

*Full Length Research Paper*

## Factors influencing agricultural credit demand in Northern Ghana

Baba Hananu<sup>1</sup>, Abdallah Abdul-Hanan<sup>2\*</sup> and Hudu Zakaria<sup>3</sup>

<sup>1</sup>Internal Audit Department, University for Development Studies, Ghana.

<sup>2</sup>Department of Agribusiness Management and Finance, University for Development Studies, Ghana.

<sup>3</sup>Department of Agricultural Extension, Rural Development and Gender Studies, Ghana.

Received 13 November, 2014; Accepted 9 January, 2015

The greatest challenge to food security is low productivity emanating from slow growth in the agricultural sector and one of the reasons for this is little or no access to financial resources by producers. Credit is one of the empowerment tools that have the potential to boost the productivity, increase food security and change the life of farmers from a situation of abject poverty to a more dignified life in the long run. Using a household survey data from United State Agency for International Development's feed the future initiative; this study employed the logistic regression model to investigate the factors influencing households' demand for agricultural credit placing much emphasis on membership to organization. A total sample size of 2,330 farm households selected from Northern Ghana was used. The results of the logistic regression model revealed significant and positive variables such as age, education, group membership and source of credit. We therefore call on stakeholders to encourage formation of cooperative groups to enable farmers pull resources together or streamline loan application procedures, intensify education of farmers on loan procedures and promote flexibility in types of collateral demanded by financial institutions in order to enhance access.

**Key words:** Credit access, farmers, food security, Ghana, logit model.

### INTRODUCTION

Declarations from the various international conferences, since 1992, identified food security as one of the underlying and cross-cutting issues that require concerted action in order to ensure the sustainable reduction of absolute poverty and thus achieve the Millennium Development Goals (MDGs) in Africa (MoFA, 2007). Undoubtedly, the food and agriculture has been recognised as the simple and most influential sector with

greater impact on poverty reduction and achieving the Millennium Development Goals (MDGs) in Africa. It is for these reasons that in 2003, the African Heads of State and Government adopted an Africa-owned and Africa-led initiative, namely the Comprehensive Africa Agricultural Development Program (CAADP), to assist African countries to revitalize agricultural growth as a strategy to combat poverty and hunger, and in the end accomplish

\*Corresponding author. E-mail: [abdallahabdulhana@gmail.com](mailto:abdallahabdulhana@gmail.com), Tel: (+233) (0261737666).

Author(s) agree that this article remain permanently open access under the terms of the [Creative Commons Attribution License 4.0 International License](http://creativecommons.org/licenses/by/4.0/)

the MDGs (ECOWAP, 2009).

Unfortunately, the agriculture sector in Ghana is plagued with challenges such as credit access which is one of the most prevalent tools for spinning agricultural development (MoFA, 2007). For instance, the share of agricultural credit in total bank lending initially fell from the mandatory 25% to about 10% before recovering to 12% in 1998 following the liberalisation of the financial sector in the early 1990s. According to the Bank of Ghana Statistical Bulletin, share of agriculture and forestry in the outstanding credit balance of money deposit banks (MDBs) in December 2009 and 2010 were 4.5 and 5.5% respectively (MoFA, 2011) and hence an indication of a low and deteriorating level of credit supply to the agricultural sector. This challenge is confirmed in the study by Nankani (2008) in which agriculture is reported to be largely excluded from the formal banking system, with only 9% of credit going to the sector. Ghana therefore faces the challenge of making substantial progress in food security resulting from lack of credit to boost production. Progress in achieving MDGs is therefore reported to be slow and projections are that the targets may not be realized by 2015 (Amponsah, 2012). The low and deteriorating level of credit supply by financial institutions stems from the fact that physical assets that the lender can seize if the individual borrower defaults are usually hard to come by. Agricultural credit suppliers are therefore not willing to extend credit which is not fully secured.

A consensus reached by the financial institutions and farmers is the group approach in which institutions focus on groups rather than on individual farmers. In this way, credit is extended to farmers who form some sort of associations, credit unions and cooperatives. Such organizations play the role in the securing, sharing and repayment of such funds and at the same time lower interest charges and make loans better secured as it is believed. As observed by Mohammed et al. (2013), when a farmer is not a member of any organization, his main source of collateral is from his own physical capital assets which are often difficult to produce by smallholder farmers as compared to a farmer who is a member of a social network.

Several studies have analyzed the use of credit among resource-poor rural dwellers and concluded that credit was allocated mainly for agricultural and non-agricultural productive activities as well as for consumption purposes though at varying allocative proportions see for instance Zeller et al. (1996) and Schreider (1995). Olatunbosun (2012) also concluded that constraint to agriculture financing is due to lack of access to credit. Our study is unique in a sense that, it looks at the factors that influence accessibility of agricultural credit by farmers with much emphasis on the effect of group membership on credit access. Consequently, this study would contribute to the literature on the factors influencing farmers' access to credit.

## LITERATURE REVIEW

Agricultural credit has been defined as the present and pro tem transfers of purchasing power from a person who owns it to a person who wants it, allowing the latter the opportunity to command another person's capital for agricultural purposes but with confidence in his willingness and ability to repay at a specified future date (Kuwornu et al., 2013). In other words, a transaction between two parties in which one, acting as creditor or lender, supplies the other, the debtor or borrower, with money, goods, services, or securities in return for the promise of future payment is known as credit (Kosgey, 2013). A household is therefore said to have access to a type of credit if at least one of its members has a strictly positive credit limit for that type of credit. Credit can be in cash or in kind. However, this study dwelled on both cash and formal source of credit.

Several studies in developing countries on credit access by farmers have considered a broad range of factors and concluded that factors that determine farmer credit access vary from one geographical area to another. For instance, using a stepwise linear regression analysis to determine the relationship between socio-economic characteristics of farmers and their rate of accessibility to agricultural credit, Etonihu (2013) concluded that education, distance to source of credit and types of credit source were significant factors affecting farmers' accessibility to agricultural credit in Nigeria.

Schmidt and Kropp (1987) revealed that the type of financial institution and its policy will often determine access. They further revealed that where credit duration, terms of payment, required security and the provisions of supplementary services do not fit the needs of the target group, potential borrowers will not apply for credit even where it exists and when they do, they will be denied access. Bigsten et al. (2003) and Fleisig (1995) stated that in developing countries asymmetric information, high risks, lack of collateral, lender-borrower distance, small and frequent credit transactions of rural households make real costs of borrowing vary among different sources of credit.

In addition, Okurut et al. (2005) employed a logit model to investigate factors that influence both credit demand and supply in Uganda by using observed household and individual characteristics. The household characteristics that influenced demand included age, education, and household expenditure per adult equivalent. They further argued that, household composition, migration status and credit demand is higher for males than females and for households with a higher dependency ratio. Demand for credit is less in households with sick members and more land assets per adult equivalent, while gender does not play a significant role in the demand for credit.

Atieno (2001) did an empirical assessment on the formal and informal institutions' lending policies and

access to credit by small-scale enterprises in Kenya. The findings showed that income level, distance to credit sources, past credit participation and assets owned were significant variables that explained participation in formal credit markets. Indeed, the study dealt with both formal and non formal lending institutions in relation to small scale enterprises in accessing general credit. Kimuyu and Omiti (2000) and Lore (2007) demonstrated that age is associated with access to credit and that older entrepreneurs were more likely to seek out for credit. Further, they asserted that age is an indicator of useful experience in self selecting in the credit market.

In an empirical study of repayment performance in group-based credit programmes in Bangladesh, Zeller et al. (1996) found that social capital results in very high repayment rates compared to traditional physical-collateral-based financial institutions. Their study further revealed that high repayments were registered in cases where farmers arranged for a flexible repayment schedule with financial institutions as opposed to fixed one. A recent and similar study by Mohammed et al. (2013) on social capital and access to credit by farmer based organizations in the Karaga District of northern Ghana deduced that the positive effect of the FBOs' social capital on access to credit calls for conscious effort to strengthen FBOs along the social capital dimensions.

Estimating the determinants of credit demand by farmers and supply by Rural Banks in the Upper East Region of Ghana using Logit and Tobit respectively, Akudugu et al. (2012) pointed out age of farmers, gender and political affiliations among others as the main determinants of credit demand by farmers while type of crop grown, farm size and the amount of savings are the main determinants of credit supply by the Rural Banks.

Similarly, results of Dzadze (2012) on factors determining access to formal credit in the Abura-Asebu Kwamankese District of Central Region of Ghana using the logistic regression model revealed extension contact, education level and saving habit as the significant and positive factors influencing farmers' access to formal credit. The study called on Ministry of Food and Agriculture (MoFA) to enhance farmer-extension agent contact by providing logistics on time for Agricultural Extension Agents (AEAs) to make periodic visits to farmers in their communities.

Chauke et al. (2013) also replicated the study by Dzadze et al. (2012) in the Capricorn District of South Africa varying the factors hypothesized to have effect on credit access and concluded that the need for credit, attitude towards risk, distance between lender and borrower, perception on loan repayment, perception on lending procedures and total value of assets are the main determinants of farmers' access to agricultural credit. The study therefore called for government policies that intend to improve the accessibility to agricultural credit by farmers.

Examining the determinants of credit access by rural

farmers in Oyo state in Nigeria (Ololade and Olagunju, 2013), the Binomial Logit model revealed that significant relationship existed between sex, marital status, lack of guarantor, high interest rate and access to credit. The need for financial institutions to help look into the conditions for obtaining credit by farmers was obvious.

In the study of agricultural credit access by Grain Growers in Uasin-Gishu County, Kenya, Kosgey (2013) also found that agricultural credit access is influenced by farmers' age, education level, family size, household size, repayment period and loan amount were highly important in influencing access to agricultural credit.

Using the Probit and Tobit regression with robust standard errors to control for heteroskedasticity, Kuwornu et al. (2012) analysed allocation and constraints of agricultural credit of selected maize farmers in Ghana. The empirical results of the Probit model revealed that gender, household size of farmers, annual income of farmers and farm size have significant influence on credit constraint conditions of the farmers while that of the Tobit regression model revealed age, bank visits before credit acquisition and the amount (size) of credit received as the significant factors influencing the rate of agricultural credit allocation to the farm sector.

Selecting farmers randomly from twenty villages in Surulere Local Government area of Oyo State in Nigeria, Adebayo and Adeola (2008) investigated the sources and uses of agricultural credit by small scale farmers. Their study revealed that majority of the farmers relied on co-operative societies for agricultural credit, thus necessitating a call on government agencies to mobilize the rural farmers to form themselves into formidable groups in order to derive maximum benefit of collective investment of group savings. From the foregoing discussions, it is clear that different factors determine the access to agricultural credit by farmers in different parts of the world or even in different locations within a given country due to differences in agro-ecological as well as socio-economic setting under which production takes place. Conclusions emanating from most of the studies have tended to be case-specific and in some cases contradictory thereby justifying the proposed study. Though, a number of studies have been conducted across the world on credit, there is dearth of literature on the effect of group membership on credit access, especially among small scale farmers in Ghana. This is a serious gap that must be bridged if the problem of low credit among farmers is to be addressed and agricultural productivity improved.

## MATERIALS AND METHODS

The study employed the logistic regression model for analyzing households' access to agricultural credit considering the dichotomous nature of the dependent variable. In other words households' access to agricultural credit was expressed in two categories: "have access to credit" and "do not have access credit", thus placing the analysis within the framework of binary choice

models and hence restricting the use of Ordinary Least Squares (OLS) because of the normality and homoscedastic assumptions of the error term. Moreover, the computed probabilities may lie outside the 0-1 range (Goldberger, 1964; Maddala, 1983; Greene, 2003), thus limiting the use of the Linear Probability Model (LPM) which is reported to have non-normal and non-constant error terms and possesses constant effect of the explanatory variable. Probit and logit models which provide equally efficient parameters are therefore the most popular statistical methods developed to analyze dichotomous response dependent variables (Demaris, 1992; Goldberger, 1964). However, our choice of the logit model over the probit model is based on Peng et al. (2002) who argued that when a continuous dependent variables are included in the model, logit model is well suited for explaining and testing the hypothesis about the relationships between a categorical outcome variable and one or more categorical or continuous variable. It is also worth noting that use of the logit model for this analysis is consistent with the literature on credit access (Ololade and Olagunju, 2013; Akudugu et al., 2009; Ayanga et al., 2006).

The study employed the threshold decision-making theory proposed by Hill and Kau (1973) and Pindyck and Rubinfeld (1998) to analyse the determinants of credit access by farmers. The theory points out the fact that when farmers are faced with a decision to adopt or not to adopt an innovation, in this case access to credit, every farmer has a reaction threshold, which is dependent on a certain set of factors. This being the case, at a certain value of stimulus below the threshold, no adoption is observed while at the critical threshold value, a reaction is stimulated by certain factors which can be household, socioeconomic and institutional characteristics of the respondent. Such phenomena are generally modeled using the relationship:

$$Y_i = X_i' \beta + \varepsilon_i \quad (1)$$

Where  $Y_i$  is equal to one (1) when a choice is made to adopt and zero (0) otherwise; this means:

$Y_i = 1$  if  $X_i$  is greater than or equal to a critical value,  $X^*$  and  $Y_i = 0$  if  $X_i$  is less than a critical value,  $X^*$ . Note that  $X^*$  represents the combined effects of the independent variables ( $X_i$ ) at the threshold level. Equation (1) represents a binary choice model involving the estimation of the probability of adoption of a given technology ( $Y$ ) as a function of independent variables ( $X$ ). Mathematically, this is represented as:

$$Prob(Y_i = 1) = F(\beta' X_i) \quad (2)$$

$$Prob(Y_i = 0) = 1 - F(\beta' X_i) \quad (3)$$

Where  $Y_i$  is the observed response for the  $i^{th}$  observation of the response variable,  $Y$ . This means that  $Y_i = 1$  for an adopter (that is, farmer's decision to demand for farm credit) and  $Y_i = 0$  for a non-adopter (that is, farmer's decision not to demand for credit).  $X_i$  is a set of independent variables associated with the  $i^{th}$  individual, which determine the probability of adoption (that is, farmer's decision to demand for credit), ( $P$ ). The function,  $F$  may take the form of a normal, logistic or probability function. The logit model uses a logistic cumulative distributive function to estimate,  $P$  as follows (Pindyck and Rubinfeld, 1998):

$$Prob(Y_i = 1) = \frac{e^{\beta' X}}{1 + e^{\beta' X}} \quad (4)$$

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

The implication for applying the logit model in this paper is that, the farmer would decide to demand credit at a given point in time when the combined effects of the factors assumed to influence farmers' decision to demand for credit exceed the reaction threshold. Based on the conceptual framework, the empirical model is estimated using the farmers' characteristics plausibly assumed to influence their credit decisions. The covariates include farm and farmer characteristics such as sex, age, age squared, education, farm size, household size, income, group membership and source of credit. The empirical model for access to agricultural credit is specified below:

$$Y = (\beta_0 + \beta_1 Sex + \beta_2 Age + \beta_3 Age^2 + \beta_4 Education + \beta_5 Farm\_size + \beta_6 Household\_size + \beta_7 Income + \beta_8 Group\_membership + \beta_9 Source\_credit + \varepsilon_i)$$

Where,  $Y$  = the dependent variable defined as the access to credit by smallholder farmers = 1 and 0 no access to credit;  $\beta_0$  = constant and intercept of the equation. The definition/measurements and a priori expectations of the variables used in the logit model are presented in Table 1. Our choice of variables for this study is based on intuition and literature (Ololade and Olagunju, 2013; Chauke et al., 2013; Dzadze et al., 2012; Kuwornu et al., 2012; Akudugu et al., 2009; Ayanga et al., 2006; Demaris, 1992).

## DATA

The data use for this study is from the United States Government's Feed the Future (FTF) initiative that aims to support growth of the agricultural sector and promote good nutrition to attain its key goal of sustainably reducing global hunger and poverty. The survey was implemented in the three northernmost regions of Ghana namely: Upper West, Upper East, and Northern Region, as well as some selected areas in Brong Ahafo Region, to provide baseline data on the prevalence of poverty, per capita expenditures, nutritional status, women's empowerment, household hunger, dietary diversity and infant and young child feeding behaviours. The survey was funded by USAID and implemented by USAID-Ghana Monitoring Evaluation and Technical Support Services (METSS), Kansas State University (KSU), University of Cape Coast (UCC), the Institute of Statistical, Social and Economic Research (ISSER) at the University of Ghana, and the Ghana Statistical Service (GSS) with US Department of Agriculture (USDA) and USAID providing technical support.

Multistage sampling procedures were applied and carried out in the three northern regions of Ghana as well as areas above the 8<sup>th</sup> Parallel in the Brong Ahafo Region of Ghana. In the first stage, a probability sampling methodology was employed to select two hundred and thirty EAs from all the EAs within the ZOI based on the Ghana 2010 Census data. The areas in the ZOI were then divided into two strata (that is, agriculture-nutrition intervention area as Strata I and agriculture only intervention area as Strata II) in the second stage to ensure an adequate number of respondents for the two strata. This resulted into an effective sample size of 4580 and was rounded up to 4600 to give further cushion for the likelihood of non-response. Maize farmers were then excised from the total sample for the purpose of this study. On the basis of predominance of maize farmers, the Northern region was selected for the study. The data set (which was used for the analysis in this study) is therefore made up of 2330 maize farmers from Northern Region.

**Table 1.** Definition/measurements and the expected signs of the variables used in the logit.

Model variable	Definition/measurements	Expected sign
Demand for Credit	Dummy (1 = if household has access to credit and 0 if otherwise)	
Sex of the farmer	Dummy (1 = male; 0 otherwise)	+
Age of the farmer	Number of years	+
Level of education	Dummy (1 = formal education; 0 otherwise)	+
Farm size	In acres	+
Household size	Number of people	+
Income	Amount in Ghana Cedis	+
Group membership	Dummy (1 if the farmer is a member of a group and 0 otherwise)	+
Source of credit	Dummy (1 if the farmer access credit from informal source and 0 otherwise)	-

**Table 2.** Summary statistics of variables.

Variable	Mean	Standard deviation
Demand for Credit	0.4925	0.5001
Gender of the farmer	0.3104	0.4628
Age of the farmer	42.9768	15.9056
Level of education	0.5006	0.5001
Farm size	3.9659	4.9603
Household size	6.0125	3.5232
Income	459.0382	1396.1240
Group membership	0.4981	0.5001
Source of credit	0.4963	0.4388

Source: Authors' computation, 2013.

**Table 3.** Logit regression results of the factors influencing access to agricultural credit.

Variable	Coefficient	Standard Error	Z
constant	-1.9422	0.3915	-4.96***
Sex	-0.7044	0.1193	-5.91***
Age	0.0384	0.0174	2.20 **
Age square	-0.0003	0.0002	-1.74*
Education	1.9523	0.1027	19.02***
Farm size	0.0147	0.0122	1.21
Household size	-0.0522	0.0150	-3.48***
Income	-0.0001	0.0000	-2.33**
Group membership	0.2159	0.1000	2.16**
Source of credit	1.2352	0.1121	11.02***
Number of observations	2329		
LR Chi-square (9)	754.35		
Probability Chi-square	0.0000		
Log likelihood	-1236.903		
Pseudo R <sup>2</sup>	0.2337		

\*, \*\*, \*\*\* denote significance at 10, 5 and 1% respectively. Source: Authors' computation, 2014.

## RESULTS AND DISCUSSION

Here summary statistics of the variables used in the study (Table 2) as well as results of the estimation of

logistic regression model (Table 3) is presented. Results from study reveal that less than 50% of households have access to credit where male household comprised of 31% of the sample. The average age of a household

head was found to be 43 years ranging from 14 to 100 years. The level of educational among households was encouraging considering the fact that 50% of the farmers were educated. Further findings revealed that on the average, 4 acres of land is being managed by 6 people with an average monthly income of GH¢ 459.04. Almost 50% of the farmers participated in group activities. Less than 50% of the farmers got farm credit from informal sources such as friends, relatives, NGOs, informal lenders, village savings and loans associations.

### **Determinants of households' access to agricultural credit**

The significant determinants of factors affecting access to credit by farmers are sex, age, age square, education, household size, income, group membership and source of credit. Though the estimated Pseudo R-squared value was low (23.4%), the log likelihood ratio (LR) statistic is significant at 1 percent, meaning that the explanatory variables included in the model jointly explain the probability of farmers' decision to access credit from the formal.

Gender was found to be negatively related to decision to access agricultural credit by farm households (Table 3). This was found to be significant at 1% level. This means that female farmers are more likely to access agricultural credit from formal institutions than their male counterparts. This is understandable given that most credit schemes designed by banks and other development institutions such as NGOs focus more on women. The result is consistent with the findings of Akudugu et al. (2012) who argued that females are considered the most disadvantaged, vulnerable and above all, credit worthy and are therefore likely to opt for credit than their male counterparts. Age of the farmer was also found to be significant 5% and positively related to households' decision to access credit. This implies that the probability of households' decision to access credit from both formal institutions increases with age of the farmer. This result is plausible for the fact that experience which increases with age is an important aspect of decision making styles in the credit market. Previous experience with lenders is an important predictor of outcomes. This experience can be gained hands-on from having started previous ventures. Experience of previous start-ups help provide farmers with considerable motivation for venturing again, opens new opportunities, links them to important resource providers and develop key competencies. Experience which increases with age, reduces the aversion to risks by farmers. Therefore, older farmers are expected to have higher probability of accessing credit from institutions than younger farmers. This result is consistent with the findings of other studies (Akudugu et al., 2012) and yet contrary to the finding of Mohammed et al. (2013).

The level of education attained by a farmer was significant at 1% significance level and showed a positive relationship with formal credit access. The result implies that level of education influences a farmer's chances of accessing credit. This is because higher level of education is associated with the ability to access and comprehend information on credit terms and conditions, and ability to complete loan application forms properly. This finding regarding education is consistent with the findings of Ayamga et al. (2006); Thaicharoen et al. (2004) and Arvai and Toth (2001) who also found that education significantly influences the decision to participate in formal credit schemes.

Surprisingly, household size was found to be significant at 10% but negatively related to agricultural credit access. This implies that the probability of households sourcing agricultural credit from formal institutions is lower for larger households but higher for smaller households. Though contrary to our expectation, the result is reasonable because credit is used for purchase of inputs and hiring of labour and therefore needed in smaller households to supplement farmers, who are labour and input constrained, thus explaining why smaller households have higher probability of sourcing credit from lenders.

Annual income was found to be a significant variable which influences household to access credit from lenders. The negative sign for the coefficient of this variable suggests that farmers with low annual income are more credit constrained than farmers with high annual income. This finding conforms to our expectation and consistent with the study of Akram et al. (2008) who observed a negative relationship between annual income and credit constraint condition of farmers.

Turning to our major variable of interest, the result revealed that membership to social group is significant at 5% and positively related to the probability of household access to agricultural credit. This conforms to our a priori expectation and consistent with the findings of Akudugu et al. (2009), Armendariz and Morduch (2005), and Kah et al. (2005) who explained that formation of economic and social associations helps improve access to credit since there is a joint guarantee by association members. This implies that when farmers joined social groups, then, the probability that they will access credit from the Banks to support their farming activities is most likely to increase. This is because the decision to join such social groups is mostly driven by the desire to access financial services, particularly credit from the Banks.

The relationship between source of credit by farmers and access to credit (in this case, demand for credit) was amazing. This variable was found to be significant at 1% and positively related to households' access to credit. This implies that the probability of households accessing credit from informal sources like friends, relative, NGOs or village savings and loans association is higher than in formal sources such as banks. Though surprising, the

result is plausible for two reasons. First, credit obtained from the informal sector entails no or low interest rate, thus making it less costly as compared to the formal sectors. Secondly, farmers incur additional transaction cost as a result of conditions involved in applying for a loan from the financial institutions. For instance, banks normally give loans to farmers on group basis. This means that in order to apply for a bank loan, the prospective borrower has to look for other farmers to form a credit group. The farmer therefore incurs transactions cost in the process of looking for the eligible farmers. Farmers who cannot afford the additional cost finally opt for informal sources.

## CONCLUSIONS AND RECOMMENDATIONS

The role of agricultural credit in the development of agricultural sector is magnificent. Accessible credit enhances farmers' purchasing power to enable them acquire modern technologies for their farm production. Access to the credit however, seems to be limited among smallholder farmers due to certain constraints. Using the Logistic regression model, the study sought to analyse the factors that influence households' access to credit from both formal and informal sectors in Northern Ghana with much emphasis placed on the membership to farmers' associations. Results from the study showed that almost 50% of households have access to credit and that decision to access agricultural credit is positively and significantly determined by age, education, group membership and source of credit. Sex, age square, household size and income though significant, have negative impact on probability of households' credit access. We therefore call on stakeholders to streamline loan application procedures, intensify education of farmers on loan procedures and promote flexibility in types of collateral demanded by financial institutions in order to enhance access. In case of collateral security, farmers should be encouraged to form cooperative groups to enable them pull resources together or form groups to access loans from financial institutions since the group lending scheme ensures higher repayment rate as the leader of the group serves as a guarantor to the bank.

## Competing Interest

Authors have declared that no competing interest exist.

## ACKNOWLEDGEMENTS

The authors are grateful to the USAID-Ghana, the Kansas State University (KSU), University of Cape Coast (UCC), the Institute of Statistical, Social and Economic

Research (ISSER) at the University of Ghana, the Ghana Statistical Service (GSS) and the US Department of Agriculture (USDA) for their collaborative efforts in implementing the survey and making the data available for this study.

**Abbreviations:** **AEAs**, Agricultural Extension Agents; **CAADP**, Comprehensive Africa Agriculture Development Programme; **ECOWAP**, ECOWAS Agricultural Policy; **FTF**, Feed the Future; **GSS**, Ghana Statistical Service; **ISSER**, Institute of Statistical, Social and Economic Research; **KSU**, Kansas State University; **LPM**, Linear Probability Model; **METSS**, Monitoring, Evaluation and Technical Support Services; **MDBs**, Money Deposit Banks; **MDGs**, Millennium Development Goals; **MoFA**, Ministry of Food and Agriculture; **OLS**, Ordinary Least Squares; **UCC**, University of Cape Coast; **USAID**, United States Agency for International Development; **USDA**, United States Department of Agriculture.

## REFERENCES

- Adebayo OO, Adeola RG (2008). Sources and uses of agric credit by small scale farmers in Surulere LGA of Oyo State. *Anthropologies* 10(4):313-314.
- Akudugu MA, Egyir IS, Mensah-Bonsu A (2009) "Access to Rural Bank in Ghana: The Case of Women Farmers in the Upper East Region", University for Development Studies, Ghana. *Ghana J. Dev. Stud.* 6(2):142-167.
- Akudugu MA (2012). Estimation of the determinants of credit demand by farmers and supply by rural banks in Ghana's Upper East Region. *Asian J. Agric. Rural Dev.* 2(2):189-200.
- Amponsah WA (2012). The new harvest: Agricultural innovation in Africa. *J. Afr. Dev.* 14(1):157-162.
- Arvai Z, Toth IJ (2001). "Liquidity constraints and consumer impatience". National Bank of Hungary, Working Paper 2001/2.
- Atieno R (2001). Formal and Informal Institutions' Lending Policies and Access to Credit by Small-scale Enterprises in Kenya: An Empirical Assessment. African Economic Research Consortium, Nairobi.
- Ayanga M, Sarpong DB, Asuming-Brempong S (2006). "Factors Influencing the Decision to Participate in Microcredit Programmes: An Illustration for Northern Ghana", University for Development Studies, Ghana. *Ghana J. Dev. Stud.* 3(2):57-65.
- Bigsten A, Collier P, Dercon S, Fafchamps M, Gauthier B, Gunning JW, Oduro A, Oostendorp R, Patillo C, Soderbom M, Teal F, Zewfack A (2003). Credit constraints in manufacturing enterprises in Africa. *J. Afr. Econ.* 12(1):104-125.
- Chauke PK, Motlathlana ML, Pfumayaramba TK, Anim FDK (2013). Factors influencing access to credit: A case study of smallholder farmers in the Capricorn district of South Africa. *Afr. J. Agric. Res.* 8(7):582-585.
- Demaris A (1992). Logit Modeling. Practical Applications. International Educational and Professional Publisher, London.
- Dzadze P, Osei MJ, Aidoo R, Nurah GK (2012). Factors determining access to formal credit in Ghana: A case study of smallholder farmers in the Abura-Asebu Kwamankese district of central region of Ghana. *J. Dev. Agric. Econ.* 4(14):416-423.
- ECOWAP (2009). Comprehensive African Agriculture Development Programme: Agricultural Policy.
- Etonihu KI, Rahman SA, Usman S (2013). Determinants of access to agricultural credit among crop farmers in a farming community of Nasarawa State, Nigeria. *J. Dev. Agric. Econ.* 5(5):192-196.
- Fleisig H (1995). The Power of Collateral. View Point. Washington D.C., the World Bank.

- Goldberger AS (1964). *Econometric Theory*. New York: Wiley.
- Hill L, Kau P (1973). "Application of multivariate probit to a threshold model of grain dryer purchasing decisions", *Am. J. Agric. Econ.* 55:19-27.
- Kimuyu P, Omiti J (2000). Institutional Impediments to Access to Credit by Micro and Small Scale Enterprises in Kenya. IPAR Discussion Paper No.026/2000. IPAR. Nairobi.
- Kosgey YKK (2013). Agricultural credit access by grain growers in Uasin-Gishu County, Kenya. *IOSR J. Econ. Fin.* 2(3):36-52.
- Kuwornu JKM, Ohene-Ntow ID, Asuming-Brempong S (2012). Agricultural Credit Allocation and Constraint Analyses of Selected Maize Farmers in Ghana. *Brit. J. Econ. Manage. Trade* 2(4):353-374.
- Lore M (2007). "An Evaluation of Human Capital Factors that can Enhance Access to Credit among Retailers in Nairobi." Unpublished Project Report Submitted to United States International University-Africa. Nairobi.
- Maddala GS (1983). *Limited-Dependent and qualitative variables in econometrics*. New York: Cambridge University Press.
- MoFA (2007). *Food and Agriculture Sector Development Policy*.
- MoFA (2011). *Agriculture in Ghana: Facts and Figures*.
- Mohammed S, Egyir IS, Amegashie DPK (2013). Social Capital and Access to Credit by Farmer Based Organizations in the Karaga District of Northern Ghana. *J. Econ. Sustain. Dev.* 4(16):146-155.
- Nankani G (2008). *The Challenge of Agriculture in Ghana: What is to be done?*
- Okurut N, Schoombee A, Berg S (2005). "Credit Demand and Credit Rationing in the Informal Financial Sector of Uganda." *S. Afr. J. Econ.* 73(2005):883-497.
- Olatunbosun B (2012). Improving credit allocation to sustainable agriculture in Sub-Saharan Africa: Review of bio-based economy benefits. *OIDA Int. J. Sustain. Dev.* 4:16-24.
- Ololade RA, Olagunju FI (2013). Determinants of access to credit among rural farmers in Oyo State, Nigeria. *Global J. Sci. Frontier Res. Agric. Vet. Sci.* 13(2):17-22.
- Peng C, Lee K, Ingresoll G (2002). An introduction to logistic regression analysis and reporting. Indiana University-Bloomington. *J. Educ. Res.* 96(1):2-14.
- Pindyck SR, Rubinfeld LD (1998). *Econometric Models and Economic Forecasts*, 4th Edition. New York: McGraw-Hill.
- Schmidt RH, Kropp E (1987). "Rural Finance Guiding Principles." GTZ, Eschborn.
- Schreider GR (1995). The role of rural finance for food security of the poor in Cameroon. Frankfurt, Germany, *Lang Verg.* pp. 123-127.
- Thaicharoen Y, Ariyapruhya K, Chucherd T (2004). "Rising Thai Household Debt: Assessing the Risks and Policy Implications," Bank of Thailand, Discussion Paper number 04/2004.
- Zeller M, Ahmed A, Babu S, Broca S, Diagne A, Sharma M (1996). Rural financial policies for food security of the poor: Methodologies for a multi-country research project. *Food Consumption and Nutrition. Discussion Paper No. 2 IFPRI, Washington, D.C., Mimeo P. 48.*