5th International Conference of AAAE

23 - 26 September 2016, United Nations Conference Centre, Addis Ababa - Ethiopia

Transforming Smallholder Agriculture in Africa: The Role of Policy and Governance

Agricultural credit provision: What really determines farmers' participation and credit rationing?

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Abstract

This paper analyzes determinants of farmers' participation and credit rationing using survey data from Ghana. The Garrett Ranking Technique is used to analyze farmers' reasons for participation or non-participation in credit programs. A probit regression model is also applied to estimate factors influencing farm households' participation in credit programs. Farm households participate in credit programs because of improved loan access for farming purposes and savings mobilization. Fear of loan default and lack of savings are reasons for non-participation in credit programs. Furthermore, membership in farmer based organizations and the household head's formal education are positively associated with farmers' participation in credit programs. The likelihood of farmers being credit rationed (i.e., they were rejected or the amount of credit they applied for was reduced) is less likely among higher income farmers and members of organizations. Policy strategies aiming to improve credit access should educate farmers and strengthen farmer based organizations that could serve as entry points for credit providers. Such market smart strategies have the potential to improve farmers' access to timely credit and to reduce rural poverty.

Keywords: Agricultural credit, Credit rationing, Participation, Farmer cooperatives, Ghana.

1   Introduction

The agricultural sector constitutes an important component in most developing countries. The sector employs more than 60% of the population and has the potential to reduce rural poverty. Yet, low agricultural productivity remains a major problem in many developing countries. Limited use of improved technologies has been identified as a major factor contributing to low agricultural productivity in developing countries (cf., Simtowe, Zeller, and Diagne, 2009). To modernize the agricultural sector, the use of improved inputs, such as fertilizer, mechanization services, and seeds, are imperative(Binswanger and Khandker, 1995). Access to improved inputs largely depends on the availability of timely and adequate credit. The limited access to adequate credit for farmers to purchase improved inputs remains a major challenge in the agricultural production process (Simtowe et al., 2009; Tadesse, 2014). This situation is common in developing countries where many small farmers are credit rationed, i.e., a loan application is rejected or the loan amount is reduced (cf., Reyes and Lensink, 2011: 1852). Adequate access to credit has the potential to impact technology adoption, thereby improving agricultural productivity and sustainable agricultural intensification (see Simtowe, Zeller, and Diagne, 2009). Furthermore, farmers access to adequate credit has consequences for food security, household welfare, and poverty (Reyes and Lensink, 2011). Credit rationing affects farmers' ability to purchase farm inputs and make farm-related investments (Reyes & Lensink, 2011). It also affects the risk behavior of producers (Eswaran and Kotwal, 1990; Guirkinger and Boucher, 2008). A farmer that is credit rationed will undertake investments in less risky and less productive technologies, rather than in more risky and productive ones (Dercon, 1996). In addition to agricultural productivity, credit rationing could affect rural development by preventing households from taking up off-farm activities, which are critical for structural transformation and the ability to move out of poverty (Reardon, 1997; Ellis, 2000).

Considering these potential impacts of adequate access to credit, there have been several initiatives by national governments, private sectors, non-governmental organizations, and development partners to improve access to credit in rural areas. In Ghana, the "microfinance revolution" of the 2000s led to the establishment of several microfinance institutions which aimed to enhance credit access in rural areas. However, high interest rates, the untimely delivery of credit, ineffective repayment schedules that did not match the seasonal nature of farming, and high transaction costs of lending to small farms made it difficult for farmers to access credit for farming purposes in rural areas (see Reyes and Lensink, 2011). To fill the gap in credit provision in rural areas, a diversity of innovative lending approaches has been promoted by microfinance institutions (MFIs). Some MFIs in Ghana provide credit, others offer both deposit and credit facilities, and others only collect deposits (Basu et al., 2004). In spite of the efforts made by policy makers to facilitate access to adequate and affordable credit in rural areas, a large number of the rural poor and smallholder farmers are neglected, they are credit rationed, or fail to participate in credit programs. This can partly be attributed to the notion that small scale agriculture is risky (Tadesse, 2014; Weber, 2012).

The problem of limited access to credit and credit rationing in many developing countries are not new, but continue to persist. There is a broad array of literature on credit constraints (for an overview, see Awunyo-Vitoret al., 2014; Petrick, 2005; Reyes and Lensink, 2011; Weber and Musshoff, 2013; Zeller, 1994). For example, Reyes and Lensink, (2011) examine credit constraints among market oriented farmers in Chile and find that most farmers are not credit constrained. Awunyo-Vitor et al. (2014) investigate determinants of agricultural credit rationing by formal lenders in Ghana and find that engagement in off-farm activities, the commercial orientation of farmers, a positive account balance, and an increase in farm size can potentially reduce rationing of loan applicants by lenders. In Malawi, Simtowe, Diagne, and Zeller, (2008) find that 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 an area where most farmers are economically productive, such as in the Nkoranza district of Ghana. This paper investigates this issue and contributes to the literature on credit rationing. It also aims to provide additional perspectives on factors influencing farmers' participation in credit schemes. To this effect, the objectives of the paper are threefold; to examine farm households' reasons for participation and non-participation in microcredit programs, to determine factors influencing farm households' participation, and to identify factors influencing the probability of farmers being credit rationed. The findings lead to a better understanding of the major reasons for farmers' participation in credit programs. Furthermore, we provide policy insights on improving credit provision in Ghana and other countries with similar conditions through better targeting of farmers and developing "market smart" microcredit policies.

2 Data and Methodology
2.1 Data

The study was conducted in the Nkoranza North and Nkoranza South districts in Brong-Ahafo Region, which contains 22 administrative districts, in Ghana. These two districts were chosen based on the importance of agriculture to the livelihoods of many farm households there. Data collection is based on multi-stage random sampling. In the first stage, a total of six communities (three communities per district) were randomly selected. In the second stage, 150 farm households were randomly selected from the six randomly selected communities. Data were collected from May to July, 2012. Through structured questionnaires, data were collected about farm household demographics, crops grown, livestock ownership, credit history, asset ownership, membership in local associations and farmer organizations. In addition, qualitative information was obtained through a semi-structured questionnaire.

2.2 Methods

This study employed the Garrett Ranking Technique to analyze farm households' reasons for joining or not joining microcredit programs. Anjugam & Ramasamy (2007) use the Garrett

Ranking Technique (Garrett and Woodworth, 1969) method to analyze reasons why members join self-help groups in their study which examines the determinants of women's participation in self-help group-led microfinance program in Tamil Nadu. The Garrett Ranking Technique (Garrett and Woodworth, 1969) formula is shown in Equation (1):

$$\text{Percent position} \sum_{j=1}^{n}[(R_{ij} - 0.5)/ N_j] * 100 \qquad (1)$$

(1),

Where:

R_{ij} = rank given for the ith item by the jth individual; and

N_j = number of items ranked by the jth individual.

The percentage position of each rank is converted into scores using the Garrett table. For each reason provided, scores of individual respondents are added together and divided by the total number of respondents to provide a mean score. The mean score for each reason is ranked by arranging them in descending order.

For estimating the factors influencing farm households' participation[1] in microcredit programs, a probit regression model is applied. Studies by Evans et al. (1999), Lukytawati (2009), Atieno (2001), and Rozelle et al. (1999) specify participation in a credit program as a function of household characteristics. The dependent variable assumes binary values of (D =1) if a household participates and (D = 0) if a household did not participate. Equation (2) is used to estimate the probability of participating in microcredit programs and is given by:

$$Prob\ (D) = F(I, H, S, W, E) \qquad (2),$$

Where:

I = vector of individual and household characteristics affecting the demand for credit;

H = vector of endowment of human capital;

S = vector of participation in any social activity;

W = vector of farm household assets; and

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[1] Participation in this context refers to an application for a loan. Therefore, a farm household participates in a microcredit program if any member of the household applied for a loan from any formal microfinance institutions during the 2011/2012 farming year.

E = vector of household events that are expected to affect the demand for credit.

The explanatory variables used to identify the determinants of households' participation in microcredit programs are presented in Table 1.

Table 1: Descriptions of variables and their expected influence on households' credit participation

Explanatory variable	Description and measurement	Expected sign
Age	Age of household head (years)	+
Age-squared	Square of household head's age	-
Gender	Gender of household head (1= male,0 = female)	+/-
Education	Years of completed education by the household head	+
Dependency ratio	Dependency ratio (household members < 15 years and > 64 years)	+/-
Membership in association	Membership of household head in an association (1 = yes, 0 = no)	+
Farm size	Farm size (acres)	+
Social activity	Household head's participation in any marriage event of a relative (1 = yes, 0 = no)	+
Livestock value	Livestock value (Ghana cedis (GH¢))^2	+
Distance in south	Distance to the nearest formal microfinance institution in Nkoranza South district (kilometers)	-
Distance in north	Distance to the nearest formal microfinance institution in Nkoranza North district (kilometers)	-

The Heckman's sample selection model is used to identify factors influencing farm households' probability of being credit rationed by microcredit programs. Gilligan et al. (2005) use two approaches to classify credit rationed households. One approach is an indirect method based on tests from a theoretical model relating to credit constraints. The other is a direct method, which utilizes qualitative questions about credit ration status collected in surveys. Jappelli (1990) apply the direct approach, categorizing households in the U.S. Consumer Finance Survey as credit rationed if they had a loan application rejected or if they did not apply for a loan because they thought they faced a high possibility of rejection (Jappelli referred to the latter group as "discouraged borrowers"). Diagne et al. (2000) also use perceived credit limit to categorize households as credit rationed if the perceived credit limit is reached from any loan source or if household members reported that they could not

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[2] Monetary values were updated for inflation and converted to their purchasing power parity (PPP) equivalent: 0.79 GH¢ /$1 PPP in 2011 (The World Bank, 2015).

obtain credit. In all of these approaches, survey questions are designed to identify whether the household's demand for credit exceeds the available supply at current prices.

According to Simtowe et al. (2008), demand for credit may exceed supply due to quantity rationing when lenders set credit limits that are lower than the demand for credit from households. This situation results from moral hazard concerns, enforcement problems, and high transaction costs. Finally, the demand for credit may exceed the supply due to risk rationing. Risk rationing has been defined by Boucher et al. (2005) as the condition that arises when lenders, rationed by asymmetric information transfer so much contractual risk to the borrower that the borrower voluntarily pulls out from the credit market, despite having the collateral wealth required to be eligible for a loan contract. This study followed a similar approach as in Simtowe et al. (2008) to identify credit rationed households – i.e., households who applied for loans and were turned down or not given the required amount – based on information from households who participated in microcredit programs. Based on this approach it can be concluded that credit constraints can only be identified among farm households who apply for credit. Following Jappelli (1990) and Simtowe et al. (2008), we assume that the reduced form of the credit constraint status of a farm household is conditional on asking for a loan, which can be explained by the same factors determining demand for credit and access to credit. Using the empirical model by Simtowe et al. (2008), the determinants of being credit rationed is determined as being conditional only on the application for a loan. Simtowe et al. (2008) estimate the model Prob (C= $1|X, D = 1$, where X is a vector of farm household and credit market characteristics that determine a farm household's condition of being credit rationed or not.

2.2.1 Econometric specification of the empirical model for credit constraint

To estimate the model of factors influencing a farm household's probability of being credit rationed, a binary response model with sample selection (Heckman, 1976) was employed, namely Prob (C= $1|X, D = 1$). This model corrects for possible sample selection bias resulting from determining factors influencing farm households' credit constraints exclusively on farm households who applied for credit. Equation (3) is the selection equation explaining participation in microcredit programs (D = 1 if an individual applied for a loan). Equation (4) is the credit rationed equation, i.e., the outcome equation in which the dependent variable is observed only when D = 1. These equations are given as:

$$D = 1[Za + u > 0] \tag{3},$$
and

$$C = 1[X\beta + \varepsilon > 0] \tag{4},$$

Where:

D = 1 if the household asks for a loan and D = 0 otherwise;

C denotes the credit constraint status indicator (with **C** = 1 indicating that the household is credit rationed);

1[.] = set indicator function;

X and Z = the vectors of (explanatory) farmer and household socioeconomic characteristics that determine microcredit program participation and the credit rationed status, respectively;

β and α = vectors of parameters to be estimated; and

μ and ϵ are unobserved error terms, where $\mu \sim N$ (0, 1), $\epsilon \sim N$ (0, 1), and corr (μ, ϵ) $= \rho$.

The conditional probability Prob (C= $1|X, D = 1$) resulting from Equations (3) and (4) was estimated using a probit model with sample selection.

2.2.2 **Explanatory variables used in the empirical model**

The various explanatory variables expected to influence households' credit constraint and their   expected   signs   are   presented   in

Table 2. These variables are described in more detail below.

Table 2: Specific socioeconomic characteristics expected to influence households' credit constraint status

Characteristic	Description and measurement	Expected sign
Age	Age of household head (years)	+/-
Gender	Gender of household head (1= male, 0 = female)	+/-
Education	Years of completed education by the household head	+/-
Dependency ratio	Dependency ratio	+
Membership	Membership of household head in an association (1 = yes, 0 = no)	+/-
Farm size	Farm size (acres)	+
Livestock value	Livestock value (GH¢)	+/-
Liquid assets	Value of liquid assets	+/-
Income	Previous year's total income of household (GH¢)	+/-
Leverage ratio	Ratio of household's formal outstanding debt over last year's income	+
Distance in south	Distance to the nearest formal microfinance institution in Nkoranza South district (kilometers)	+
Distance in north	Distance to the nearest formal microfinance institution in Nkoranza North district (kilometers)	+

Age: It is expected that demand for credit will increase with age since economic activity increases with age until it decreases later in life. The supply of credit will increase with age if lenders consider age as an indicator of experience. Hence, the net effect on the probability of being credit rationed cannot be predetermined (Gilligan et al., 2005).

Education: The educational level of the household head could have a positive or negative effect on the demand for credit. On the one hand, education will have a positive effect if it improves managerial skills, which means more economic activity and therefore an increasing demand for credit. On the other hand, education will have a negative effect if the household head is employed off-farm and earns income from other sources or if the household head is more likely to save. The supply of credit will increase if lenders consider educated people as less risky for loan defaults. Thus, the net effect on the probability of being credit rationed is ambiguous (Gilligan et al., 2005; Simtowe et al., 2008).

Gender: The gender of the household head is expected to have a positive effect on the demand for credit because male household heads in Ghana generally have more access to productive resources, which will increase their demand for credit. On the other hand, it is expected that female-headed household will have more access to credit because most microfinance institutions are biased towards females (Simtowe et al., 2008). Therefore, the effect of the gender of household head on the probability of being credit rationed is ambiguous.

Dependency ratio: It is expected that as the number of dependents in a household increases relative to economically active members, the demand for credit by the household will increase.

Liquid assets and Income: The value of liquid assets (namely, the total value of all bicycles, motorcycles, cars, refrigerators, televisions and gas/electric cookers) and livestock, as well as the previous year's income of farm households can be used as an indicator of wealth. It is expected that households that are wealthier will have a higher demand for credit. In addition, lenders might supply most credit to wealthier households because the risk of default is lower (Gilligan et al., 2005) since their assets can more easily be liquidated to offset debts. Thus, the net effect of liquid assets and also income on credit constraint is ambiguous.

Membership in Association: Membership of household head in an association is expected to increase demand for credit. Membership can also be a proxy for social capital. Membership is expected to increase access to credit, especially when lenders view membership in an association as decreasing the risk of default. Thus, the net effect on the probability of being credit rationed cannot be predetermined.

Farm Size: The total farm size is expected to increase demand for credit arising from demand for factors of production, such as labor, fertilizer and other variable inputs. Hence, farm size should have a larger effect on credit demand and therefore positively influence the probability of being credit rationed (Gilligan et al., 2005; Simtowe et al., 2008).

Leverage ratio: This is the ratio of formal outstanding debt over last year's income, which is an indicator of a household's income earning capacity. A higher ratio means that the household has more debt than income and hence a lower credit limit. Thus, it is hypothesized that the leverage ratio will have a positive relationship with the probability of being credit rationed (Zeller, 1994).

Distance: A longer distance to the nearest microfinance institution is expected to have a positive relationship with the probability of a household being credit rationed because a longer distance to travel will increase the transaction costs of obtaining a loan (Gilligan et al., 2005).

3 Results

3.1 Descriptive Statistics

Of the 150 farm households surveyed, 109 (72.7%) applied for credit and 41 (27.3%) did not apply for credit during the 2011/2012 farming year. This implies that there is likely to be a high demand for credit from formal financial institutions. Of the 109 farm households who applied for loans, 59 (54.1%) received the full amount requested and50 (45.9%) received a lesser amount or had their loan applications rejected (credit rationed). In this study, if at least one member of a household received a lesser amount or had a loan application rejected, the household is considered to be credit rationed. Table 3 shows reasons cited by households for not applying for a loan and reasons cited by households for why they thought their loan application was rejected. Major reasons why farm households did not apply for a loan include; no guarantor (34.1%), did not need a loan (26.8%), and procedure is too complicated (14.6%). On the other hand, most of those who applied and had their loan applications rejected, did not know why they were rejected (62.9%). This is followed by not having a guarantor (20%), and then not having enough collateral (11.4%).

Table 3: Households' reasons for not applying for credit and loan rejection

Reason	Did not apply	Applied for credit
No need	11 (26.8%)	n/a
Do not have enough information on how to get the loan	4 (9.8%)	n/a
Procedure is too complicated	6 (14.6%)	n/a
Have a large amount of debt	1 (2.4%)	n/a
Other characteristics	5 (12.2%)	n/a
No guarantor	14 (34.1%)	n/a
Reason for loan rejection	n/a	n/a
Not enough collateral	n/a	4 (11.4%)
Outstanding debt is too high from the lender's perspective	n/a	1 (2.9%)
No guarantor	n/a	7 (20%)
Lender disliked personal characteristics	n/a	1 (2.9%)
Do not know	n/a	22 (62.9%)

Source: Survey data (2012).

Table 4 provides household characteristics separated by whether or not the household applied for a loan. The results show that loan applicants have significantly higher levels of education (9.56 years) compared to those who did not (7.71 years). Income is also significantly higher among households who applied for loan (GH¢ 3,156.72 or $3,995.85 PPP) compared to those who did not (GH¢ 2,233 or $2,826.58 PPP). The distance traveled from the farm household

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to the nearest formal microfinance institution is significantly shorter for those who applied for loans (3.92 km) compared to those who did not (7.32 km). The other household characteristics were not significantly different between the two groups.

Table 4: Mean characteristics of households by loan application

Characteristic	Applied for credit (N=109)	Did not apply (N=41)	Total (N=150)
Age of household head (years)	45.93	46.76	46.15
Size of household (number of persons)	4.19	4.02	4.15
Years of education	9.56	7.71**	9.05
Gender of household head (1 =Male, 0 =female)	0.82	0.83	0.82
Dependency ratio	0.29	0.25	0.28
Farm size (acres)	7.66	6.28	7.29
Previous year's total income (GH¢)	3,156.72	2,233**	2,904.36
Value of liquid assets (GH¢)	1,007.03	1,229	1,067.73
Value of livestock (GH¢)	1,925.73	1,046.27	1,685.35
Distance to formal microfinance institution (km)	3.92	7.32***	4.85

Source: Survey data (2012).

Notes: *** and **denote a significant difference in means at the 1% and 5% level, respectively.
The PPP in 2011 is 0.79 GH¢/1 USD (The World Bank, 2015).

Table 5 shows the characteristics of households by credit ration status. The results show that the average age of household heads among household who applied for credit is 46 years. Most notably, credit rationed households are significantly older than their counterpart who are non-rationed. Non-rationed households are more likely to be male-headed (90%) compared to rationed households (72%). This may be as a result of women's higher demand for microcredit compared with men, consistent with the credit participation results. With regard to farm size, credit rationed households cultivated less land (6.81 acres) than non-rationed households (8.39 acres). Consistent with expectations, the average annual income of credit rationed households (GH¢ 2,377.80 or $3,009.87 PPP) is significantly less than for non-rationed households (GH¢ 3,816.81 or $4,831.41 PPP). Implying that with higher income a household demand for credit may be low making that household less likely to be credit rationed. On the other hand, lenders may consider household with higher income as having higher repayment capabilities, thus less likely to default. In addition, the value of liquid assets owned is about three times as large for non-rationed households compared to credit rationed households. Similarly, the value of livestock is significantly greater for non-rationed households compared to credit rationed households. Finally, the total amount borrowed by credit rationed households is significantly less than that for non-rationed households.

Table 5: Mean characteristics of households by credit ration status

Characteristic	Rationed (N=50)	Non-rationed (N=59)	Total (N=109)
Age of household head (years)	47.74	44.39*	45.93
Size of household (number of persons)	3.98	4.37	4.19
Years of education	9.22	9.85	9.56
Gender of household head (1=Male, 0=female)	0.72	0.90**	0.82
Dependency ratio	0.30	0.28	0.29
Farm size (acres)	6.81	8.39*	7.67
Previous year's total income (GH¢)	2,377.80	3,816.81***	3,156.72
Value of liquid asset (GH¢)	442.84	1,485.15**	1,007.03
Value of livestock (GH¢)	1,118.72	2,609.64**	1,925.73
Total amount borrowed (GH¢)	871.43	1,488.98**	1,326.88
Formal outstanding debt (GH¢)	75.18	258.28	174.29
Ratio of formal outstanding debt over income	0.06	0.06	0.06
Distance to formal microfinance institution (km)	4.20	3.69	3.92

Source: Survey data (2012).

Note: *** **, and * denote a significant difference in means at the 1%, 5%, and 10% level, respectively.

3.2 Reasons for participating and not participating in credit programs

Table 7 shows farm households' reasons for not joining the credit programs. The three most important reasons ranked by farm households are the fear of loan default, lack of savings potential, and lack of trust in credit programs.

Table 6 explores reasons given by farm households for joining credit programs. Among the six reasons, the three most important reasons are mobilization of savings, loan access from a program for farming purposes, and the expansion of an existing income-generating activity or undertaking a new income-generating activity.

Table 7 shows farm households' reasons for not joining the credit programs. The three most important reasons ranked by farm households are the fear of loan default, lack of savings potential, and lack of trust in credit programs.

Table 6: Reasons provided by households for participating in credit programs

Reason	Nkoranza South		Nkoranza North		Total
	Mean score	Rank	Mean score	Rank	
Access loan from a program for agriculture	61.29	1	53.33	2	58.20
Expand existing or undertaking a new income-generating activity	44.61	3	36.00	4	40.60
Save money	55.83	2	65.23	1	59.41
Learn and share information on farming practices	35.17	6	35.00	5	35.13
Reduce or pay back old debts	37.70	4	25.67	6	34.92
Access loan for purposes other than agriculture (e.g., consumption)	36.95	5	42.33	3	38.91

Source: Survey data (2012).

Table 7: Reasons advanced by households for not participating in credit programs

Reason	Nkoranza South		Nkoranza North		Total
	Mean score	Rank	Mean score	Rank	
Fear of loan default	52.69	1	58.39	1	55.65
Loan conditions unsuitable and/or too restrictive	48.26	5	43.09	6	45.80
Do not have time to join	41.50	7	46.29	3	44.55
Peer group exclusion	44.80	6	43.83	5	44.27
Locations of the programs are far	50.00	3	36.29	7	38.00
Lack of trust in such programs	48.50	4	45.25	4	47.20
Lack of savings potential	51.68	2	52.23	2	52.02

Source: Survey data (2012).

3.3 Factors influencing households' participation in credit programs

Factors influencing farm households' participation in formal credit programs are presented in Table 8. The likelihood ratio chi-square (χ^2) of 46.39 indicates that the estimated model, taken jointly, is statistically significant at the 1% level. This shows a strong explanatory power of the model. The results also show that overall about 81% of the model is correctly predicted.

Table 8: Probit estimation of households' participation in credit programs

Variable	Marginal Effect	Z-statistic	Probability	Mean
Age	0.010	0.36	0.721	46.15
Age-squared	-0.000	-0.30	0.766	2242.47
Gender	-0.164***	-2.59	0.010	0.82
Education	0.014*	1.71	0.087	9.05
Dependency ratio	0.251	1.37	0.172	0.28
Social activity	0.033	0.32	0.749	0.09
Farm size	0.016*	1.83	0.068	7.29
Membership in association	0.379***	6.13	0.000	0.39
Livestock value	0.000	0.63	0.531	1685.35
Distance in south	-0.006	-1.06	0.288	3.18
Distance in north	-0.007	-0.32	0.749	1.64
LR Chi-square	46.39***			
Pseudo R squared	0.26			
Log likelihood	-64.79			
Percent correctly predicted	80.98			
Number of observations	150			

Source: Survey data (2012).

Note: Marginal effects are shown in percentage points and are calculated at sample means. *** and * denote statistical significance at the 1% and 10% level, respectively.

The Heckman probit results present the marginal effects of the Heckman probit estimate, showing the probability of households being credit rationed. The model shows a Wald chi-square (χ^2) of 24,609.17, which is statistically significant at the 1% level, implying that the explanatory variables included are important in predicting changes in the dependent variable. Besides, the Wald test of the independence of the equation is statistically significant at the 5% level with a correlation coefficient (ρ) of 1.0, implying that there is an existing positive correlation between the error terms of the outcome and the selected equations. Hence, the use of the Heckman's sample selection technique is appropriate.

Table 9: Heckman probit estimate of determinants of being credit rationed

Variable	Marginal Effect	Z-statistic	Probability	Mean
Age	0.012	0.30	0.766	46.15
Age- squared	-0.000	-0.10	0.924	2,242.47
Gender	-0.076	-0.57	0.567	0.82
Education	0.004	0.40	0.692	9.05
Dependency ratio	0.152	0.83	0.404	0.28
Membership in association	-0.203**	-1.97	0.048	0.39
Farm size	0.004	0.35	0.727	7.29
Livestock value	-0.000	-0.09	0.929	1,685.35
Liquid asset value	-0.000	-0.74	0.462	1,067.72
Income	-0.000**	-2.07	0.038	2,904.36
Leverage ratio	0.316	0.76	0.449	0.05
Distance in south	-0.006	-1.04	0.297	3.18
Distance in north	0.041*	1.73	0.084	1.64
Wald Chi-square	24,609.17***			
Log likelihood	-112.76			
Number of observations	150			
Censored observations	41			
Uncensored observations	109			
LR test of independent equations (rho = 0): chi2(1) = 6.15 Prob>chi2 = 0.0131**				

Source: Survey data (2012).

Note: Marginal effects are shown in percentage points and are calculated at sample means

***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

4   Discussion

4.1   Farmers' participation and non-participation in credit programs

Most respondents cited mobilization of savings as the primary reason for participating in credit programs. This is because of the lending requirements of the microfinance institutions, which mandate that clients must save before they can qualify for a loan. Secondly, most people joined these programs to get loans for agricultural purposes because agriculture is their primary income source. The third most important reason for participating in credit programs is to expand existing income-generating activities or to undertake new income-generating activities. This result is consistent with the findings of Anjugam and Ramasamy (2007). They also used the Garrett Ranking Technique to identify reasons for joining self-help groups in the Rananathapuram and Coimbatore districts of India, finding that obtaining a loan from the group and the promotion of income-generating activities are the two most important reasons for people joining self-help groups. Barnes et al. (1999) also identify learning how to save money as the primary reason for joining the Foundation for

International Community Assistance (FINCA) Program in a focus group discussion in Uganda as the third most important reason.

Examining reasons why households were discouraged from joining credit programs, the results show that the fear of loan default is the most important reason that deterred farm households from joining credit programs. This could be attributed to the erratic nature of rainfall in the area. Since agriculture in the study area is solely dependent on rainfall, the probability of loan default will be higher if precipitation is low. Low rainfall could lead to a reduction in crop yields and subsequently to a reduction in income, making it difficult for lenders to repay loans. Furthermore, the high interest rate charged by Microfinance Institutions (MFIs) may also account for the fear of loan default. Finally, households who join MFIs may fear that they will be pressured to divert some of their loan towards social demands. These social demands, such as funerals, marriages, and naming ceremonies, are not profitable and thus make it difficult for households to repay loans. The result that households fear loan default is consistent with Matul and Tsilikounas' (2004) findings in Bosnia and Herzegovina. Hashemi (1997) also finds that 49% of non-MFI participating households in Bangladesh cited the fear of not being able to repay loans and the burden of another debt as major reasons for not joining credit programs.

A lack of savings is the second most important reason households cited for not joining credit programs. The high ranking of this reason may result from the requirement of most formal credit programs that clients must save before they can qualify for a loan. Finally, a lack of trust in credit programs is the third most important reason. This could be due to the fact that some households in the study area were victims of unscrupulous people who pretended to work for MFIs and ended up cheating them.

4.2 Determinants of participation in credit programs

Results on the determinants of farm households' participation in credit programs indicate that the gender of the household head has a significant and negative influence on the marginal probability of participating in credit programs. The results show that male-headed households are 16.37% less likely than female-headed households to participate in credit programs, holding all the other variables at their mean. Owuor (2009) find a similar result and attribute it to the involvement of women in the rural economy and to the fact that women receive more attention from MFIs than men. The household head's formal education has a significant (at the 10% level) and positive influence on the probability of participating in credit programs, which is consistent with our *a-priori* expectation. This result implies that at a mean of 9.05 years of formal education and holding all other variables at their mean, a one-year increase in formal education by the household head will increase the probability of participating in a credit program by 1.4%. It is expected that household heads with more education acquire more skills and knowledge, which can help in household decision making, especially with regard to financial markets and understanding requirements, procedures, and paperwork formalities of formal MFIs. This result is consistent with findings in Owuor (2009), Ayamga

et al. (2006) for credit schemes, and Lukytawati (2009) for Rotating Savings and Credit Association (ROSCA). Lukytawati (2009), for example, explains that more education may give household heads the knowledge to anticipate income and expenditure fluctuations, thereby influencing the probability of participating in ROSCA.

Furthermore, farm size has a significant (at the 10% level) and positive influence on the probability of a household participating in credit programs. For example, with a mean farm size of 7.29 acres, a 1.0 acre increase in farm size will increase the probability that the household will participate in credit programs by 1.6%, holding all other variables at their mean. This is also consistent with the *a-priori* expectation since larger farm size increases the demand for factors of production, such as labor, capital, seeds, fertilizer, and equipment. These demands can only be met by demanding additional capital, which can be obtained through credit.

Finally, membership in an association has a significant and positive influence on the probability of participating in credit programs, confirming the *a-priori* expectation. The results show that being a member of an association increases the probability that a household participates in credit programs by 37.9%, keeping all other variables at their mean. Membership in an association can be used as a proxy for social capital (Narayan and Pritchett, 1996; Krishna and Uphoff, 2001). Many studies have shown that social capital increases access to credit (e.g., Brata, 2005; Lawal et al., 2009). Thus, it can be expected that social capital increases the probability of applying for a loan. The result is consistent with Nugroho and O'Hara (2008), which reports a significant and positive relationship between borrowing from banks and poor people's membership in business associations. The explanation they provide is that the poor can obtain knowledge on banking procedures from their business connections, thus boosting their networking access to bank loans.

The variables age of household head, household dependency ratio, and social activity are all insignificant, albeit their directional influence on the probability of participating in credit programs is consistent with the a-priori expectations.

4.3   Determinants of credit rationing

The Heckman probit results of factors influencing farm households' credit constraints show that household membership in local associations, distance to the nearest formal microfinance institution in the Nkoranza North district, and total household income (farm and off-farm) are statistically significant factors influencing the probability that a farm household is credit rationed. Membership in local associations by any household member has a negative relationship on the probability of households being credit rationed. This implies that if a household belongs to an association, the probability of being credit rationed will decrease by 20.3% if all other explanatory variables are held at their means. If we assume that membership in an association is a proxy for social capital, the results indicate that social capital enhances access to credit through enhanced social networks from membership in an

association. This is consistent with findings in Baiyegunhi et al. (2010), Islam et al. (2011), and Nugroho and O'Hara (2008). The distance from farm households to the nearest formal MFI in the Nkoranza North district is statistically significant and positively related to the probability of being credit rationed. This implies that at the mean distance of 1.64 km, an increase in the distance to the nearest microfinance institution in the Nkoranza North district by 1.0 km will increase the probability that a farm household is credit rationed by 4.1%, holding all the other variables at their means. This result was expected since it was expected that a greater distance to the closest formal MFI would increase transaction costs of obtaining a loan. The implication is that farm households may prefer to use informal lending services due to lower transaction costs resulting from proximity.

Furthermore, household income (farm and off-farm) significantly and negatively affects the probability of being credit rationed. This implies that at the average annual income of GH¢ 2,904.36and holding all other explanatory variables at their means, an increase in a household's total annual income by GH¢ 100 will reduce the probability of being credit rationed by 0.4%. The result shows that farm households with higher incomes are less likely to be credit rationed compared to their counterparts with lower incomes. Possible explanations are that households with higher incomes may demand less credit since they have a greater capacity to finance their economic activities and that lenders may perceive households with higher incomes as having a lower risk of default. This result is not surprising and is consistent with Awunyo-Vitor et al. (2014), Rahji and Fakayode (2009), Nuryartono et al. (2005), Akram et al. (2008), and Quoc et al. (2010). Awunyo-Vitor et al. (2014) find that farmer's income from the previous year decreases the probability of being credit rationed. Similarly, Nuryartono et al. (2005) use total income as an indicator for welfare status and conclude that increasing total income decreases a household's probability of being credit rationed. Likewise, Quoc et al. (2010) find that having a greater previous year income decreases the probability of being credit rationed and also decreases the extent of the credit constraint. Their explanation is that wealthier households have more collateral, are better educated, encounter fewer access barriers, and are better connected socially.

An increase in the age of the household head decreases the probability that the household is credit rationed, which is consistent with the *a-priori* expectation. Nevertheless, the age of the household head has no significant effect on the probability of the household being credit rationed.

5 Conclusion and policy implications

This paper examined reasons for participation and non-participation in credit programs and factors influencing farmers' participation and credit rationing status in the Nkoranza districts of Ghana. Using the Garrett Ranking Technique, farm households' reasons for participation or non-participation in credit programs were analyzed. A probit regression model was applied to estimate factors influencing farm households' participation in credit programs. The findings suggest that mobilizing savings and accessing loans for agricultural purposes are the

most important reasons influencing farm households' decisions to participate in credit programs. Among farm households who did not participate in credit programs, the fear of loan default and lack of savings potential are the most important reasons. Gender of the household head, formal education level, farm size, and membership in associations are among factors that significantly influence farm households' participation in credit programs. Membership in associations, household previous year income, and distance to the nearest MFI in the Nkoranza North district are factors that significantly influence the probability of a farm household being credit rationed.

The findings have several implications on the provision of agricultural credit to small farmers. There is a need to implement adult financial literacy programs by government training institutions and development partners. Such programs would provide education for farmers about credit and farm business management. Policy makers should also consider the potential of strengthening farmer cooperative organizations, which could provide a collective capital and social collateral for small farmers. Such social assets could increase farmers' access to credit and reduce transaction costs for credit providers. The strengthening of farmer cooperative organizations could serve as units for training farmers on farm business and credit management, and could also provide economies of scale helping enable farmers to purchase improved inputs and reduce marketing costs. We also recommend that formal MFIs should be encouraged to substitute physical collateral for social collateral through group liability strategies. This will enhance participation of productive small farmers and reduce their likelihood of being credit rationed. There is also a need to encourage farm households to take on alternative livelihood activities, such as investment in off-farm income generating activities. This will augment income, enhance repayment capabilities, and empower farm households to participate in credit programs. Finding market smart strategists to deal with challenges facing small famers in accessing credit has far reaching implications to increasing agricultural productivity, developing smallholder agriculture, and ameliorating the incidence of poverty in rural areas. These findings have policy-relevant implications in other countries where farmers have limited access to credit.

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