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Determinant Factors of Credit Use and Its Impact on Small Farmer's Income: A Study in Lemo Woreda, Hadiya Zone, Southern Region, Ethiopia

Nuri Lefebo Toramo (PhD)
Assistant professor, Wachemo University, Ethiopia

Abstract
Delivering productive credit to the rural farmer has been a hotly pursued. Farmers in Ethiopia cannot implement improved agricultural technologies out of their own funds. They need credit to implement the new technologies. However, the achievement of credit is controversial. Therefore, the major concern of this study was to assess the impact of credit on gross farm income and to identify factors affecting credit use by small farmers. Primary data were collected from randomly selected farmers. A total of 118 households comprising 85 credit users' and 35 non-users were included in the final analysis. In addition, secondary data were collected from relevant organizations and pertinent documents. Descriptive statistics such as mean, standard deviation and percentages were used for analyzing the data. Moreover, t-test and χ^2 - test were employed to compare credit users and non-users with respect to the hypothesized and other related variables. A binary logit model was employed to examine factors influencing agricultural credit use. In this regard, a total of eleven explanatory variables were included in the empirical model of which six were significant, while propensity score matching technique was employed to analyze the impact of credit on gross farm income. Fertility status of the soil, total household expenditure, and frequency of contact of DA were highly important in influencing agricultural credit use as evidenced by the model output. The other critical variables include farm size and gross farm income. While cultivated area, number of draft oxen, credit and total livestock unit were highly important factors of production contributing to gross farm income. The other critical variables include family labor and frequency of contact of DA. Therefore, considering of factors affecting credit use, impact of credit on gross farm income and livelihood of the farmer are vital in providing information to undertake effective measures with the aim of extending loans and increasing access to credit.
Keywords: Farm credit, farm income, Impact, Propensity Score Matching, Ethiopia.

1. INTRODUCTION

Agriculture is the dominant sector in the Ethiopian economy. The level and the speed of 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. The importance of agricultural credit in the development of the sector has been underlined strongly by various authors (Kebede, 1982; Itana, 1985; Berhanu, 1993; Negussie, 1993; Bekele, 1995; Freeman et al 1996; Belay and Belay, 1998; Fantahun, 2000; Meehan, 2001; Woldy, 2002; and Tsehay and Mengistu, 2002). All these authors has concluded that credit helps to bring the requested productivity, bring farmers live for better and food self-sufficiency through the adoption of new and improved technologies.

However, there are many factors influencing credit use. Hence, this study aimed at identifying factors affecting credit use and impact of credit on gross farm income and standard of living of the small farmers. The aforesaid brief summary of evidence and arguments suggests that micro-finance interventions normally lead to increase in incomes, contribute to individual and household livelihood security and change of social relations for the better but that they cannot always be assumed to be doing so.

Credit in agriculture can also be an instrument of defaults and stagnation rather than an instrument of progress, unless it is promptly and efficiently used in increasing agricultural productivity (Dhawan and Kahlon, 1977). Under conditions of peasant agriculture, both the provision of credit and its efficient use in increasing agricultural productivity confront difficult problems. Some of the problems are lack of access to credit, inadequate supply of credit, untimely supply of credit, and diversion of credit.

In view of the current need for attaining food-self sufficiency in the country, and the study area being one of the strategic places to fulfill this requirement, the findings of the research would be of great policy use. The study of factors affecting credit use is important in providing information that will enable effective measures to improve access to credit. It will also enable lenders and policy makers to get knowledge as to when and how to channel efforts in order increase access to credit. Moreover, the study on impact of credit on the livelihood of the society and gross farm income enables the lenders to stop, change, or continue providing credit service and the policy makers to formulate appropriate policy for extending credit. Therefore, the outcome of the study would be useful in formulating appropriate credit policy for the agricultural sector, besides modifying the ways of

extending loans by the credit institutions. Above all, it can be a benchmark for further study.

2. LITERATURE REVIEW

Formal Financial Institutions in Ethiopia: The formal financial institutions include the National Bank of Ethiopia (NBE), Commercial Bank of Ethiopia (CBE), Development Bank of Ethiopia (DBE), Construction and Business Bank (CBB), and the recently proliferating private commercial banks like Dashen, Wogagen, Abysinia, Awash International, Nib-International, etc; and the non-banking financial institutions like the public and private insurance companies (Ethiopian Insurance Corporation (EIC), NICE, NYALA, Africa, Awash, etc.).

In the Ethiopian context, farm credit has been made available through public financial institutions of which Commercial Bank of Ethiopia (CBE) and Development Bank of Ethiopia (DBE) are the two major providers of input credit (such as fertilizer, improved seed, herbicides, farm tools, etc). But AIDB/DBE sharply reduced its supply of fertilizer loans in the early 1990s as its existence was threatened by massive default. Development Bank of Ethiopia (DBE) stopped extending input credit since 1997. Currently the major source of input credit is micro finance institutions and with limited participation of Commercial Bank of Ethiopia (CBE).

There are many micro-financial institutions officially recognized by the National Bank of Ethiopia (NBE, 2009). These institutions deal directly with individual farmers who fulfill the loan provision criteria set by their management. Though figures on the amount of credit they provide are not available, it is believed that these institutions play an important role in narrowing the gap between the demand and supply of credit in rural areas. The advantage of these financial institutions is that farmers can get loan in cash and use it to purchase the most limiting production resources.

Due to large number of defaulters, banks were not interested in extending input credit to farmers. The regions came into the picture of credit administration to fill the gap (Mulat, 1994). The majority of farmers in Ethiopia (over 80%) buy fertilizer on credit (Mulat, 1994). Since farmers are forced to re-pay their fertilizer loans immediately after harvest when grain prices drop to very low levels because of over supply, farmers became defaulters.

Informal Financial Sector: The informal financial sector in Ethiopia comprises mainly *Iqqubs* (rotating savings scheme), *iddirs* (traditional insurance schemes), *arata-abedari* (usurers), etc. This sector is neither regulated nor counted for in the country's financial intermediation process. The sector, however, provides by far the greatest financial services to the bulk of the population on flexible terms.

Though, the informal financial sector is important to most informal sector operators and the farming population, government support to the sector has been until recently very little. Nowadays, micro enterprises and informal sector promotion are getting serious consideration and support from policy makers as it is believed that this sector generates sizeable self- employment and helps alleviate poverty. Solomon (1996) stated that the informal financial institutions are by far the most important sources of loanable funds both for the rural and urban population. Dejene (1993) empirically demonstrated how inaccessible the formal credit is to the majority of the Ethiopian population. According to him, the bulk of the Ethiopian population makes little or no use of the formal savings and lending institutions.

Performance of Micro finance Activities: Measuring the impact of micro finance services on the urban and rural poor is fraught with many methodological problems relating to the fungibility of money and separating the impact of micro finance intervention from other interventions. Rigorous econometric studies are costly and often highly specific, unfriendly to practitioners, making generic application of their findings impossible. The framework used in this study to assess the impact of micro finance industry as a whole is using the outreach, sustainability and impact criteria.

Outreach is a hybrid measure that assesses the extent to which an MFI has succeeded in reaching its target clientele and the degree to which the MFI has met the clientele's demand for financial services (Yaron, 1994). Alternatively, outreach is the provision of a wide array of quality financial services to a large number of poor people (Lariviere and Martin, 1999). It is measured in terms of the number of clients, loan size, percentage loans to clientele below the poverty line, percentage of female clients, range of financial and non-financial services offered to the poor, the level of transaction costs levied on the poor and the extent of client satisfaction with respect to financial services. However, on top of the criteria of sustainability and outreach, one has to include developmental effects (income and empowerment) on the target group as core performance criteria.

The sustainability of an MFI is measured in terms of generating enough revenues (excluding subsidies) to cover the cost of all factors of production and loanable funds. If an MFI is to maintain its capital holding, it must generate sufficient resources to meet its operating costs, including the costs of administering loans, mobilizing and training groups, mobilizing funds for on-lending, and covering the bad debts. A basic condition for financial sustainability of an MFI depends on its ability to break even, given the cost of lending. A sustainable MFI operates in such a way that the cost of making loan (the cost of funds plus administrative and default costs) is equal to or less than the price (that is, the interest rate) it charges borrowers. Establishing a sustainable MFI and reducing poverty are not conflicting objectives. Actually building sustainable micro finance institutions in

Ethiopia will be preconditions to deliver financial services to the poor in a sustainable manner that permits donors to withdraw after making relatively modest interventions.

Economic Rationale of Credit Use: As agriculture is the major sector of the economy and the peasant sector is dominant within agriculture, strengthening and developing the peasant sector is bound to stimulate the agricultural sector which in turn will trigger the rest of the economic sectors the cumulative effect of which will be net increase in the GDP (AIDB, 1993). Most of the time, especially during the take-off stage, agricultural development cannot be made by farmers out of their own funds because of their low level of income. This widening the gap between the owned and the required capital calls for outside funds (Singh et al, 1985) .

Some researchers (Gonzalez-Vega, 1977; Pischke, 1980; Adams and Graham, 1981; and FAO, 1996; underlined the importance of credit facilities to small holders of less developed countries (LDCs). Governments of LDCs and aid agencies have spent large amounts of money on agricultural credit schemes. Loans are an essential part of various input packages that were prescribed as part of agricultural investment projects designed to introduce modern technologies and thus stimulate change and growth in agricultural studies undertaken in Ethiopia. In support the above explanations, credit expansion to small farmers increases their productivity and improves their standard of living. For instance, Assefa (1987) reported the need for the expansion of agricultural credit to all areas of the country. Likewise, Birhanu (1993) and Getachew (1993) pointed out the need for agricultural credit to increase productivity and accelerate adopting rate of agricultural technology package. Tsehay and Mengistu (2002) also reported that credit expansion improves the standard of living, and bring about economic and social empowerment of women. Similarly, Belay and Belay (1998), emphasizes that credit is essential for agricultural development. Negussie (1993) listed out several ways in that credit can contribute to the improvement of the economy.

Meehan (2001) concluded that the provision of financial services to the poor has a crucial role to play in providing household food security and alleviating poverty. If the credit is found to be adequate and productive, it will positively influence the optimum use of resources and enables the full application of technology (Vastoff, 1968). Traditional peasants have low level of production unless they are provided with reasonable amount of agricultural
credit (Dhawan and Kahlon, 1977).

Wolday (2002) pointed out that poverty in Ethiopia is a multidimensional and so its solution. The delivery of financial services has been viewed as one of the anti-poverty tools of the development programs in Ethiopia. To ascertain whether the formal credit intervention has brought about positive welfare shocks to its clients, a descriptive analysis was made use of by taking credit users and non-users respondents. The inter-temporal comparison of welfare status of the farmers captures variables like gross farm income, off-farm income, consumption, assets, nutrition, health, education, etc.

In Ethiopia, the importance of agricultural credit in the development of the sector has been underlined strongly by various researchers (Kebede, 1982; Itana, 1985; Berhanu, 1993; Negussie, 1993 Bekele, 1995; Freeman et al 1996; Belay and Belay, 1998; Fantahun, 2000; Meehan, 2001; Wolday, 2002; and Tsehay and Mengistu, 2002). All these researchers have concluded that credit helps to raise productivity, improve standard of living and attain food self-sufficiency through the adoption of new and improved technologies.

Factors Influencing Credit Use

Farm development involves adoption of improved and efficient technology, which demands credit facility to purchase the required packages of inputs. Miller (1977) noted that the shortage of finance in combination with very low level of saving due to little or no marketable surplus of agricultural production is considered to be one of the major constraints impeding farm development in most of the developing countries.

Singh and Ramanna (1981) reported that the distribution and consumption of fertilizers is closely associated with the use of credit. If there is a need for increasing fertilizer use, the provision of efficient credit service for the purchase of the same is considered very essential. The close relationship between fertilizer consumption and credit use calls for the mobilization of considerable financial resources. Dhillon and Sankhayan (1978) pointed out that the availability of working capital was a significant factor influencing the access to and use of fertilizers on favorable terms and at the right time.

Credit studies conducted in India (NCAER, 1974; Sarap, 1987) and in Nigeria (Oludimu, 1983) used regression analysis to assess the factors that influence the need for institutional credits by small farmers based on cross-section data obtained from field surveys. The studies revealed that farmers adopting improved farming practices and farmers with relatively high farm incomes have substantially higher credit needs compared with farmers using traditional practices and having lower farm incomes. Farm size and literacy were positive and significant factors associated with the level of credit needs of small farmers.

In another study based on the data obtained from a sample survey of 699 randomly selected peasant farmers in Bolivia, Miller and Ladman (1983) applied discriminant analysis to identity a set of socio-economic, physical and psychological factors that influence credit use among small farmers with a view to differentiate between

borrowers, potential borrowers, and non-borrowers. The results of the study indicated that borrowers were characterized by higher resource base, farm size, higher level of education, large number of cattle, higher household incomes, higher level of market integration, greater use of improved technology, larger operating costs and investments, higher risk ability, etc. Potential borrowers were characterized by farther distance from markets, low level of market integration, higher transaction costs, less number of cattle, etc. Further more, non-potential borrowers were characterized by older age, lack of interest to expand production, lower level of education, limited use of improved technology, shortage of labor and proximity to market.

Assefa (1989) empirically tested a set of socio-economic and other important factors influencing agricultural credit use among small farmers aimed at differentiating borrowers from non-borrowers. Using discrimnant analysis, Assefa found that large farm size, high investment, adoption of improved technology were significant variables in distinguishing borrowers from non-borrowers. He noted that policy implications regarding combined services of input supply, credit, marketing, training extension, etc. should be adopted to increase agricultural productivity.

Wolday (1989) followed log-linear farm income function and probit models to identify the factors, which inhibit the income of small farmers, and to access the major factors that limit the consumption of fertilizer and improved seed in peasant farming. His study was based on the sample survey conducted during 1987/88-crop year in Shebedino woreda, Ethiopia. His empirical test confirmed that the size of land holding, amount of fertilizer used, number of cattle, and value of farm tools in the farm income function and farm labor, farm income, ownership of radio, and extension contact in the probit model were significant and satisfactory variables to explain the variations in farm income and the adoption of fertilizer use by small farm Generally, credit removes the financial constraint to production and helps to accelerate the adoption of new technologies, increase productivity, and improve national and personal incomes. In addition, it constitutes an integral part of the process of commercialization of the rural economy and a convenient means of addressing rural poverty (MoA, 1995). Credit is the key input in every development program. This is particularly true for rural development because so long as sufficient credit is not provided to the development programs of poor sections of the society, the goal of development cannot be achieved. Access to capital in the form of either accumulated saving or a capital market is necessary in financing the adoption of many new agricultural technologies (Feder et al, 1985).

3. METHODOLOGY

Description of the Study Area: Lemo is one of the 10 rural Districts of Hadiya Administrative Zone in Southern Ethiopia. It is bordered on the south by the Kembata Tembaro Zone, on the southwest by Duna and Soro Districts, on the west by Gomibora District, on the northwest by Misha District, on the north by Gurage Zone, on the northeast by Ana Lemo District, and on the southeast by Shashogo District. It is located some 230 km south of Addis Ababa and 175 km west of Hawassa town. There are a total of 33 *kebeles* in the District. Rural towns in the District are Belesa and Lisana. It has a total land of 34,973 hectare. The town of Hosanna is surrounded by Lemo District. Based on the 2007 Census conducted by the CSA, the District has a total population of 118,594, of whom 58,666 were men and 59,928 were women; 2,049 or 1.73 percent of its population were urban dwellers. However, based on 2012/13 annual household survey of the District, it has a total population of 150,719, of whom 74,574 were men and 76,145 were women. The majority of the inhabitants were Protestants, with 74.07 percent of the population, 12.37 percent were Muslim, 7.2 percent were Ethiopian Orthodox Christian, and 6.14 percent were Catholic.

The credit Services/Products that provided by financial institutions are: agricultural credit, petty trade credit, handicraft credit and service credit. Annual lending rate is 15 percent for all credit types and no other additional charges. The institutions have adopted some policy regarding credit term. These include: loan term for all agricultural and micro-business loans ranges between three months and two years depending on the type of activities financed; loan term for small investment and working capital loan on the other hand extends from a minimum of two years to the maximum of 5 years depending on the nature of the business being financed; working capital loans are provided only for a maximum of one year; it is only for investment loans that the policy of 2 to 5 years repayment terms applies, while agricultural loans may have longer periods.

Data Sources, Sampling and Data Collection: To select sampled respondent farmers, two-stage simple random sampling technique was employed. Use of administrative units is necessary to select representative study sites within the District. The smallest administrative unit in the District is *Kebele*. There were 33 *Kebeles* in the District. Three *Kebeles* namely: Ambicho Gode, Jawe and Shurmo were randomly selected. The reasons for choosing the simple random sampling technique are its simplicity and existence of similarity in farmers' socio-economic conditions in all midland *Kebeles* of the District. Thus, those chosen *kebeles* were assumed to be representative of Lemo district. By taking the list of farm household heads from each selected *Kebeles* as a sample frame, 118 representative farm household heads were randomly selected in probability proportion to size of each *Kebele's* population (Table 1). Representative sample size was determined using the formula which is

developed by Yamane (1967): $n = \frac{N}{1 + N(e)^2}$

Where, n is sample size, N is target population and e is level of precision, in this case it is 9%.

Table 1. Total number of the sampled farmers and population in the sampled *kebeles*

Kebele	Total number of households	Sampled farmers
Ambicho Gode	889	39
Jawe	904	39
Shurmo	922	40
Total	2715	118

Source: Own computation, 2017 from LDOARD

In this study, both primary and secondary data sources were used to gather necessary data regarding to assess the impact of credit on gross farm income and to identify factors affecting credit use by small farmers. The data used for this study were collected from a sample of formal credit user and non-user farmers through structured questionnaires, which were prepared for the study. Information pertaining to respondents, socio-economic characteristics and institutional situations etc. were obtained directly through the interview, which was conducted at household level. Secondary data were obtained from published and unpublished documents of different organizations

Methods of Data Analysis: Descriptive statistics like means, frequencies, percentages, maximum, minimum, and range were used to describe the descriptive result while Logistic regression model and Propensity score matching (PSM)model were employed to identify factors affecting credit use the impact of credit on gross farm income.

Specification of the models: Following Pindyck and Rubinfeld (1981) the cumulative logistic probability function is specified as:

$$P_i = F(Z_i) = F\left(\alpha + \sum_{i=1}^{m} B_i X_i\right) = (1/_{1+}e^{-(\alpha+\Sigma\beta_i x_i)})$$

Where: P_i represents the probability of that i^{th} household will make a certain choice (in this case user and non-user), given explanatory variables (X_i); e represents the base of natural logarithms (2.718); X_i represents the explanatory variables; m_i represents the number of explanatory variables, i = 1, 2, 3 …, m, and α and β_i are parameters to be estimated.

Coefficient interpretation will be understandable if the logistic model once written in terms of the odds and log of odds (Hosmer and Lemeshow, 1989). The odds ratio is simply the ratio of the probability of being credit user (P_i) to the probability that he/she would be non-user ($1-P_i$). But P_i is non-linear not only in X_i but also in α_i and β_i which creates an estimation problem. So, we cannot use the familiar OLS procedure to estimate the parameters.

But $1-P_i = \frac{1}{1+e^{zi}}$

Therefore, the odds ratio becomes,

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

Therefore, to get linearity, we take the natural logarithms of odds ratio equation (4), which results in the logit model as indicated below:

$$Zi = Ln\left(\frac{p_i}{1-p_i}\right) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_m X_m$$

As P goes from o to 1, the logit goes from $-\infty$ to ∞. That is, although the probabilities lie between 0 and 1, the logits are not so bounded (Gujarati, 1995).

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

$$Z_i = \alpha + \sum_{i=1}^{m} \beta_i \chi_i + u_i$$

Propensity score estimation: A logit model was used to estimate propensity scores using a composite of pre-intervention characteristics of the sampled households (Rosenbaum and Robin, 1983) and matching was then performed using propensity scores of each observation.

The effect of the treatment on the treated was explained by using a standard multiple linear regression model, which is specified as follows:

$Y = \beta 0 + \beta_i X_i + u_i$

Where, *Y i* is magnitude of the impact of the credit use on beneficiaries expressed in income, β0 is the regression intercept, β_i is a vector of regression coefficients to be estimated, *X i* is intervention independent variables and *U i* is an error term.

Definitions of Variables and Working Hypothesis

Dependent variable of the logic model: The dependent variable for the logit analysis is of dichotomous nature representing the observed status of credit use of the household. It represented in the model by 1 for credit users and 0 for non-users.

Dependent variable of the Propensity score matching model: The dependent variable for the Propensity score matching model is of continuous nature representing the observed status of gross farm income of the household. This refers to the total value of crops and livestock products. Based on the literatures reviewed and discussion held with stakeholders, the explanatory variables selected for this study were broadly categorized under socioeconomic, institutional and natural factors. In what follows, a brief explanation of the explanatory variables selected for this study and their likely influence on the credit use and impact on farmer's income is presented below.

Age of household head: This was defined as the age at the time of interview measured in years completed. Through time farmers acquire experience in formal credit use. In addition, older farmers may accumulate more wealth than younger ones. Therefore, this variable was hypothesized to have a positive impact on agricultural credit use.

Sex of household head : This is a dummy variable, which takes a value 1 if the household is male and 0 otherwise. Gender differentials among farm households play a significant role in the economic performance of a given household. Some empirical studies have demonstrated that gender is important in defining the economic role of rural people in Africa (Mc Sweeney, 1979; Dey; 1980; Addis, et al, 1999). More specifically, gender differentials can be related to access to credit. In this case, one may expect that female-headed households have less access to credit because they are less experienced in formal credit. This may be because females are more preoccupied with childcare and home management than interaction with the external environment. Therefore, this variable was hypothesized to have positive impact on agricultural credit use.

Family size: This refers to the total number of family members of the household. The larger the number of family members, the more the labor force available for production purpose. This is true if the dependency ratio of the household is small. Large family size needs more production for consumption so that more access to credit and vice versa. Therefore, Family size was hypothesized to have either positive or negative impact on access to credit and have either positive or negative impact on farmers' income.

Education level of household head: This is a dummy variable, which takes a value 1 if the household is literate and 0 otherwise. Educated farmers are expected to have exposure to external environment, to be acquainted with agricultural technologies, too frequently meet DA's and get written agricultural materials, etc. Therefore, an educated farmer would be expected to go for agriculture credit.

Farm size: This is the total farm size cultivated by the household given in hectare. Since it reflects ownership of an important asset, it is expected to affect access to agricultural credit. The theory of substitutability of factors of production implies that, land substitutes the other input fertilizer, which is purchased from credit. Hence, larger farms apply a smaller amount of fertilizer obtained through credit. Therefore, farm size, as a variable, was hypothesized to have inverse relationship with agricultural credit.

Fertility status of the soil: Soil fertility refers to the productivity of the soil with little or no application of fertilizer. Soil fertility and productivity are directly correlated. The more the soil fertility, the more productivity of the land is. Hence, the lesser the farmer applies fertilizer to the soil, the lesser the dependence on agricultural credit. Therefore, this variable expected to have a negative relation with the dependent variable.

Number of Oxen: This is the number of draft oxen per household during that production year. Oxen are the prominent source of traction power in the study area. Farmers with large farm size would have more number of oxen for cultivation. However, a farmer with large farm size has less access to credit. This is because of substitutability of factors of production. This implies that large farm size leads to large number of oxen which in turn leads to less fertilizer purchased from credit. Therefore, number of oxen, as a variable, hypothesized to vary inversely with the access to agricultural credit and a positive impact on agricultural production thereby farmers' income.

Off-farm income: This refers to the total value of crops and livestock products. Off-farm activities generate additional sources of income for smallholders it also may help farmers to adopt new technologies. This is because relatively the well to do farmer tend to take risks than the poor ones. Moreover, credit is given to potential productive farmers than poor farmer. Therefore, this variable was expected to influence access to credit positively.

Total livestock ownership: This refers to the total number of animals possessed by the household measured in tropical livestock unit (TLU). Livestock is considered as another asset which is liquid and a security against crop failure. Farmers owning more livestock can settle their debts and they even neutralize crop failure by selling out their animals and animal products. In this study access to credit use of farmers is expected to increase with the total livestock owned and have a positive impact on farmers' income.

Frequency of Contact DA: This refers to the total number of visits development agent per year. Agricultural extension services provided by agricultural bureaus and NGOs to farmers are mediated by DAs. DAs play an important role in the introduction, dissemination and adoption of new technologies. Therefore, this variable is expected to influence access to credit use positively and influence production positively and thereby increased in income.

Total expenditure: This refers to the sum of household expenses on food item, clothing, education, health, etc. The household, which spends more, is expected to be wealthier. The wealthier household expected to spend more not only consumption items but also production items. The household, which spends more out of its capital, is expected to spend more on farm inputs, which again increases his capital later. Therefore, it is hypothesized that this variable has a positive relationship with access to agricultural credit.

Input Credit : This is the value of total credit used for production purpose. Since, the credit extended to the farmers used for production purpose, it encourages production. Therefore, this variable was hypothesized to have a positive impact on agricultural production thereby farmers' income.

4. RESULTS AND DISCUSSION

4.1. Results of Descriptive Statistics Analysis.

The descriptive statistics analysis made use of tools such as mean, percentage, standard deviation and frequency distribution. In addition, T-test and Chi-square test statistics were employed to compare credit user and non-users groups with respect to some explanatory variables.

Out of the total 118 interviewed households 85 (72%) were credit users, and the remaining 33 (28%) were non credit users. The average age of household heads was 43 years with the minimum and maximum ages of 21 and 73 years, respectively. The average age of credit user household heads was 45 years, while that of non credit users was 41 years with mean difference significant at 1% level. On the other hand, the average family size of the sample households was 5.87; higher than the national average of 5 persons (CSA, 1994). The largest family size was 14 and the smallest was 1. The average family size of credit users was 5.84, while that of non credit users was 5.74 with no significant difference between means of the two groups.

The survey results also revealed that 74 percent of the sample household heads were illiterate, whereas 26 percent of the house holds heads were literate (Table 3). Of the total sample respondents, 74 percent of the credit users and 72 percent of non credit users were illiterate respectively. There was no significant difference between non credit users and credit users in terms of their literacy level. The sample was composed of both male and female-headed households. Of the total sample household heads 82 percent were male household heads and 18 percent were female household heads. 15 percent of the non credit users and 19 percent of the credit users were female-headed households respectively. The differences in terms of gender among the two groups was not significant (Table 3). Land is the basic asset of farmers. The average size of own cultivated land was nearly 1.49 ha, the minimum and the maximum being 0.25 and 5 ha, respectively. Credit users cultivated on average larger area of land (1.51ha) than non credit users (1.07ha). The mean difference was significant at 1 % level. The results of the survey also indicate that the average gross income were 2123 for credit users and 1321 for non-credit users, respectively. The differences between the two groups, was significant at 1% probability level.

Table2. Socio-economic and institutional characteristics of the households (continues variables)

Characteristics	Credit users (N=85)		Non credit users (N=33)		T- value	Total Sample (N=118)	
	Mean	St.dev	Mean	St.dev		Mean	St. dev
Age	45	13	41.0	13.04	2.881***	43	11.02
Family Size	5.81	2.26	5.73	2.15	0.240	5.87	2.13
Total land holding	1.52	0.95	1.07	0.95	4.471***	1.48	0.84
Total live stocks in TLU	3.71	4.27	2.12	2.59	2.431**	3.78	4.12
Gross farm income	2125	1323	1455	1243	2.81***	1825	1523
Amount of money spent	40.55	244.70	86.76	177.23	0.594	64.81	234.91
Amount of Money Borrowed	426.90	369.60	321.90	256.38	1.554	404.17	350.19
DA contact days/ months	1.86	1.46	0.97	1.36	2.611**	1.52	1.46
Experience in agri. ext	2.99	1.82	2.00	0.25	3.122***	2.74	1.66

Source. Computed from the field survey data

*** and ** represent level of significant at 1% and 5% level respectively.

Farmers in the study area undertake both crop and livestock production activities. Though livestock holding size varied among the sample farmers, 84.75 percent of the total respondents owned livestock. Livestock are kept for various economic and social reasons in the study area. The major economic reasons include provision or supply of draught power, generation of cash income, food and animal dung (as an organic fertilizer and fuel). Based on Storck *et al*. (1991) standard conversion factors, the livestock population number was converted into Tropical Livestock Unit (TLU), so as to facilitate comparison between the two groups. On the average, a household had 3.78 TLU with standard deviation of 4.12 (Table 3). The minimum number of livestock kept was 1 whereas the maximum was 35.5 TLU. Credit users owned a larger number of livestock (on average 3.71 TLU) compared to the non credit users (on average 2.12 TLU) with mean difference significant at 5% significant level. The implication is that credit users have more access to financial capital by selling their livestock to recover their loan (Table 2). Expenditure on social festivals includes expenditure for social ceremonies such as wedding, circumcision, funeral of a family member or close relative and engagement. Of the total respondents 10.50 percent reported that they had celebrated one or more of the above occasional ceremonies and 89.50 percent stated that they had not celebrated any of them during the study period. Meanwhile, amount of money spent for social ceremonies were 40.55 percent of credit users and 86.76 percent of non credit users (Table 2). Experience in agricultural extension package varied among the sample from minimum value of one-year experience to a maximum of 10 years experience. Credit users participated on average for higher number of years (2.99) as compared to the non-credit users who participated on average for 2 years (Table 2). The mean difference between the two groups was significant at 1% level of significance. That is, farmers experience in agricultural extension services has significant role in farm performance. The results of the survey also indicate that 76.40 percent of the respondents had extension contact, while 23.60 percent did not have any contact with extension agents. An average number of extension contact days were 1.86 for credit users and 0.97 for non-credit users, respectively. The differences between the two groups, was significant at 5% probability level. That is, respondents who had frequent contacts with development agents generate more production as compared to those who had no or few contacts (Table 2). The sample households on average borrowed Birr 404.17. However, the loan size varied in accordance with the type of financial institution. An other sources of income for the farmers of the area, other than livestock and crops production, were off-farm activities. About 28.00 percent of the sample household heads reported that at least one of their family members was engaged in off-farm activities, which helped them to earn additional income. The survey results also indicated that larger proportion of credit user households (32 %) sent their members to off-farm activities as compared to the non credit user households (14 %), with significant percentage difference at 10 % probability level.

Table 3. Socio-economic and institutional characteristics of farmrs (discrete variables)

	Credit users		Non credit users		χ^2-value	Total	
	No.	Percent	No.	Percent		No.	Percent
Illiterate	63	74	24	72	5.156***	87	74
Literate	22	26	9	28		31	26
Male	69	81	28	85	2.172	97	82
Female	16	19	5	15		21	18
Benefited Yes	75	88	22	67	7.480***	96	82
No	10	12	11	33		22	18
Income off-farm Yes	27	32	5	14	3.757*	34	28
No	58	68	28	86		84	72
Saving Money Yes	8	7	0	0.00	2.814	9	5
No	77	93	33	100.00		109	95
Purpose of borrowing					0.165		
For agri. Input purchasing	49	58	18	56		67	57
For other purposes	37	42	15	44		51	44

Source. Computed from the field survey data

*** and * Represents significant at 1% and 10 %level

The sample farmers were asked about their perception of the benefit of credit. Out of the total respondents, 88 percent of the non-defaulters and 67 percent of defaulters replied that they have benefited from the credit service (Table 3). The difference in perception of credit benefits was significant between the two categories.

4.2. Results of the Econometric Model:

Factors Influencing Use of Agricultural Credit: To study factors affecting credit use, data gathered from 118 small farmers were subjected to logistic regression analysis. The statistical software used for analyzing the data was stata 11 for windows. The logit model was selected for analyzing the factors influencing the use of a given technology (in this case, credit) of the sample households. Prior to running the logistic regression model, both

the continuous and discrete explanatory variables were checked and no problem for the existence of multi-collinearity.

The maximum likelihood estimates of the logistic regression model show that farm size, fertility status of the soil, Off farm income, total expenditure, and Frequency of contact of DA per year were important factors influencing agricultural credit use of small farmers.

Farm size was found to be important in reducing agricultural credit use. The Wald statistics corresponding to the variable show that it is significant at 10% probability level. The odds favoring access to fertilizer credit use decreases by a factor of 0.325 for farmers who had higher farm size. The possible explanation is that as farm size increases, the farmer can produce more from his large land holding, so that he need not go for credit. The results of a study by Berhanu (1993) had also revealed that farmers with relatively larger farm size tend to use a smaller amount of fertilizer credit. This statement supports the economic logic of the substitutability of fertilizer for land.

A farmer facing the problem of low level of production due to shortage of farm land and limited use of modern farm technologies would increase his productivity through the use of fertilizer and other improved farm inputs. In practice, all the sample farmers bought fertilizer on credit. For this reason, agricultural credit use was inversely correlated with the level of farm size. This result is also consistent with studies carried out in India (NCAER, 1974; Sharma and Prasad, 1978; Subbarao, 1980) which revealed that the level of farm credit for fertilizer and high yielding varieties (HYV) varied inversely with farm size, i.e., small farms used relatively more credit than large farms. Farmers with limited farm income due to limited land holding tended to intensify their farm by acquiring more fertilizer and HYV thorough credits. This inverse relationship between agricultural credit use and farm size is in line with the results of a study on adoption of new farm practices in Thailand (Greene, 1970), which stated that farmers with smaller farm size used more fertilizer than farmers with larger land holdings. However, whether the size of land holding owned by a farmer is large or small, as far as the extended credit is well managed, it is beneficial to farmers because quick return will be obtained within the crop season.

Off farm income is another factor, which is significantly related to the dependent variable and that it is significant at less than 5% probability level. The odds favoring access to fertilizer credit use increases by a factor of 1.102for farmers who had higher farm income. An empirical study in India at three villages revealed that institutional credit is concentrated in the richer households who have the following characteristics: more educated, older, large family size, and large farm size (Bhende, 1983). Higher farm income increases credit worthiness, which strengthens the repayment ability of farmers. This condition holds true for the fact that higher level of farm income increases the repayment capacity of the farmer, which could in turn increase the quantity of fertilizer taken on credit. It is apparent that low-income farmers often face scarcity of capital to use and adopt improved inputs particularly, fertilizers. For many reasons, lending agencies are unable to serve the majority of the small farmers, especially the low income one. Berhanu (1993) showed that the annual farm income was significant and positively correlated with the level of fertilizer credit use so that farmers with relatively high farm income were those with relatively larger scale of operation and greater amount of fertilizer credit.

It is also apparent from the results that total expenditure would increase access to fertilizer credit. The odds in favor of credit use increased by a factor of 1.131 for households, which had higher expenditure than those households who had less expenditure. The possible explanations for this can be related to availability of capital. As availability of capital increases, total expenses on different items also increase. The increase in the availability of capital in turn reflects the resource base of the farmer and the overall economic activity of the farmer to satisfy his needs and receive credit.

Fertility status of the soil has a negative relationship with the dependent variable showing that households having more fertile soil did not receive fertilizer, which is given on credit. The odds in favor of access to credit use decreased by a factor of 0.245 for the farmers who owned more fertilize soil as compared to the farmers who owned poor soil. The inverse relationship between land fertility and fertilizer credit use is that a land with higher soil fertility status requires little or no application of fertilizer (which is acquired through credit) and vice versa. Birhanu (1993) revealed that land fertility was significantly, negatively related with fertilizer consumption.

Frequency of contact with development agent has a positive relationship with the dependent variable showing that households having more frequent contacts with the development agent (DA) have better access to fertilizer credit use. The odds in favor of access to fertilizer credit use increased by a factor of 1.16 for households who had frequent contacts with DA. The development agents in the rural area have long been a strong arm of ministry of agriculture (MOA) and other service-giving governmental and non-governmental organizations in stimulating the adoption of innovations. Belay and Belay (1998), had also reported that farmers who had frequent contacts with development agents on agricultural development matters were the ones who got more access to credit facility and settled their debts timely(see Table 4).

Table4: Maximum likelihood estimates of logit model

Explanatory variable	Estimated Coeffi.	Odds ratio	Wald statistics	Significance level
Constant	-2.239***	0.107	4.780	0.029
SEXHH	0.148	1.159	0.033	0.855
FAMILYSZ	0.067	1.070	0.347	0.555
AGEHH	-0.014	0.986	0.428	0.513
EDUC	0.505	1.658	0.994	0.319
FARMSZ	-1.121**	0.325	3.004	0.083
FERTST (1)	-1.404***	0.245	4.875	0.027
FERTST (2)	-1.894***	0.150	8.834	0.003
OXNO	-0.268	0.765	0.471	0.492
OffINC	0.00***	1.102	4.068	0.044
EXPENDIT	0.002***	1.131	15.030	0.000
FREQDA	0.141***	1.162	19.972	0.000
TLU	0.167	1.181	2.077	0.150

2 Log Likelihood 143.211, Model Chi-Square 97.358*** Correctly Predicted (count R^2)[1] 82.8, Sensitivity[2] 85.5 Specificity[3] 78.6

Source. Computed from the field survey data

Impact of credit on farmer's income: The other objective of the study was to assess the impact of credit on gross farm income. To achieve this propensity score matching technique was employed. The value of R^2 was 57.9 and F-test confirmed the significance of the results at one per cent level. This means that the fitted regression equation with six variables explained 57.9 per cent of the variation in gross farm income of the farmers.

Table 5: Parameter estimates of propensity score matching technique

Explanatory Variables	Estimated Coefficients	t - value
Constant	6.333	26.84***
AREA	0.654	5.330***
OXNO	0.432	3.030***
CREDIT	0.039	4.773***
FMLABOR	-0.227	-1.958*
TLU	0.241	2.627***
CONTDA	0.371	1.686*

*, *** Significant at 10% and 1% levels, respectively

Source: Computed from survey data

The significance of the elasticity coefficients was estimated and was found to be significantly different from zero, thereby reflecting their impact on changing the gross farm income. From Table 5 above it can be observed that four elasticity coefficients were statistically significant at 1 percent, while family labor and contact of DA were significant at 10 percent significance level. The results of the study showed that one percent increase in the cultivated area would result in 0.654 percent increase in the gross farm income of small farmers. That is, there is a possibility of increasing small farmers' gross farm income if they cultivated more land. The number of draft oxen also showed positive effect on output and one percent increase in the number of draft oxen would lead to 0.432 percent increase in gross farm income among small farmers. A positive and significant effect was also observed in the use of agricultural credit. Results revealed that one percent increase in fertilizer (credit) would increase the income of small farmers by 0.039 percent. The study observed a positive and significant effect of contact of DA on gross farm income. A percent increase in contact of DA would increase the income of small farmers by 0.386 per cent. The total livestock ownership (TLU) also showed a positive and significant effect on gross farm income. A percent increase in TLU would increase the income of small farmers by 0.241 percent. Family labour had a negative coefficient and was significant at 10 percent. This implied that family labour was in excess usage and would reduce the gross farm income of small farmers if employed more than their existing mean level use. These results are in accordance with those of Negussie (1993). The aggregate of elasticity of coefficients is found to be 1.04. This means that one percent increase in all the inputs would bring about roughly one percent increase on gross farm income of small farmers. This shows that production is in the range of constant returns to scale and this implied that there is scope for increasing the factor inputs with the exception of family labor.

5. CONCLUSIONS AND POLICY IMPLICATIONS

Small farmers in Ethiopia cannot implement improved agricultural technologies out of their own funds. They need credit to implement the new technologies. However, the achievement of credit is controversial. It has been

reported in various studies that micro finance has very beneficial economic and social impacts. Others argue that it can be an instrument of defaults and stagnation rather than an instrument of progress. Therefore, the major concern of this study is to assess the impact of credit on gross farm income.

For the purpose of this study primary data were collected from purposively selected four PAs. A total of 118 households comprising 85 credit users and 33 non-users were included in the final analysis. In addition, secondary data were collected from relevant organizations and pertinent documents. Descriptive statistics such as mean, standard deviation and percentages were used for analyzing the data. Moreover, t-test and χ^2 - test were employed to compare credit users and non-users with respect to the hypothesized and other related variables. A binary logit model was employed to examine factors influencing agricultural credit use. In this regard, a total of eleven explanatory variables were included in the empirical model of which five were significant, while propensity score matching technique was employed to analyze the impact of credit on gross farm income. Fertility status of the soil, total household expenditure, and frequency of contact of DA were highly important in influencing agricultural credit use as evidenced by the model output. The other critical variables include farm size and gross farm income. While cultivated area, number of draft oxen, credit and total livestock unit were highly important factors of production contributing to gross farm income. The other critical variables include family labor and frequency of contact of DA. Therefore, considering of factors affecting credit use, impact of credit on gross farm income and livelihood of the farmer are vital in providing information to undertake effective measures with the aim of extending loans and increasing access to credit.

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