



### Full Length Research Paper

## Access to Microcredit and its Effect on Crop Productivity and Household Income in Hawassa Zuria District of Sidama Zone Southern Ethiopia

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### Abstract

This study was carried out in Hawassa Zuria District of Sidama Zone with the objectives of identifying factors that affect access to credit and evaluating the effects of microcredit on maize and haricot bean productivity and farm households' income. The study was based on the data obtained from 194 randomly selected households from the study area. Descriptive statistics such as mean, proportion and standard deviation were employed to characterize sample households and assess credit access and utilization. The binary logistic regression model was applied to identify factors that affect access to credit. Moreover, multiple linear regression models were used to evaluate the effects of access to micro credit on crop productivity and household income. The results indicate that 46 percent of the sample households had access to credit. Households who had access to credit differed significantly from their counterparts in terms of level of household income, distance of their residence from microfinance office, education status of household head, their occupation, membership in cooperatives, access to irrigation, access to training and loan experience. The results from logistic regression model indicated that factors such as education status of household head, cooperative membership, training, and prior loan experience were the determinants of access to credit positively and significantly. The results from multiple linear regression model indicated that access to credit had significant and positive effects on crop productivity and household income. It is therefore important to take into account those factors that significantly affected credit access in promoting rural microcredit.

**Keywords:** Microcredit, Crop productivity, Household income

### **Introduction**

Credit is an important element in agricultural production systems. It allows many producers to meet their cash needs induced by the production cycle that characterizes agriculture. Agricultural production is characterized by a production cycle where inputs are transformed into outputs with considerable time lags (Conning and Udry, 2005). With limited access to credit, the budget balance within the year can become a constraint to agricultural production (Dong et al., 2010; Ali and Deininger, 2012). While payments for materials, purchased inputs, and consumption are financed with cash, preparation, planting, cultivation, and harvesting are typically completed over a period of several months, in which very little cash revenue is earned. Most cash income is received a short time after harvest. These lags make it necessary for farmers to manage liquidity during the production season. With access to credit, farmers can purchase inputs as needed and reach the optimum production level. When access to credit is limited, the amounts and combinations of inputs used by a farmer may deviate from optimal levels, which in turn limit the production and/or consumption choices. The marginal contribution of credit therefore allows input levels closer to the optimal levels, thereby increasing yield and output (Feder et al., 1990).

Financial services provision in case of Ethiopia characterized with limited access, higher interest rate and poor quality with lengthy procedure. Due to these reasons farmers always face problems during cultivation time to purchase farm inputs and others. Different studies conducted in different areas of the country confirmed that Ethiopian farmers are constrained with credit supply. A study conducted by (Tilahun, 2015) in Amhara region found that 66.17 percent of households are credit constrained which shows how the rural credit market landscape in Ethiopia is highly imperfect. The Ethiopian agricultural finance diagnostic report for Ministry of Agriculture which is prepared by Amha and Peck (2010) explained that farm households in rural Ethiopia are highly credit constrained. In theory, it has been argued that a farm household facing binding credit constraint is more likely to misallocate its resources and under-invest than its unconstrained peers.

There has been no research conducted in the study area on effects of microcredit access on crop productivity and household income. This study was, therefore, conducted to assess the access and utilization of credit by the farmers from microfinance institutions in the study area.

area, identify factors determining microcredit access of rural households and analyse the effects of microcredit access on crop productivity and income of rural households.

## Materials and methods

### Description of the Study Area

Hawassa Zuria Woreda is found in Sidama Zone, Southern Nations Nationalities and Peoples Region (SNNPR), Ethiopia. It is located at 23 km far from Hawassa, the capital city of the SNNPR. The District has a total area of 22,843 hectare. The total population of the study District is estimated at 152048, of which 76694 are male and 75352 are female (CSA, 2007). More than 90% of the population earns living from agriculture and livestock rearing. The study area is known by two agro-ecological zones namely *Kola* (75%) and *Woynadega* (25%). The average Temperature is 27, and the average rainfall ranges between 900-1400 with elevation of 1680-2000 above sea level. There are two cropping seasons such as *Belg* (from mid-February to late May) and *Maher* (from June to October).

### Sampling Techniques and Sample Size

The population of the study refers to household heads in the District who have and/or have not access to credit from micro finance institutions. Two-stage sampling techniques were adopted for the study to select representative sample. In the first stage, the total kebeles of Hawassa Zuria Woreda were stratified into two agro-ecological namely *Kola* and *Woynadega*. The *kola* stratum represents around 75% of total kebeles and remaining 25% of the kebeles fall in *woynadega* agro-ecology. From each stratum, the sample unit was selected proportionally; three kebeles from *kola* agro-ecology and one kebele from *woynadega* agro-ecology. In the second stage the sample households were selected randomly and proportionally after listing all the total households of kebeles. The sample size was determined based on the formula provided by Yamane (1967) as follows.

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

Where:  $n$  = sample size

$N$  = total number of households in selected kebeles (3772)

$e$  = level of precision (assumed to be 7%) as it is possible to use 5-10%.

Thus, a total of 194 sample respondents were included in the study.

### Method of Data analysis

The data collected were analyzed by using different techniques both descriptive statistics and econometric model. Descriptive statistics such as frequencies, mean and percentage were employed to describe and characterize sample households. Moreover an economic model known as logistic regression model and multiple linear regression models were used to examine the relationship between the dependent and independent variables. The logistic regression analysis was used to identify factors determining access of microcredit of rural households. This study was intended to find out major determinants of microcredit in the study area which affects farmers to access microcredit or not. The dependent variable (access to micro credit) is a dummy, which takes a value of zero or one depending on whether rural household has access to microcredit or not.

In the analysis of studies involving qualitative choices, usually a choice has to be made between logit and probit models. According to Amemiya (1981), the statistical similarities between logit and probit models make the choice between them difficult. The justification for using logit is its simplicity of calculation and that its probability lies between 0 and 1. Moreover, its probability approaches zero at a slower rate as the value of explanatory variable gets smaller and smaller, and the probability approaches 1 at a slower and slower rate as the value of the explanatory variable gets larger and larger (Gujarati, 2012). The specification binary logit regression model is as follows.

$$P_i = \frac{e^{z_i}}{1 + e^{z_i}} \quad (2)$$

Where,  $P_i$  is the probability of having access to credit,

$$Z_i = \beta_0 + \sum \beta_i X_i + u_i \quad (3)$$

Where,  $\beta_0$  = Intercept

$\beta_i$  = Regression coefficients to be estimated

$X_i$  = Variables and

$u_i$  = Disturbance term

The probability that a household belongs to those who do not access to credit is:

$$1 - P_i = \frac{1}{1 + e^{z_i}} \quad (4)$$

Then odds ratio can be written as:

$$\frac{p_i - 1 + e^{z_i}}{1 - p_i} = e^{z_i} \quad (5)$$

The left hand side of equation (4),  $1-P_i$ , is simply the odds ratio in favor of having access to credit. It is the ratio of the probability that the household has access to credit to the probability that it would not have access to credit. By taking the natural log of equation (4) the log of odds ratio can be written as:

$$L_i = \ln\left(\frac{p_i}{1-p_i}\right) = \ln\left(e^{B_0 + \sum_{j=1}^n \beta_j x_{ij}}\right) = \ln e^{Z_i} \tag{6}$$

Where,  $L_i$  is log of the odds ratio in favor of having access to credit, which is not only linear in  $X_{ij}$  but also linear in the parameters and  $Z_i$  is as defined earlier. Thus it is estimated using the maximum likelihood estimation technique.

In order to identify the effect of microcredit influence on income of the rural households multiple regression analysis was used. Microcredit access is regressed as one of the independent variables which affect the income of the rural households. If microcredit access has significant relationship between rural household income (and productivity) and microcredit access; it can be concluded that accessing microcredit has effect on improving farmer’s income and crop productivity. Therefore, the model of regression analysis is specified as follow:

Dependent variables  $Y_{1i}$  is annual income of the farmers (and crop productivity)  
 $Y_{1i} = \beta_i X_{1i} + \epsilon_i \tag{7}$

Where  $X_{1i}$  = explanatory variable expected to affect the income (crop productivity) of the sample respondents are (land size; type of crop cultivated; access to micro credit; education level; irrigation facilities; marital status and others)  
 $\beta_i$  = the unknown parameter that reflects the impact of the change in variable  $X$  on  $Y_i$  which will be estimated  
 $\epsilon_{1i}$  = is the error term, and  $i = 1, 2, 3...n$ , where  $i$  is the number of observations.

**Results and Discussion**

*Demographic characteristics of sample households*

From the total sample households, about 68 percent were male headed and the remaining 32 percent were female headed (Table 1). The mean age of sample respondents was found to about 36.5 years with minimum and maximum ages of 20 and 70 years respectively. The majority (about 74 percent) of sample household heads were married. The mean family size of the sample households was calculated at 5.95 with minimum, maximum and standard deviation of 1, 12 and 2.42, respectively.

**Table 1:** Demographic characteristics

Variable	N	Minimum	Maximum	Mean/Proportion	Std. Dev.
Sex of the respondent (1=Male, 0=Female)	194	0.00	1.00	0.68	0.47
Age of the respondent in years	194	20.00	70.00	36.53	9.43
Marital status of household head (1=Married, 0=Single)	194	0.00	1.00	0.74	0.44
Total family size in number	194	1.00	12.00	5.95	2.42

*N=Number of observations, Std. Dev.=Standard Deviation; Source: Own survey result (2017)*

*Socioeconomic Characteristics*

The mean family income of sample households was found to be about 10682 with minimum, maximum and standard deviation of 1000, 70000, and 12174.73, respectively (Table 2). The majority (about 53%) of the respondents were illiterate. The mean farm of the sample respondents was estimated to 0.71 hectare with minimum of 0.13 and maximum of 6.50 hectare. The occupation or livelihood strategy of about 58% of the sample households was found to farming only. This indicates diversification into alternative income sources is limited and the majority of farmers rely on farming as a means of livelihood. Only 32% of the sample households were members of cooperative societies in the study area. Few farmers (only 10% sample households) were able to get access to irrigation. This shows that almost all farmers largely depend on rain-fed agriculture. Access to training is limited and estimated at 46%. This means that the majority were not able to have access to basic skill development training including credit utilization and timely repayment.

**Table 2:** Socioeconomic characteristics of sample respondents

Variable	Minimum	Maximum	Mean/proportion	Std. Deviation
Family income (Birr)	1000.00	70000.00	10681.96	12174.73
Education (1=Literate, 0=Illiterate)	0.00	1.00	0.47	0.50
Total farm size (ha)	0.13	6.50	0.71	0.81
Occupation (1=Farming only, 0=Farming and off/non-farm)	0.00	1.00	0.58	0.50
Member of cooperative (1=Yes, 0=No)	0.00	1.00	0.32	0.47

Irrigation access (1=Yes, 0=No)	0.00	1.00	0.10	0.30
Training access (1=Yes, 0=No)	0.00	1.00	0.46	0.50

Source: Own survey result (2017)

#### Access to and Utilization of Microcredit

The result indicated in Table 3 shows that about 46% of the sample respondent had access to microcredit. The same proportion of the respondents had loan experience. This implies that access is a key variable that influences utilization of credit smallholder farmers. Some households were located at a distance as far as 15 kilometers that undermines credit access to resource poor farmers. Of the total sample households only 42% did receive credit during 2015/16 production year. The mean level loan received by sample households was estimated to about 1867 Birr.

**Table 3:** Access and utilization of microcredit

Variable	Minimum	Maximum	Mean/ Proportion	Std. Deviation
Do you have access to microcredit? (1=Yes, 0=No)	0.00	1.00	0.46	0.50
Do you have loan experience (1=Yes, 0=No)	0.00	1.00	0.46	0.50
Distance to microfinance office (Km)	3.60	15.00	8.82	3.69
Have you received credit during 2015/16? (1=Yes, 0=No)	0.00	1.00	0.42	0.49
Amount of loan (Birr)	120.00	20000.00	1866.78	2865.58

Source: Own survey result (2017)

#### Maize and Haricot Bean Productivity of Sample Farm Households

Table 4 depicts the results of maize and haricot bean productivity of sample farm households in quintals per hectare. The average productivity of maize and haricot bean was found to be 32.31 and 22.92 with corresponding standard deviation of 17.67 and 12.58, respectively.

**Table 4:** Descriptive statistics of maize and haricot bean productivity of sample households

Productivity (qt/ha)	Maize	Haricot bean
<b>Mean</b>	32.31	22.92
<b>Standard deviation</b>	17.67	12.58
<b>Minimum</b>	4.00	2.00
<b>Maximum</b>	85.00	74.00

Source: Own survey result (2017)

#### Factors Affecting Access to Credit

The results of logistic regression model are presented in Table 5. The result depicts four out of twelve variables were significant in influencing access to credit. These include education of household head, cooperative membership, access to training and loan experience.

Education of household was found to be significantly and positively related to access to credit at one percent level of significance. A change in education status from illiterate to literate would increase the odds ratio in favor of having access to microcredit by a factor of about 1999 while other factors remained unchanging, which indicates that education is highly important in smallholder farmers' to microcredit.

Membership of farmers in cooperatives was a factor that affected access to credit positively and significantly. The result indicates that farmers who are members in cooperatives are more likely to have more access to microcredit than their counterparts. This could be due information exchange among cooperative members that enhances the knowledge required to access and utilize microcredit. A change in cooperative membership status from non-member to member would increase the odds ratio in favor of having access to microcredit by a factor of about 10.70, by keeping other factors constant.

Skill development training given to farmers on business management and effective utilization of credit was also found to be positively and significantly related to access to microcredit. Farmers who have got training were more likely to have accessed microcredit as compared to those who did not participate in training. When training is offered and other factors held constant, it would increase the odds ratio in favor of having access to microcredit by a factor of 13.86.

Prior loan experience was also found to a determinant factor of access to credit. Farmers have loan experience were more likely to have access to credit than their counterparts. Keeping other factor not changing, having previous loan experience would increase the odds ratio in favor of having access to microcredit by a factor of about 35.23.

**Table 5:** Results of binary Logistic regression model

Variable	Odds ratio	Std. Err.	z	P>z
Age	0.9499993	.066323	-0.77	0.439
Marital status	5.279	1.325682	1.26	0.209
Income	1.000041	.0000566	0.72	0.471
Education	1999.481	1.876144	4.05	0.000
Family size	0.84409	.2962264	-0.57	0.567
Farm size	0.380394	1.118724	-0.86	0.388
Occupation	1.527454	1.132137	0.37	0.708
Cooperative membership	10.70206	1.35252	1.75	0.080
Irrigation access	1.08453	1.715288	0.05	0.962
Training	13.86094	1.426591	1.84	0.065
Distance	0.8484387	.1723212	-0.95	0.340
Loanexperience	35.2275	1.157548	3.08	0.002

Source: Model output (2017)

#### Effects of Access to Microcredit on Farm income

A multiple linear regression was employed to evaluate the effect microcredit program on farm income of sample households. The overall model significance shows that the model is adequate and best fit to the data at hand (F-statistic = 35.6 and p-value <1%). The coefficient of determination (R-squared = 0.57) indicates that nearly sixty percent of the total variation in income is due to the factors that are included in the model (Table 6). The result depicts that access to credit is highly significant at less than one percent in influencing farm income. Having access to credit would increase income by 16 percent (as the dependent variable in log form), keeping other factors constant. This shows that improving access to credit in rural areas would increase household income and contribute to poverty reduction.

**Table 6:** Effect of microcredit access on farm income

Variable	Coefficient	Std. Err.	T	P>t
Microcredit	1.600934	0.1115253	14.35	0.000
Age	0.001514	0.0071911	0.21	0.833
Sex	0.1025481	0.111898	0.92	0.361
Family size	0.0372602	0.0273228	1.36	0.174
Farm size	-0.0683327	0.0654625	-1.04	0.298
Irrigation access	0.0045163	0.1476434	0.03	0.976
Training	0.015832	0.1242686	0.13	0.899
Cons	7.648219	0.2479192	30.85	0.000

Source: Model output (2017)

#### Effects of Access to Microcredit on Productivity of major Crops

Productivity (yield per hectare) of major crops in the study area such as maize and haricot bean was assessed by employing OLS estimation technique of multiple linear regression models. Table 4.8 shows the result of the model fitted for maize crop. The overall model significance shows that the model is adequate and best fit to the data at hand (F-statistic = 12.61 and p-value <1%). The coefficient of determination (R-squared = 0.62) indicates that sixty two percent of the total variation in income is due to the factors that are included in the model (Table 7). The result indicates that access to microcredit is highly significant (p<1%) at affecting maize productivity. The positive sign on the coefficient of microcredit shows that credit access has a positive effect on maize crop productivity. Having access to credit its utilization would increase maize productivity by about 32.8 quintals per hectare, keeping other factors constant. Thus, access to credit is a key factor to improve crop productivity as it goes with productivity enhancing inputs such mineral fertilizers, improved seeds, etc.

**Table 7:** Effect of microcredit access on maize productivity

Variable	Coefficient	Std. Err.	T	P>t
Microcredit	32.79215	5.998373	5.47	0.000
Sex	-5.188648	2.687172	-1.93	0.055
Age	-0.0557638	.1784006	-0.31	0.755
Family size	1.045584	0.6947183	1.51	0.134
Farm size	5.06248	1.697185	2.98	0.003
Irrigation access	-.5678199	3.664734	-0.15	0.877
Training	-1.844153	3.1283	-0.59	0.556
Cons	32.7092	6.87878	4.76	0.000

Source: Model output (2017)

Table 8 shows the result of the model fitted for haricot bean crop. The overall model significance shows that the model is adequate and best fit to the data at hand (F-statistic = 5.01 and p-value <1%). The coefficient of determination (R-squared = 0.74) indicates that 74% of the total variation in income is due to the factors that are included in the model (Table 4.9). The result from haricot bean model indicates that access to microcredit is highly significant (p<5%) at affecting haricot bean productivity. The positive sign on the coefficient of microcredit shows that credit access has a positive effect on haricot bean crop productivity. Having access to credit its utilization would increase haricot bean productivity by about 17 quintals per hectare, keeping other factors constant. Thus, access to credit is a key factor to improve haricot bean crop productivity.

**Table 8:** Effect of microcredit access on haricot bean productivity

Variable	Coefficient	Std. Err.	t	P>t
Microcredit	16.99122	6.757135	2.51	0.014
Sex	5.186092	3.298798	1.57	0.121
Age	.3371076	.2490431	1.35	0.181
Marital status	2.585283	4.130915	0.63	0.534
Education	-12.92099	6.456517	-2.00	0.050
Family size	-1.032439	.9069734	-1.14	0.259
Farm size	3.830992	3.50908	1.09	0.279
Occupation	-5.778714	3.660701	-1.58	0.119
Cooperative membership	-3.162522	4.426773	-0.71	0.478
Irrigation access	6.086769	4.571433	1.33	0.188
Training	2.692102	3.616099	0.74	0.459
Distance	2.444564	.5475544	4.46	0.000
Cons	-11.95764	8.984139	-1.33	0.188

Source: Model output (2017)

### Conclusion and Recommendations

This study found that credit access is an important intervention that could significantly contribute to household income and crop productivity improvement. Based on the findings of the study, the following conclusions and recommendations are made. The study also found out that more than fifty percent of the sample households in the study area did not access credit. This lends an important message for the concerned bodies such as local government, Omo microfinance and others working in the area to work on factors that affect access to microcredit in the area.

The study identified education status of household heads as a key factor affecting access to credit. It was found out that illiterate households are less likely to get access to credit. It is therefore imperative that more attention should be given to raise the level of literacy in the area which was found to be 47 percent much low as compared to the proximity of the study area to the Regional City. Therefore, it is important to adult literacy program and informal trainings to enhance the levels of awareness and knowledge of the households in the study area.

Cooperative societies are crucial farmer organizations that facilitate agricultural input distribution and output marketing in the Region. The result of this study indicated that membership in cooperatives had a positive and significant effect on access to microcredit. It is therefore important to organize farmers into cooperative and work to increase membership so as to promote access to credit.

Farmers' skill development training is important in raising knowledge and awareness of farmers about credit utilization. The finding of this study also confirms that access to credit is a key determinant of access to credit. Thus, concerned authorities working in the area such as local administration, offices of agriculture and natural resources and non-governmental organization should provide relevant trainings to the farm households on regular basis. Experience in loan utilization was found to be another important factor that affected access to the current credit. This calls for the need to set up inclusive credit delivery mechanisms that give a due attention to those who had no or little previous loan experience.

Finally, the study found out that access to credit had a positive and significant effect on household income and crop productivity. Therefore, there need to be a concerted effort to extend credit to more distant (remote) areas and increase the level of credit utilization where there is insufficient access.

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