09	9.81
Off Farm Job	0	1	0.43	0.41
Savings	0	1	0.39	0.41
Membership	0	1	0.31	0.44
Access to EO	0	1	0.26	0.38
Land ownership	0	1	0.51	0.49
Household size	5	16	11.00	4.52
Farm size	0.5	2	1.5	0.59
Distance	1.5	7	2.5	1.07
Districts:				
West Akim	0	1	0.25	0.35
Suhum	0	1	0.25	0.35
Asuogyaman	0	1	0.25	0.35
Brim South	0	1	0.25	0.35

Source: Field Survey, 2020
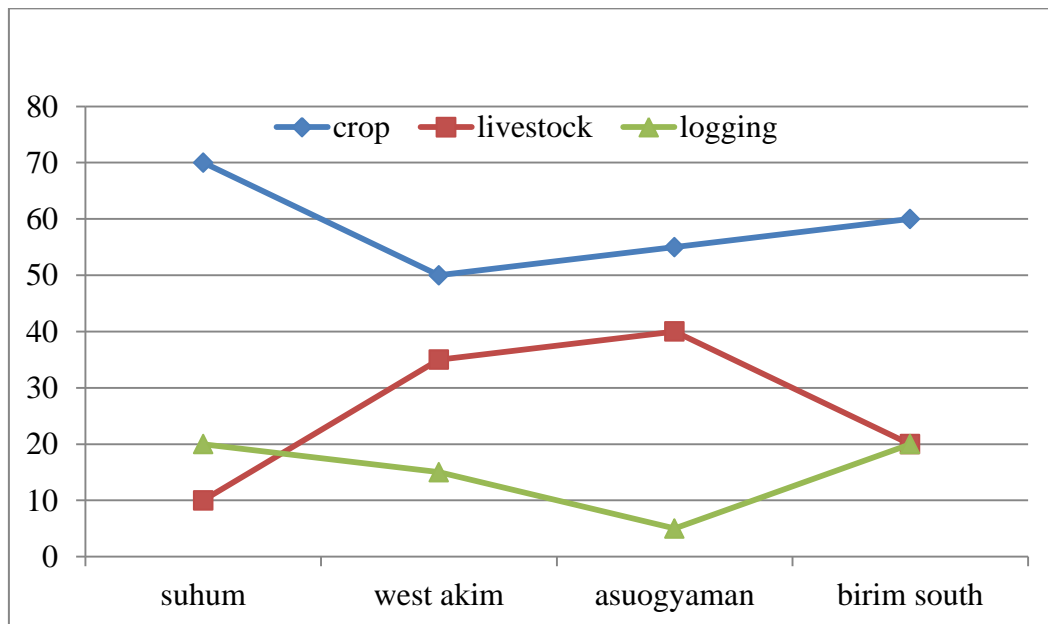
Source: Field Survey, 2020

Figure 1: Types of Farming Activities

4.2. Empirical Analysis: The Determinant of Access to Agricultural Credit

Section headings This subsection interprets the determinants of agricultural credit accessibility in the general scope of the model. The result is shown in Table 4. The significant determinants influencing access to credit by farmers in the study are gender, age, education, off-farm job, land ownership, household size, farm size and distance. The model had a good fit because it has a log-likelihood of -1162.25432 and a wald chi^2 of 101.82 at a 1% significant level.

The gender variable showed a negative with a statistically significant level at 1%. This implies that, the probability of the Male farmers' access to credit is relatively lower than female farmers. The result seems interesting and contradicts prior studies [30][31] which reported that the males are more likely to receive credit compared to females. However, the finding confirms the study of [13]who stated that the banks and other development institutions emphasize more on women when designing the credit market scheme. [16]also concluded that females are categorized as vulnerable and credit worthy and are likely to access credits. The age of the farmers was at a significant level at 1% and positively related to the household decision to secure credit. Thus, the smallholder farmer's willingness to demand credit increases with the famers' age. This result is reasonable because experience in decision-making styles in credit market is relevant which increases with age. The experience which increases with age helps reduce risk aversion on farmers. Therefore, the older farmers are probable higher in accessing credit from institutions than the youth which was contended by [13]. This also agrees with the findings from [15]) research and disagrees with [32].

The farmers' level of education derived significant value of 1% with a strong relationship with access to credit, thus, a year increase in the farmer's educational level increases access to credit by 0.172 units. Thus, an increase in farmer demanding credit is in accordance to the level of education due to the technical knowledge, greater understanding with credit markets or facilities. This manifests that, even though the majority of the respondents were illiterates in the study area the farmers that attained tertiary education access credit higher than the lower level of educators. A study assessed by [33] is in accordance with this study finding revealed that, there is a significant high correlation existing of accessing credit for livestock and education. However, the results show that many farmers with low education level find it difficult to comprehend the procedures for acquiring loans from the formal source. The findings of [34]) is also in line with this study result, that reports that, the educational level of the respondents enable them to deal with the process necessary to access credits. Therefore, the level of education helps in securing credit and cutting down the cost of credit transactions.

The farmer's participation in off-farm job showed a significant level at 5% with a negative association to access to agricultural credit. The coefficient of the negative sign indicates the farmers who are not participating in off-farm job are likely to use credit compared to the off-farm job participants due to their sufficient funds to self-invest in their farming activities with the extra income generated from different sources. This result supports the deduction of [35]who testified that association between income level and access to credit negatively impacts the association between income level and access to credit. However, the findings oppose to [36] concluded the higher the relatively wage of farmers, the higher the access to credit than lower wage farmers.

The land ownership variable, the total proportion of land owned by the smallholder farmers, showed a significant level at 1% and positively influenced the farmer's decision to access agricultural credit. This means

an increase in the farmlands owned also increases with the smallholder farmers' agricultural credit rational. Land is the most preferable asset accepted as collateral. Collateral is one way for a lender to grant credit as prove a borrower present to show sincerity to repay the loan or to be seized when there is a failure to pay. These authors, Reference [37] highlighted that the main collateral with the formal source of credit is land ownership certification

There is a significant level at 1% and positively related to agricultural credit with the household size. The variable sign shows an increase in one person to the household, dependence on the farm also increased so farmers are likely to request for credit for farming activities to provide foods and other basic necessities for the family. On the other part where family is a small size one, the farmers can achieve their monetary necessity from their farming revenue. There could be a reason of diversification of family members in their farming income from products and other farming activities which would need a huge amount of credit. There will be a possibility for larger families to access loans through a close relationship with the traders. These researchers, Reference [38,39]discovered that access to credit is significantly influenced by the family size, which supports the study's findings.

In addition, the total farm size showed a significant level of 1%, depicting that the farm size increased by one acre of land will increase the access of agricultural credit by the coefficient of 0.361unit. Large farm size may imply large production, which leads to high income, making the farmer creditworthy. Reference [40] revealed that wealthy people are more likely to receive credit. The distance to the nearest financial institution is an interesting major variable in the instances of accessing credit. The result found that distance from the farming area to the nearest credit facility has a significant value of 10% with negative relation. According to [41], the bank's distance determines the borrower's borrowing condition. Thus, if the distance is far for the farmer, he or she is less likely to access credit.

Table 4: Determinant of Access to Agricultural Credit

Variables	Coefficient	Robust Standard Error	Marginal Effect
Gender	-0.705	0.119	-0.712***
Marital status	0.127	0.096	0.104
Age	0.191	0.064	0.172**
Age Square	-0.051	1.432	-0.036
Education	0.172	0.050	0.141**
Farm Experience	0.261	0.811	0.149
Off-farm Job	-0.117	0.055	-0.098*
Savings	0.541	0.452	0.404
Membership	0.121	3.330	0.087
Access to Extension Office	0.188	0.947	0.136
Land ownership	0.042	0.012	0.035**
Household size	0.163	0.056	0.127**
Farm size	0.361	0.175	0.154**
Distance	-0.182	0.094	-0.110*
Constant	1.134	0.225***	-
Log likelihood	-1162.2582		
Pseudo R^2	0.5686		
Prob>chi^2	0.0000		
Wald chi (14)	101.82		

Note: Significance levels: [*] = p < .05; [**] = p < .01. Marginal effects are calculated at sample means and the standard errors are robust.

Source: Field Survey, 2020

4.3. The Disaggregated Determinants of Access to Agricultural Credit

Weights The Table 5 provides the outcomes for the formal and informal source of credit and the gender composition used as the dependable variables. The model showed a low acceptable with the coefficient of determinations (R^2=: informal=0.27, formal=0.21, male=0.37 and female=0.28), implying that less than 40% of the variability change in accessing credit by farmers are determined by the independent variables (determinants).

 In the case of informal agricultural credit, the age of the respondents discovered a negative relation in accessing credit by farmers at a significant level oat 1%. Thus, the higher the age group, the lower the farmers will choose to access the informal credit. The result hypothesizes that smallholder farmers are of age with less or no education, which seem risk-averse and might not demand credit. The findings conform to the study conducted by [13]which reveals that age was positive and significant to farmers' decisions to access credit; thus, there is a probability that household choice to access credit from formal sources increase with the farmers' age. The farmer participating in the group membership is an influential determinant to access from the informal credit, which is significantly at a level of 1% with a positive coefficient. This can be attributed to the fact that, there will be a positive contribution towards accessing for credit by an improvement of belongingness and cooperative actions. Most of the informal credits are collateral-free and mainly based on the relationship or social trust. According to [42], farmers' group is a crucial role that helps in empowering farmers with farming techniques, knowledge and management skills, reducing transaction costs and benefiting from collective actions. Land ownership and farm size were positively correlated to accessing informal credit by farmers at the significant value of 1% and 5%, respectively. This implies that, farmers who own the farming land are more likely to cultivate large areas of crop requiring for more inputs like seedlings, fertilizers and labor; hence the farmers' access to informal credit will be very high. Similarly, informal lenders are willing to offer loans to the smallholder farmers as the owned land increases because farmers are willing to pay the loans at the due date of repayment which was emphasized by [37]Also farm size is seen as symbolic for social status in the society; therefore, farmers with a big size of farm are likely to access more credit from the informal source. This is slightly in agreement with the claims that many famers have been rejected from accessing loans from the informal source due to lack of collateral security [36]. Farm holding size is very important in terms of access to credit which can serve as a security. Contrary to findings in the study by [43], there was no significant relationship between farm size and credit access. Thus, farmers with large size of farmland can sell a portion of the land to use the proceeds to meet farming activities needs instead of borrowing.

In terms of formal credit, the result depicted that gender was positive in relation to access to formal credit, and significant at 5%, explaining that majority of male farmers in the study area request for credit from formal institutions. This opined that male farmers are risk-takers in acquiring loans and their farming activities are capital extensive than female farmers. According to these researchers [44]argument, a female farmer has a

smaller size of the farm with low yield and owes few properties. This result contradicts the finding of [13]where more female farmers access agricultural credit from the formal source than the male farmers. This assertion from these researchers could mean that the suppliers of formal credit in that geographical area focus much on female farmers by giving them the expected loan requested at low-interest rate; hence, these female farmers will be willing to access. The level of education was significant at 1%, with a positive coefficient in accessing credit from formal financial services. This means that, the chances of increasing farmers' access to credit from the formal credit depends on an increase of the number of years in education. This is practical because the procedures or requirements needed to apply for formal credit heavily depend on the capacity to access and comprehend the information on the terms of credit and conditions, and completing of loan application forms properly depends on the level of education. The result of education affirms the findings [45];[46]concluding that in the decision for farmers' participation in the formal credit scheme is influences by the educational level of the farmers. The saving with the formal financial services and farm size coefficients showed a significant 1% probability level. This implies that, the higher the farmer saves with the formal source of credit the farmer's credit rational increases. Savings increases the asset (deposits) of every bank as well as disbursing these deposits to their customers (smallholder farmers) as credit. Therefore, the lenders or suppliers will also be willing to offer credit to these farmers who save with them. According to [47], in participating credit programs, the lending requirement mandates a client to save before being qualified for a loan. The most acceptable form of collateral is land holdings. Therefore, the larger or the increase in an acre of the farm size, there is a probability increase in the farmer's choice of accessing formal credit by 0.106. Lacking collateral limits many farmers with small farm size in participating in the formal credit market. The study concurs to the conclusions by [48], farmers that hold a large proportion of farm land access to formal sources other than those with a smaller proportion of farm land. The assertion can also be attributed that, the amount of credit to receive depends on the farm size in the study, the bigger the size of the farm, the relatively higher of the amount of credit given or received. This is inconsistent with the study of [49], which concluded that the amount of credit estimated by the double hurdle model shows that given participation in credit obtained from formal sources significantly influences farm size. The results showed that, land ownership and distance to the financial services were significant at a 1% with a negative coefficient. Thus, farmers' access to formal credit is likely to reduce to the proportion of land owned increases. This means that, the farmers will dispose off some of the farm lands to meet their farming activity needs instead of acquiring for credit. Land ownership certification is the main demanding document as collateral in the formal source hence not all smallholder farmers have sought for certification of owned land due to the lack of knowledge, difficult processing procedures or unavailability of land registration services. The findings of the study confirm with these previous studies that found out that the land owned impact significantly on the farmers' access to agricultural credit [50][51][35] The distance showing a negative sign means that, the longer the distance to the nearest financial services will probable decrease in the decision by the farmer's access to formal credit. Formal financial sources of credit are mostly situated in the cities, while most smallholder farmers are in a deprived community. In other instances, where the proximity of banks is close, some smallholder farmers will not access on the basis that he or she does not need credit or the amount to receive from loan application is not sufficient. This result is similar to the contribution by [49]), that reported that, distance has a significant link to access to formal with a negative effect.

In addition to the gender composition, the male had level of education and farm experience at a significant level of 1% with positive effect on smallholder farmer decision in accessing to credit. This result means that, an increase in the number of years in education increases the farmers' decision to access agricultural credit from various sources. Therefore, the male farmers will be encouraged to further climb the educational ladder formally instead of lowering the number of years of schooling. This result affirms the outcomes of [52], that the higher the level of education the higher the ability to use and understand the information required to the terms and conditions to accomplish the loan request. Likewise, an increase in farming experience by a year is likely to increase the male farmer's decisions in using credit. The farmer with more experience had a better relationship with other farmers, lenders, traders, etcetera when accessing the informal credit source. The building of trust among borrowers needs more periods to ascertain. Farm experience also act as a key part in accessing credit from the formal source because the experience farmer has already engaged with banks to access several credits, so the farmer well understands the terms, conditions and procedures. The results agree with the findings revealed by [53]that the greater the farming experience, the higher the association with formal sources of credit from banks. The marital status of the smallholder farmers showed a significant at 5% with positive coefficient on the smallholder farmer willingness to demand for credit. The result suggests that male married male farmers are likely to access credit from the study area. It can be explained that, married farmers seem to be responsible in their activities to default loan repayment. The study's results contradict the conclusion made by [54], that irrespective of the closeness to credit source, farmers are limited by their marital status. This researcher's result can be deducing that due to their social problems, there will be mismanagement of loan, resulting in loan default. The household size under the male composition showed a negative coefficient but statistically significant at 5%. The negative relationship with the significant influence of household size on males means a unit increase in household is likely to cause a decrease in male farmer's access to credit. The findings collaborate with the results by [13], the probability of households demanding for agricultural credit is relatively lower for smallholder farmer with a large family size compared to the other. The outcome of the study is realistic due to the purpose of accessing credit is to patronize farm equipment, seedlings and labor which will help smaller family size to increase in the farming activities, which gives explanation to the smaller family size been rational for demanding credit. This also implies that, funds that will be needed to improve their farming activities can be contributed by the members in the household especially with a huge number than accessing for facilities.

Lastly for the dependent variable, females as part of the gender composition showed that marital status, off-farm job and group membership were significant at 1% and 5% respectively. Marital status showed a positive coefficient at a significant level of 1% with females in the decision to access credit. This explains that, there is the possibility that an increase in participating in agricultural credit by the female smallholder farmers in the study area is married. A reason behind this explanation might be on the part of the lenders that, if the female farmer is unable to repay for the loan, there is a possibility that the partner (husband) can service the loan since partners normally serve as a guarantor. The result further indicates that, female smallholder farmers participating in off-farm job is 1% at a level of significance with positive influence on the access to agricultural credit. Which goes to say that, having another source of income other than farming in the study area leads to an increase in the probability of female farmers of accessing agricultural credit. Thus, these female farmers will be

able to meet the requirement of opening account with initial deposits to reflect cash flows to serve as cash collateral, especially in the formal credit facilities. In addition, off-farm jobs tend to accumulate more assets that will finally act as collateral when seeking credit. The result conforms to the findings of [55] which concluded that most agricultural credit require relatively shorter loan servicing periods, hence the household with regular income from off-farm job tends to participate more as they are easily cushioned against risks of farming activities' failures. In addition to the determinants which influence female smallholders to participate in agricultural credit is group membership that showed a significant level at 5% with a positive impact. This implies that, there is a probability that female farmers participating in group membership increase the access of agricultural credit in the study area. Most lenders of credit are willing to offer loans to individuals in a group membership for the fact that these group can serve as collateral since they are sometimes obliged to save with the institution requesting for credit. In accordance to the findings of [56]Armendariz de & Gollier, (2007), who concluded that, lending through groups causes peer selection effect among farmers who know each other with the consequent rise in productivity and increased income base.

Table 5: Disaggregated Determinant of Access to Agricultural Credit

Variables	Informal sources		Formal sources		Male		Female	
	Coefficient	S. E	Coefficient	S. E	Coefficient	S. E	Coefficient	S. E
Gender	0.531	1.065	0.240*	0.145	-	-	-	-
Marital status	0.062	0.251	0.123	0.762	0.181*	0.071	0.193**	0.050
Age	-0.132**	0.033	0.166	0.170	0.121	0.221	0.336	1.231
Age Square	0.163	0.941	0.331	0.180	0.192	0.458	0.210	0.190
Education	0.411	0.851	0.220**	0.107	0.121**	0.039	0.115	0.169
Farm Experience	0.170	0.141	0.012	0.181	0.125**	0.028	0.117	0.123
Off Farm Job	0.193	0.432	0.106	0.222	0.212	0.111	0.155*	0.061
Savings	0.162	0.261	0.206***	0.089	0.127	0.091	0.122	0.138
Membership	0.091**	0.035	0.171	0.063	0.119	0.132	0.124**	0.034
Access to EO	0.011	0.421	0.126	0.159	0.023	0.142	0.103	0.132
Land ownership	0.581***	0.260	-0.133*	0.075	0.032	0.101	0.098	0.158
Household size	0.141	0.128	0.151	0.612	-0.166***	0.011	0.067	0.139
Farm size	0.332*	0.159	0.160**	0.058	0.149	2.610	0.196	0.190
Distance	-0.034	0.071	-0.313*	0.112	-0.210	0.333	-0.412	0.783
Constant	2.141	1.121	0.113	0.102	0.137	0.111	1.167	1.139
Log likelihood	-133.0943		-1109.3392		-1286.2118		-196.023	
Pseudo R^2	0.2661		0.2071		0.3709		0.2812	
Prob>chi^2	0.0000		0.0000		0.0000		0.0000	
Wald chi (14)	123.82		221.82		143.18		171.82	

Note: Significance levels: * = $p < .05$; ** = $p < .01$. S.E is standard error

Source: Field Survey, 2020

5. Conclusion and Policy Implication

All In this paper, we assessed the relationship between the determinants of the accessibility of agricultural credit

by the smallholder farmers and further goes into a detailed investigation of the determinants that influence a smallholder farmer accessibility of agricultural credit in terms of formal, and informal source as well as their gender composition through the empirical analysis using binary logistics model. Again, Descriptive statistics was used for the qualitative analyses. The following are the conclusions derived from our findings. It can be concluded from the results obtained from the binary logistic analysis in the districts under consideration and the pooled sample that an increase in the educational level of the smallholder farmer, the age of the smallholder, the land ownership, household size of the smallholder farmer, size of the farm and the distance to the nearest agricultural credit facility is more likely to increase the smallholder farmer's agricultural credit accessibility for the general scope of the model. However, an increase in the gender of the smallholder farmer and the smallholder farmer's off-farm job participation will affect the smallholder farmer's agricultural credit accessibility to decline. The results again revealed a heterogeneous effect based on gender composition and source of credit acquisition.

The study adds up to the existing knowledge. The results of our research recommend that smallholder farmers will be willing to access credit if more financial instructions are made available because long distances to the financial institutions reduce farmers' access to credit. The study also recommends that, the government interventions in the financial institutions should be reviewed and revised to help the smallholders get access to credit since agriculture contributes enormously to the growth of the country's economy.

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