

Full Length Research Paper

# Determinants of Smallholder Farmers Credit Use Decision: A Case of East Gojjam Zone, Amhara National Regional State, Ethiopia.

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Abstract

This study was conducted to identify determinants of smallholder farmers credit use decision in East Gojjam Zone, Ethiopia. The study was based on primary data obtained in a cross-sectional survey from 200 respondents drawn by using multi-stage random sampling technique. The finding of the study confirmed that 61.5% of respondents had used credit. A Binary Logistic-model was used to identify determinants of credit use decision. A total of 12 explanatory variables were included in the analysis. The results of the analysis indicated that, among the hypothesized explanatory variables included in the model, seven variables were found to be significantly affecting the farmers' decision on the likelihood of the use credit in the study area. Among these, education level of a household head, monthly frequency of extension contact, number of family size, Perception on the fertility of the land and participation on off-farm activities were found positively affect the farmers' decision to use credit. Whereas, total tropical livestock unit and religion were also negatively affect the farmers' decision to use credit. The coefficients of other five variables were not statistically significant at the conventional probability levels implying that they were less important in effecting the farmers' decision to use credit. The study, therefore, recommends that greater attention should be given to expand informal education to strengthen learning opportunities of farmers and enhance their knowledge on important of credit and extension service to farmers should also be strengthened. Besides, timely provision of credit at required amount and place should also be given emphasis.

**Key words:** Binary logistic model, East Gojjam zone (Ethiopia), Non-user, and User.

Introduction

Agriculture is the dominant sector in the Ethiopian economy. The level and the speed of the country economic development are determined to a great extent by the growth of agricultural sector. This sector, which is composed of small, fragmented and subsistence farming families has limited or no working capital to purchase inputs to improve productivity. Hence, credit is a vital component of modern agriculture. Credit helps to bring the requested productivity, bring farmers live for better and food self-sufficiency through the adoption of new and improved technologies. The importance of agricultural credit in the development of the sector has been underlined strongly by various authors (Berhanu, 1993; Bekele, 1995; Freeman et al 1996; and Tsehay and Mengistu, 2002). According to Miller (1977), credit provides the means for the temporary transfer of assets from an individual or organization to one which has not.

Efforts to deliver formal credit and financial services to the rural poor in developing countries have failed over the years (Adams, 2009). Commercial banks generally do not serve the needs of the rural poor because of the perceived high risk and the high transaction costs associated with loans and request of collaterals. To fill the gap, the government of Ethiopia has tried to deliver formal credit to rural areas by establishing micro finance institutions and farmers cooperatives. Despite government initiatives, the use of agricultural credit by farmers still seems limited. This might be due to several reasons on the side of the financial institution or on the borrower side.

Previous studies on agricultural credit, such as (Kulwant, 1996; Anbes, T. 2003; Alimi T. and Oluwasola O.; 2008; Abedullah *et al.*, 2009 and Otunaiya A.O., *etal.*; 2014,) examined different factors influencing the demand of agricultural loans. But, the factors, magnitude and direction of influence of each variable on farmers' decision on different studies at different place and time are different. This is due to variations in socio-economic and institutional factors among countries, regions, villages and farms. It implies that, the importance of area specific studies on factors affecting farmers' decision on use of credit. Besides, no study in the area has so

far been made with respect to factors affecting credit use. Though, the main aim of this study is to identify the socio-economic, institutional and physical factors that determine the use of credit in the study area

### Hypothesis

Based on literature reviewed and authors experience the expected sign, code, type and unit of measurements of independent variables included in the binary logit model were summarized in the following table 1.

**Table 1.** Definitions and Units of Measurement of Variables Included In the Logit Model

Variable	Variable code	Type of variable	Unit of measurement	Exp. sign
<b>Credit use decision</b>	CREDUSE	Dummy	1; if a house hold took credit; and 0 otherwise	
<b>Sex of house hold head</b>	SEX	dummy	1; male and 0; female	+/-
<b>Age of the household head</b>	AGE	Continuous	Measured in years	+/-
<b>Responsibility</b>	RESP	Dummy	1 if the household head has social position in the PA, 0 other wise	+
<b>Education level</b>	EDUCL	Continuous	measured in number	+
<b>Monthly frequency of extension contact</b>	FRQEXCT	Continuous	measured in number	+
<b>Total size of cultivated land</b>	AREACUL	Continuous	Measured in hectare	-
<b>Irrigation use</b>	IRRUSE	Dummy	1; If a household has owned irrigated plot and 0; otherwise	-
<b>Total tropical livestock unit number of family size</b>	TTLU	Continuous	Measured in tropical livestock unit (TLU)	-
	TFSZ	Continuous	measured in number	+
<b>Religion</b>	RELIGIN	Dummy	1=orthodox, 2=Muslim, 3=protestant, 4= others	-
<b>Perception on the fertility of the land</b>	PEROFER	Dummy	1= highfertile , 2= medium, 3= low (average index of farm plots was taken)	+
<b>Participation on off farm activities</b>	POFFFA	Dummy	1; if a house hold participate on off farm activities; and 0 otherwise	-

### Research Methodology

#### *The study area*

East Gojjam zone is one of the eleven zones of the Amhara national regional state which is located in the northern part of Ethiopia and has a total area of 14705.36 sq. km, with an altitude ranging from 800 to 4070 m.a.s.l. The Zone includes 16 rural districts and 2 urban administrative, with a total of 382 kebeles of which 36 are urban kebeles. The estimated land use pattern of the zone shows that 33.67% is used for cultivation, 11.7% for grazing, 20.6% for forest bushes and shrubs and the rest 34.03% is used for other purposes & including unused land (DOARD, 2012). The zone is also characterized by mixed farming where the rural population of the zone is dependent on both crop and livestock production for their livelihood. The farming community, which is characterized by small, fragmented and subsistence farming families has limited or no working capital to purchase inputs to improve productivity. Hence, credit is a vital component of modern agriculture. However, Availability of fertilizer, improved seeds and credit at the required time and place particularly for remote and inaccessible areas are still problems encountered.

#### *Sampling design and data collection*

Both primary and secondary data were collected. The primary data were collected from 200 sample household heads through conducting formal survey based on structured questionnaire that was prepared. Secondary data were collected from the different records, strategic plans, seasonal and annual reports, and previous studies. Three stage sampling technique was used to draw the sample respondents of the study. In the first stage, out of 16 districts 3 districts were selected. Secondly, from each district 2 Kebeles (the lowest administration level of the government) and a total of 6 Kebeles were selected using simple random sampling technique. Finally, Probability proportional to size random sampling technique was used to draw individual sample households from each kebeles.

#### *Analytical methods*

Descriptive statistics such as mean, standard deviation and percentage were used to see the socio economic difference between the two groups (User and non-User). Besides, to identify the determinants of smallholder farmer's credit use decision binary logit model was used. The inadequacy of the linear probability model suggests that a non-linear specification may be more appropriate and the candidate for this will be an S-shaped curve bounded in the interval of 0 and 1 (Amemiya, 1981; Maddala, 1983). Hosmer and Lemshew (1989) pointed out that a logistic regression has got advantage over others in the analysis of dichotomous outcome variables. There are two primary reasons for choosing the logistic distribution. These are 1) from a mechanical point of view, it is an extremely

flexible and easily used function, and 2) it lends itself to a meaningful interpretation. The logit model is simpler in estimation than the probit model. Therefore, a binary logistic regression model was used to study the decision behavior of sampled households on use credit (Pindyck and Rubinfeld, 1981).

Following Hosmer and Lemeshow (1989), the logistic distribution function for identification of the user and non-user household heads can be defined as:

$$P_i = \frac{1}{1 + e^{-z_i}} \dots\dots\dots 1$$

Where:

$P_i$  is the probability of being participate for the  $i^{th}$  farmer and  $Z_i$  is a function of  $n$  explanatory variables ( $X_i$ ), and expressed as:

$$Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_m X_m \dots\dots\dots 2$$

Where  $\beta_0$  is the intercept and  $\beta_i$  are the slope parameters in the model. The slope tells how the log-odds in favor of being decision to use credit change as independent variables change.

Since the conditional distribution of the outcome variable follows a binomial distribution with a probability given by the conditional mean  $P_i$ , interpretation of the coefficient will be understandable if the logistic model can be rewritten in terms of the odds and log of the odds, (Gujarati, 1995). The odds to be used can be defined as the ratio of the probability that a farmer will decide to use credit ( $P_i$ ) to the probability that he/she will not ( $1-P_i$ ).

But,  $1-P_i = \frac{1}{1 + e^{z_i}} \dots\dots\dots 3$

Therefore,

$$\frac{P_i}{1-P_i} = \frac{1 + e^{z_i}}{1 + e^{-z_i}} = e^{z_i} \dots\dots\dots 4$$

And

$$\frac{P_i}{1-P_i} = \frac{1 + e^{z_i}}{1 + e^{-z_i}} = e^{\beta_0 + (\sum_{i=1}^n \beta_i X_i)} \dots\dots\dots 5$$

Taking the natural logarithm of the odds ratio of equation (5) will result in what is known as the Logit model as indicated below:

$$\ln \left[ \frac{P_i}{1-P_i} \right] = \ln \left[ e^{\beta_0 + (\sum_{i=1}^n \beta_i X_i)} \right] = Z_i \dots\dots\dots 6$$

If the disturbance term  $U_i$  is taken into account the logit model becomes

$$Z_i = \beta_0 + \sum_{i=1}^n \beta_i X_i + U_i \dots\dots\dots 7$$

Hence, the above econometric model will be used in this part of the study to identify variables that affect the household heads decision to use credit.

**Results and Discussion**

*Descriptive analysis*

The survey result indicated that among the total sample household heads, 94% were male and 6% of them were female. The marital status of household heads showed that 94%, 1.5%, 2% and 2.5% of them were married, single, divorced and widowed, respectively. The crude dependency ratio of sample household heads was found to be 0.69 (i.e. for each 100 persons in the production age group, there are about 69 young and old dependants to be supported) which is less than that of the zone (0.88).

The finding of this study showed that all respondents know about the presence of credit institution and 93% of respondent reported that the presence of credit access but only 61.5% of respondents had taken credit for agricultural activities for the survey year. Respondents also explained that Cooperatives and ACSI (Amhara credit and saving Institution) are the main sources of loan. Besides, when they faced shortage cash for consumption purpose and needs to fill their shortage they used informal sources with high level of interest rate.

In order to investigate the presence of group mean difference with respect to the hypothesized social, economic, and institutional factors uni-variate tests were used. Student’s t-test and Chi-square statistics were used to identify the potential continuous and dummy variables differentiating users from non users respectively. User and non user households significantly different in three of the six hypothesized continuous variables (Table 2).

The average age of the sample household heads was found to be 45.69 years ranging from 22 to 82 years with standard deviation of 12.10. Of the total sample household heads 47 percent of them have an age of greater than 45 years. The mean age of users and non users were 45.28 and 45.81 years with standard deviation of 11.88 and 12.28 respectively. The mean age of users was found to be less than that of non-users, but statistically insignificant.

**Table 2.** Mean and t-test values of continuous variables differentiating users from non-users (n=200);

Variable	User	non-user	total	t-value
AGE	45.28	45.81	45.69	0.305
EDUCL	2.79	1.54	2.31	2.714***
FRQEXCT	1.8	1.38	1.64	2.5**
AREACUL	1.96	1.79	1.89	0.972
TTLU	5.27	5.57	5.38	-0.666
TFSZ	6.36	5.93	6.2	1.547

\*, \*\*, \*\*\* indicates Significant at 10%, 5% and 1% probability level respectively

Source: Survey result

The education level of household heads is expected to increase the probability of credit use decision. Hence, The survey results indicated that about 31% of the total respondents are illiterates, while the rest 69% of the respondents had various educational levels ranging from the ability to read and write up to 12th grade. The average grade level of sample respondents was found to be 2.31 with standard deviation of 3.22. The mean grade level of users and non users were 32.79 and 1.54 with standard deviation of 3.34 and 2.89 respectively.

Farmers are used credit for the purchase of technologies such as fertilizer, herbicides, pesticides, water pumps and for livestock purchase which helps them to increase productivity and production. Hence, frequency of extension contact is expected to affect the decision to use credit. The mean monthly frequency of extension contact was found 1.64, 1.8 and 1.38 for total respondents, users and non-users with standard deviation of 1.15, 1.19 and 1.05 respectively. The mean difference test result showed that significant and positive effect of monthly frequency of extension contact for use of credit.

The average cultivated land of total sample households was found to be 1.9 hectares with standard deviation of 1.15 ha. The average cultivated land size of users and non-users was found 1.96 and 1.79 ha with a standard deviation of 1.26 and 0.93, respectively. Their own land size of most households (82%) falls between 0.25 and 2 ha. It was found that only about 18% of the sample households have a farmland size of above two hectares. There was a slight difference in the mean total cultivated land size between the two groups. However, the result of t-test showed that the mean difference was insignificant. The average size of livestock in TLU was found to be 5.38, 5.27 and 5.57 for total sample households, users and non-users with a standard deviation of 3.08, 3.00 and 3.24 respectively. About 51% of total sample household heads has more than 5 TLU sizes of livestock.

Households having relatively large number family members must have to increase the size of cultivated land or increase the productivity of its own land using technologies to meet the food requirement of family members. Therefore, farmers who have small size of land and large number of families are more eager to use technologies than others. The family size of the sample households ranges from 2 to 12 persons, with a mean of 6.2 persons and standard deviation of 1.92. About 63 percent of the total sample households have a family size of above 5 persons per household head. The average family size of user and non-users was found to be 6.36 and 5.93 persons with standard deviation of 1.89 and 1.95, respectively.

User and non-user households not only differ in quantitative variables but also in terms of qualitative variables. It was, therefore, desirable to use a method of testing the differences between users and non-users with respect to qualitative variables. Hence, the chi-square test was used to test the presence and absence of difference between the two categories of households (Table 3).

Of the total sample household heads, 49.5% were reported that they have responsibility at their village or peasant association level. It was also 52.84% and 44.15% for the user and non-user farmers respectively. Moreover, 48.5% of the total respondents have reported that they have of their own irrigation plots and had also practiced small scale irrigation. The result of  $\chi^2$ -test showed that insignificant difference between household heads of the two groups in responsibility and presence of irrigation plot.

The survey result found out that 95.5% of respondents were orthodox follower and the rest 4.5% were Muslim. Respondents have also rated their farm plots fertility in to three categories as fertile, medium and low. According to their classification from a total of 727 farm plots managed by sample household heads, 109(15%), 407(56%) and 211(29%) farm plots were classified as fertile, medium and low fertile respectively. The result of  $\chi^2$ -test also showed that significant difference between household heads of the two groups.

Concerning the participation on off farm activities of sample household heads, the survey results indicated that about 34.5% of the total respondents were participated on off farm activities, while the rest 65.5% of the respondents were not. 62.6% of users and 70.13% non-users were not participated in off farm activities. The result of  $\chi^2$ -test showed insignificant difference between the two groups.

**Table 3.** Dummy Variables Differentiating Users from Non-Users (N=200)

Variable	Score	User	Non-User	Total	$\chi^2$
SEX	0	5	7	12	2.121
	1	118	70	188	
RESP	0	58	43	101	1.43
	1	65	34	99	
IRRUSE	0	65	38	103	0.232
	1	58	39	97	
RELIGIN	1	120	71	191	3.158***
	2	3	6	9	
	3	0	0	0	
	4	0	0	0	
PEROFER	1	24	34	58	16.945***
	2	74	38	112	
	3	25	5	30	
POFFFA	0	77	54	131	1.188
	1	46	23	69	

\*, \*\*, \*\*\* indicates Significant at 10%, 5% and 1% probability level respectively

Source: Survey result

### Econometrics Analysis

#### *Determinants of farmer's decision to use credit*

Under this section the important socio-economic and institutional factors, which were hypothesized to affect household's decision to use credit were analyzed. Logit-model and household level analysis was used to analyze determinants of smallholder farmer's credit use decision. Multicollinearity problem for continuous explanatory variables was assessed using a technique of variance inflation factor (VIF) and the degree of association between each dummy/discrete variable was also assessed using contingency coefficient. Finally, the variables were considered for further analysis after verifying that multicollinearity is not a problem.

Generally, twelve (12) explanatory variables were included in the model to identify the determinants of farmers' decision to use credit. The maximum likelihood econometric estimation method was used to estimate the coefficients of the explanatory variables in the Binary logit model. The results of Binary logit model regression analysis indicated that, among the 12 hypothesized explanatory variables included in the model, seven variables were found to be significantly affecting the farmers' decision on the likelihood of use credit in the study area. Among these, education level of a household head (EDUCL), monthly frequency of extension contact (FRQEXCT), number family size (TFSZ), Perception on the fertility of the land (PEROFER) and participation on off-farm Activities (POFFFA) were found positively affect the farmers' decision to use credit. Whereas, total tropical livestock unit (TTLU) and religion (RELIGIN) were also negatively affect the farmers' decision to use credit. The coefficients of other five variables were not statistically significant at the conventional probability levels implying that they were less important in effecting the farmers' decision to use credit (Table 4).

Education is one of the factors which had a significant influence at 1% probability level and positively affect farmers' decision to use credit. Decision to use credit for purchase of agriculture technology requires some knowledge and skill to understand the impact of using technologies on the output and productivity. Hence, Farmers with formal education are privileged to have early contact with new innovations and improved technologies which are designed to improve output and productivity than others. Moreover, such farmers are early adopters of technologies. The odds ratio (1.181) indicates that with the assumption of citrus-paribus decision to use of credit will be increased by a factor of (1.181) as the education level increases by one.

Monthly frequency of extension contact to development agents was also another important variable that had a significant influence at 1% probability level and positively affects decision of farmers to use credit. This implies that farmers who had frequent contact to development agent have more knowledge about the use of technologies and decides to use credit to purchase technologies. Farmers in the study area also mostly used credit for purchase of fertilizer. The result also showed that the likelihood of decision to use of credit will be increased by a factor of (1.527) as the average monthly extension contact increase by one unit. Total livestock holding and



religion also significantly and negatively affects farmers' use of credit. The result of the study has conformity with the a priori expectations that the farmers who have more frequency contact with development agent are more likely to use agricultural loan.

**Table 4.** Maximum Likelihood Estimates of a Binary Logit Model

Variables	B	S.E	Wald	Sig.	Exp(B)/Odds ratio
SEX	.885	.760	1.355	.244	2.423
AGE	.016	.015	1.209	.272	1.017
RESP	.315	.376	.701	.402	1.370
EDUCL	.167	.064	6.865	.009***	1.181
FRQEXCT	.423	.158	7.144	.008***	1.527
AREACULT	.220	.224	.969	.325	1.246
IRRUSE	-.249	.339	.540	.462	.779
TTLU	-.197	.075	6.946	.008***	.821
TFSZ	.237	.116	4.196	.041**	1.267
RELIGIN	-1.389	.821	2.861	.091*	.249
PEROFER	1.169	.292	15.998	.000***	3.218
OFFINC	.659	.393	2.817	.093*	1.933
Constant	-3.823	1.497	6.524	.011**	.022
Chi-square .....	49.48***				
-2 log likelihood.....	217.098				
correctly predicted .....	70.00				
Sensitivity.....	53.2				
Specificity.....	80.5				
Number of cases.....	200				

\*, \*\*, \*\*\* indicates Significant at 10%, 5% and 1% probability level respectively

Source: Survey result

Farmer's perception on the fertility of their land was also significant at 1% probability level and positively influences the farmer's decision to use of credit. Farmers who perceived their land fertility is low more likely used credit than from those who perceived their land is high fertile. This is due to the fact that most farmers need credit for the purpose of purchase of fertilizer. Moreover, Participation on off farm activities also significantly and positively affects the decision of farmers to use credit. The positive effect is contrary to a prior expectation. This might be due to the reason that farmers who participate on off-farm activities particularly on petty trade are more familiar with the importance of credit than others.

### Conclusions

Agriculture is the dominant sector in the Ethiopian economy, which more than 85% labour force is engaged on it with small, fragmented and subsistence farming families. Hence, increasing the productivity and production of the sector is paramount important to supply enough food for the increasing population.. To do this, the use of modern technologies with subsistence farming families is fundamental. However, Subsistence farming families has limited or no working capital to purchase inputs to improve productivity. Thus, credit is a vital component of modern agriculture for adoption of new and improved technologies. However, the results of the study showed that only 61.5% of respondents had taken credit for agricultural activities for the survey year. This confirmed that still the use of agricultural credit by small holder farmers is limited. Binary logit model regression analysis result indicated that, education level of a household head, monthly frequency of extension contact, number family size, Perception on the fertility of the land, total tropical livestock unit, religion and participation on off-farm income were found to be significantly affecting the farmers' decision on the use credit in the study area. Based on this, the study recommends expansion of informal education to strengthen learning opportunities for farmers to enhance their level of thinking, Strengthen the frequency of extension service given for farmers to upgrade their knowledge on important of technologies and use of credit and timely provision of credit at required amount and place should also be given emphasis.

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### Ethics

All the authors read and approved the manuscript and no ethical issues involved.

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