

Determinants of Microcredit Use among Small-Scale Farmers in Ethiopia: Evidence from Raya kobo Woreda, Ethiopia

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Abstract

Background: This study was fully conducted through primary data collected from 385 small scale farm household heads. Those farm household heads were determined by the Cochran formula of sample size determination and selected through three stage probability sampling. **Result:** The result of the study was obtained from binary logistic regression model and states that gender, age, education, family size, dependency ratio, oxen ownership, irrigation, extension service, membership of social organization, total asset, remittance, economic shocks, purpose of credit use, perception for group lending, organizational procedures and distance from the town were important factors influencing small-scale farmers access to micro credit in the study area. The rest factors, those are marital status, farm size and soil fertility were less powerful in explaining smallholder farmers' access to microcredit loans. **Conclusions:** Therefor the expansion of irrigation scheme and reduction of bureaucratic procedures to develop new rural institution plays a great role in the creation and expansion of non-farm activities and increase access of microcredit use.

Keywords: Irrigation scheme, Logistic regression, Micro-credit, Raya kobo

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1. Background

Most developing countries depend on their agricultural sectors for economic growth, food security as well as poverty reduction which contribute up to 30% of GDP in less developed countries (LDCs) (Miller *et al.*, 2010, Kotchikpa *et al.*, 2018).

Similar to other sub-Saharan African (SSA) countries, Ethiopia's agriculture sector is dominated by small-scale farmers which contributes about 40% of GDP and 80% of both employment and export shares. Even though smallholder farmers in Ethiopia produce 96% of the national agricultural output, it is unable to feed the fast-growing population and characterized by an average land holding of one hectare per household, yet using backward farming system, which ultimately results low income (Seid, 2016, Doreen and Philip, 2014).

In subsistence agriculture and low-income countries like Ethiopia where small-scale farming system dominate the overall national economy, small-scale farmers are facing severe shortage of financial sources to purchase productive agricultural inputs since the price of input is going up every year and farmers can't utilize inputs by their own fund. It is not only on the price of inputs but also small holder farmers can't participate in non/off-farm economic activities due to lack of sufficient financial sources for working capital to diversify income source and income acquisition. Consequently, the dependence of the subsistent farmers on financial institutions for credit has become substantially increasing nowadays (Fengxia *et al.*, 2010, Bhusare S., & Chanda R., 2017).

Microfinance in Ethiopia started in 1994/5, particularly; the licensing and supervision of microfinance institution proclamation of 40/1996 encouraged the spread of microfinance institution in both rural and urban areas. In recent years, several micro financial institutions are found in Ethiopia. There are thirty three registered micro-finance institutions were established with their considerable variations in geographical distribution, capital and customer size (Gosa 2014).

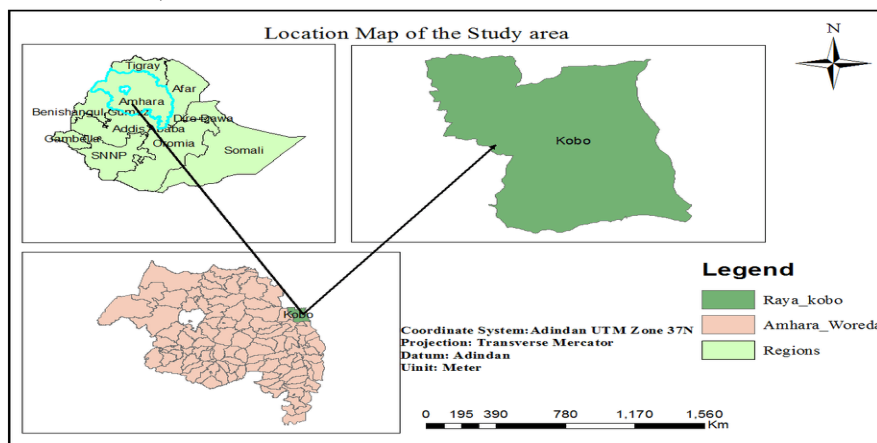
The provision of credit services to the poor has been considered as one of the mechanism to reduce poverty, promote rural entrepreneurship and stands to benefit poor individuals who lack collateral, steady employment, verifiable credit history, or other requirements necessary to gain access to formal credit. It can significantly increase the ability of households to meet their financial needs such as the purchase and use of improved agricultural inputs and which accelerates the households' ability to adopt modern agricultural technologies that can increase the income of the household. However, large numbers of small-scale farmers in developing nations have limited access to formal credit, which constrains poor farmers' capability to expand their production and improve their living condition, technology adoption and livelihood diversification (Kiros Habtu 2012).

Some of the basic factors that hinder small-scale farmers to access micro-credit were literacy status, household size, farm size, off-farm income, agricultural extension service, educational status of household head and distance from residence to the source of credit (Amanuel and Degye 2018, Wivine Muhongayire 2012, Gizachew *et al.* 2017). In the study area, there was not a well-organized study of microcredit use and the main objective of this study was identifying the core determinant factors which constrain small-scale farmers' access of microcredit service.

2. Materials and research methods

2.1. Description of the study area

Raya Kobo is one of the woreda's in north wollo zone of Amhara region which comprises 45 kebeles with a total population of 245,200, of whom 121,605 are men and 123,595 are women. It has a population density of 119.7 people per square kilometer with a farm household of 60,098. Generally the woreda is characterized by low and erratic rainfall, shares 43.74% of irrigable land of the zone, having an average land holding of 0.7 hectares and income is earned by selling the dominant crops and paid labor in addition to livestock and dairy production (WOA, 2010, RKWCO, 2017).



Map 2.1: location of the study area

2.2. Type, Source and method of data collection

This study was fully employed through primary data. The primary data related to household income, household expenditure, farm size and demographic factors which were expected to constrain micro-credit use was collected through structured questionnaires.

2.3. Sampling method and sample size determination

In the study area, there were 60,098 small holder farm households. To select the representative sample of the target population (small-scale farm household heads), the Cochran's (1963) formula of sample size determination for infinite population was used and which is seen as follows.

$$n_0 = \frac{Z^2 pq}{(e)^2}$$

$$= n_0 = \frac{(1.96)^2 * (0.5)^2}{(0.05)^2}$$

$$= 385$$

Where, n_0 = sample size, e = the level of precision at 95% of confidence interval

To obtain the above representative sample, the study applied three stage probability sampling method. In the first stage, systematic random sampling was used to select seven (7) out of 45 (forty-five) rural kebeles in the woreda. In this stage, the 6th kebele, Jemedo, was selected through lottery method and the remaining was selected systematically through this kebele by taking the skipping factor. In the second stage, based on the list of clients of ACSI in the study area, rural farm households in the selected kebeles was stratified based on the microcredit program as users and non-users and finally, the sample was selected from each stratum in the selected kebeles proportionally as

$$n_i = \frac{N_i}{N} \times n,$$

where

$$n_i = \text{sample size of the strata } i, N_i = \text{total househlds of strata } i, N$$

$$= \text{total households of the sample unit and } n = \text{total sample size}$$

2.4. Model specification

A Logit model, which is a univariate binary model, was preferred given that the dependent variable was a

dichotomous, having access of microcredit service or not having access of microcredit service. The dependent variable was expressed as:

$$y_i = \begin{cases} 1 & \text{if } y_i^* > 0 \\ 0 & \text{Otherwise} \end{cases}$$

Where y^* is a latent variable expressing the quantity of microcredit loans contracted by small holder farmer i from micro finance institutions, ACSI. This quantity was a function of the small farmers' household and his farm characteristics (X_i), as expressed in the form of

$$y_i^* = \beta_0 + \sum_{j=1}^n \beta_j X_{ij} + \mu_i \dots \dots \dots \text{eq}_1$$

The cumulative logistic probability function was specified as:

$$p_i = f(Z_i) = F\left(\beta_0 + \sum_{i=1}^n \beta_i X_i\right) = \frac{1}{1 + e^{-Z_i}} \dots \dots \dots \text{eq}_2$$

Where P_i is the probability that a farmer was using Microcredit given his household and farm characteristics X_i , and β_0 and β_i are the parameters to be estimated. After a simple mathematical manipulation of the above equation, equation 2, the odds ratio can be written as

$$(1 - p_i) = \frac{1}{1 + e^{Z_i}} \text{ Or } \left(\frac{P_i}{1 - P_i}\right) = \frac{1 + e^{Z_i}}{1 + e^{-Z_i}} = e^{Z_i} \text{ (Wooldridge, J. (2004))}$$

By taking the natural logarithms of the odds ratio with the consideration of the expected errors made during the research process, the Logit model becomes

$$Z_i = \ln\left(\frac{P_i}{1 - P_i}\right) = \beta_0 + \sum_{j=1}^n \beta_j X_j + \mu_i$$

Therefore, the coefficient of the logit model β_i , presents the change in the log of the odds associated with a change in the explanatory variables, X_i .

2.5. Description and expected sign of working variables

The descriptions and expected sign of the working variables were described in the following table.

| Variable | Types of variable | description of variables | Expected sign |
|-------------------------------|-------------------|---|---------------|
| Credit use | dichotomous | 1= if they use credit, 0 = otherwise | |
| Income acquisition | continuous | the total income accused from microcredit use | |
| Gender | dichotomous | 1= male, 0 = female | + |
| Age | continuous | Years of age | + |
| Marital status | dichotomous | 0=single, 1=married, 2=divorced, 3=widowed | + |
| Education | dichotomous | 0 = illiterate, 1 = read and write, 2 =primary education, 3=secondary education, 4 = tertiary education and above | + |
| Family size | Continuous | Number of family members | + |
| Dependency ratio | Continuous | the dependency level of farm household | + |
| Farm size | Continuous | Total land size owned in hectare | + |
| Ox ownership | dichotomous | 1 = having oxen, 0 = otherwise | - |
| Irrigation | dichotomous | 1= have access to irrigation; 0= otherwise | + |
| Extension service | continuous | the time of contact with extension experts | + |
| Membership of S. organization | dichotomous | 1=member, 0=otherwise | |
| Soil fertility | dichotomous | 1= fertile, 0=less fertile | - |
| Total asset | continuous | Number of cattle's and real assets of the household | - |
| Remittance | dichotomous | 1= obtaining remittance income, 0= otherwise | + |
| Economic shocks | dichotomous | 1=if the household experience to shocks , 0 otherwise | + |
| Purpose of credit | dichotomous | 1 = agriculture and allied activities 0 = consumption | + |
| Perception for group lending | dichotomous | 1=better perception, 0=bad perception | + |
| Organizational procedures | dichotomous | 1= nimble, 0 = monotonous | + |
| Distance from town | continuous | Number of km from the credit source | |

Table 2.1: The expected sign of working variables

3. Results and Discussion

3.1. Descriptive statistics

As shown in the following table, non- users was elder, had slightly lesser family size and have greater dependency ratio compared to their user counter parts. The non-user households also have lower contact with extension workers, have long distance from the credit source, lower farm size and have relatively higher household asset.

| Variable | non-user | | user | | T -test |
|----------------------------|----------|--------|-------|--------|---------|
| | Mean | St.dev | Mean | St.dev | |
| Age | 50.14 | 7.55 | 46.11 | 6.96 | 5.03* |
| Family size | 5.68 | 1.72 | 6.55 | 1.82 | -4.57* |
| Dependency ratio | 0.38 | 0.24 | 0.35 | 0.18 | 1.2 |
| Extension service | 8.96 | 3.46 | 11.34 | 3.54 | -1.63* |
| Distance from- the town | -22.76 | 15.48 | 15.38 | 13.52 | 4.57* |
| Farm size | 0.68 | 0.23 | 0.67 | 0.19 | 0.05 |
| Total asset | 69.82 | 20.81 | 61.57 | 18.74 | 3.77* |

*= significance level at 95% confidence interval.

Table 3.1: Descriptive statistics of continuous variables

The descriptive statistics of the dichotomous variables was shown in the following table, table 3.2. It states that the majority of the respondents were married and which constitute 56.1% of the total sample size. About 24.42% of the households were illiterate and 75.58% literate, among whom 28.83% could read and write, 29.09% had studied primary education and the remaining 17.66% studied secondary education and above. It also shows that from the selected microcredit user respondents, 57.14% of the users was members of social organizations, didn't get micro-irrigation service, and receives high money in the form of remittance from their relatives and experience high economic shocks. The purpose of microcredit use determines the level of microcredit use by the household. In the study area, 54.29% of respondents were using microcredit service for agricultural and allied activities but the p-value of this variable shows that there is no difference in distribution between the two groups.

| Variable | category | Non-user | | User | | Total | | χ^2 value |
|---------------------------|-------------------------------|----------|-------|------|-------|-------|-------|----------------|
| | | N | % | N | % | N | % | |
| Gender | male | 161 | 62.16 | 110 | 87.3 | 271 | 70.39 | 25.7 |
| | Female | 98 | 37.84 | 16 | 12.7 | 114 | 29.61 | |
| Marital status | single | 5 | 1.93 | 0 | 0 | 5 | 1.3 | 14.18 |
| | Married | 129 | 49.81 | 87 | 69.05 | 216 | 56.1 | |
| | Divorced | 76 | 29.34 | 22 | 17.46 | 98 | 25.45 | |
| | Widowed | 49 | 18.92 | 17 | 13.49 | 66 | 17.14 | |
| Education | illiterate | 76 | 29.34 | 18 | 14.29 | 94 | 24.42 | 13.75 |
| | Read and write | 75 | 28.96 | 36 | 28.57 | 111 | 28.83 | |
| | Primary education | 71 | 27.41 | 41 | 32.54 | 112 | 29.09 | |
| | Secondary education and above | 37 | 14.29 | 31 | 24.6 | 68 | 17.66 | |
| Ox ownership | Have oxen | 128 | 49.42 | 47 | 37.3 | 175 | 45.45 | 5.02 |
| | Haven't oxen | 131 | 50.58 | 79 | 62.7 | 210 | 54.55 | |
| Irrigation | Has access | 65 | 25.1 | 63 | 50 | 128 | 33.25 | 23.68 |
| | Hasn't access | 194 | 74.9 | 63 | 50 | 257 | 66.75 | |
| Mem. of org. | Member | 85 | 32.82 | 72 | 57.14 | 157 | 40.78 | 20.76 |
| | Non-member | 174 | 67.18 | 54 | 42.86 | 228 | 59.22 | |
| Soil fertility | fertile | 101 | 39 | 43 | 34.13 | 144 | 37.4 | 0.858 |
| | Less fertile | 158 | 61 | 83 | 65.87 | 241 | 62.6 | |
| Remittance | getting remittance | 94 | 36.29 | 66 | 52.38 | 160 | 41.56 | 9.033 |
| | Didn't get remittance | 165 | 63.71 | 60 | 47.62 | 225 | 58.44 | |
| Economic shocks | experience shocks | 85 | 32.82 | 69 | 54.76 | 154 | 40 | 17.01 |
| | Didn't experience shocks | 174 | 67.18 | 57 | 45.24 | 231 | 60 | |
| Purpose of credit | consumption | 124 | 47.88 | 52 | 41.27 | 176 | 45.71 | 1.49 |
| | Agriculture and allied | 135 | 52.12 | 74 | 58.73 | 209 | 54.29 | |
| group Perception | Better perception | 92 | 35.52 | 72 | 57.14 | 164 | 42.6 | 16.2 |
| | Bad perception | 167 | 64.48 | 54 | 42.86 | 221 | 57.4 | |
| Organizational procedures | nimble | 103 | 39.77 | 74 | 58.73 | 177 | 45.97 | 12.27 |
| | Monotonous | 156 | 60.23 | 52 | 41.27 | 208 | 54.03 | |

Table 3.2: descriptive statistics for dichotomous variables

3.2. Econometric result

The logistic regression model estimation was tested for the problem of multicollinearity through variance inflation factor (VIF) and for the problem of model sensitivity and specificity by receiver operating characteristics curve analysis. The variance inflation factor result shows that there is no the problem of high multicollinearity since the mean VIF was 5.73 while the area of ROC was 0.89 and this infers that the model have not the problem of model selection.

The maximum likelihood estimates of the logistic regression model show that gender, age, education, family size, dependency ratio, oxen ownership, irrigation, extension service, membership of social organization, total asset, remittance, economic shocks, purpose of credit use, perception for group lending, organizational procedures and distance from the town were important factors influencing small-scale farmers access to micro credit in the study area. The rest factors, those are marital status, farm size and soil fertility were less powerful in explaining smallholder farmers' access to microcredit loans.

Since the coefficients of the logistic regression models are interpreted in terms of the odds ratio, the following table gives the marginal effects of the logit model.

Table 3.1.: The marginal effects of logistic regression

Marginal effects after logit

$$y = \text{Pr}(\text{credit use}) (\text{predict})$$

$$= .21813785$$

| variable | dy/dx | Std.Err. | z | P > z |
|------------------------------------|-------|----------|--------|-------|
| gender* | 0.258 | 0.055 | 4.720 | 0.000 |
| age | 0.009 | 0.004 | -2.280 | 0.023 |
| marital status* | 0.038 | 0.049 | 0.780 | 0.436 |
| education* | 0.056 | 0.026 | 2.160 | 0.031 |
| family size | 0.077 | 0.016 | 4.950 | 0.000 |
| dependency ratio | 0.265 | 0.127 | -2.080 | 0.038 |
| farm size | 0.027 | 0.117 | 0.230 | 0.818 |
| oxen ownership* | 0.136 | 0.051 | -2.670 | 0.008 |
| irrigation* | 0.161 | 0.059 | 2.730 | 0.006 |
| extension service | 0.022 | 0.007 | 3.030 | 0.002 |
| membership of social organization* | 0.180 | 0.054 | 3.300 | 0.001 |
| soil fertility* | 0.035 | 0.054 | -0.640 | 0.520 |
| total asset | 0.003 | 0.002 | -2.020 | 0.043 |
| remittance* | 0.148 | 0.055 | 2.680 | 0.007 |
| economic shocks* | 0.115 | 0.055 | 2.070 | 0.038 |
| Purpose of micro-credit* | 0.110 | 0.050 | 2.190 | 0.028 |
| Perception for group lending* | 0.122 | 0.058 | 2.110 | 0.035 |
| Organizational procedures* | 0.134 | 0.051 | 2.620 | 0.009 |
| Distance from the town | 0.004 | 0.002 | -2.080 | 0.038 |

(*) dy/dx is for discrete change of dummy variable from 0 to 1 {*, ** significant at 1% and 5% respectively}

The results of the logit model show that female household heads were constrained from microcredit service than their male counterparts. The age of household head affects the probability of microcredit use negatively at 95% of confidence interval and it implies as the age of the household head increases by one year, the probability of using micro credit loans will decrease by one percent. Education have a positive effect and it is expected that Literacy status can influence farmers' access to formal credit institutions, since literate farmers are assumed to have information about the market and other facilities provided by the government. Access of irrigation scheme has a positive effect and as the household being irrigation accessed, the probability of using microcredit will increase by 16 percent. Frequency of extension service as a determinant variable had a positive effect on rural household's participation in credit utilization and was significant at 1% significance level.

In this research, the total livestock and the fixed assets of the household converted in Ethiopian birr at the current market price were one of the factors that determine microcredit use. The result was significant at 95% of confidence interval and it is interpreted as the household's asset increased by one birr, the probability of microcredit use will decline by 0.3 percent. Experience of shocks, remittances income and better perception of group lending was positively and significantly related to the probability of accessing a microcredit service to the household.

Finally, the result of the logit model indicates that distance travelled by households from their home to microfinance institutions was negatively affect household's participation of credit service negatively at 5% significance level. The negative relationship between the town and the household's residence implies that those

households who travelled a long distance to reach the town participates less in the credit market.

4. Conclusion and recommendations

This study was fully conducted by using a primary data collected through structured questionnaires from 385 household heads which were selected through three stage probability sampling techniques. The data was analyzed through descriptive statistics and logistic regression methods. In the study area there was a reasonable determinants of microcredit use which was explained by the logistic regression estimate. The estimates of the model shows that being male, lower age, better education, large size of the family, low dependency ratio, have not oxen for plough, having access of irrigation service, high contact of extension service, being a member of social organizations, lower household asset, getting remittance income, experiencing a continuous shocks, pursuing microcredit for agricultural activities, having better perception for group lending, having nimble organizational procedures and small distance from the town promotes smallholder farmers access to micro credit participation in the study area.

Therefore, the expansion of irrigation scheme plays a great role in the creation and expansion of non-farm activities with a supervised extension service and it is recommended to expand irrigation scheme and skilled extension workers with underlined strategies.

The reduction of bureaucratic procedures and developing new rural institution is also the best mechanism to motivate small-scale farmers' micro-credit service participation. As I was realizing the felling of clients during the data collection showed that there is a problem of organizational procedures so that reducing institutional bureaucracy and delivering standardized service creates a satisfaction for clients and increase access for microcredit which in turn promotes income diversification and acquisition.

Author's contribution

The author of this manuscript, Mr Abate Belaye devotes more starting from idea generation to the final result. Time were allocated for data collection and digging out valuable materials to make the manuscript smart.

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Competing interest

The author states that there is no any competing interest.

Availability of data and materials

The datasets generated and analyzed during the study are not publicly available, due to confidentiality issues, but they are available from the corresponding author.

Consent for publication

Not applicable

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Ethics approval and consent to participate

Not applicable

List of Acronyms

| | |
|-------|---------------------------------------|
| ACSI | amhara credit and saving institution |
| GDP | gross domestic product |
| LDCs | less developed countries |
| RKWCO | raya kobo woreda communication office |
| SSA | sub Saharan Africa |
| VIF | variance inflation factor |
| WOA | woreda office of agriculture |

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