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Factors Affecting Smallholder Farmers Access to Formal Credit (Desci) In Saharti
Samre Woreda, Tigray; Ethiopia

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Thesis Summited To the Department Of Economics In Partial Fulfillment Of The
Requirement For The Degree Of Master Of Science In Development Economics

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ADAMA, ETHIOPIA

FACTORS AFFECTING SMALL HOLDER FARMERS ACCESS TO FORMAL CREDIT
(DESCI) IN SAHARTI SAMRE WOREDA, TIGRAY; ETHIOPIA

A THESIS

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“Most of the people in the world are poor, so if we knew the economics of being poor, we would know much of the economics that really matters. Most of the world’s poor people earn their living from agriculture, so if we knew the economics of agriculture, we would know much of the economics of being poor. People who are rich.....”

Theodore W. Shultz, 1979 Nobel Prize for Economics speech

Source: (Master Thesis by Doreen Auma and Philip Ahen Mensah 2014)

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CRONYMS

ACSI	Amhara credit and saving institution
CSA	Central statistics authority
DAS	Development agents
DBE	Development bank of Ethiopia
DECSI	Dedebit credit and saving institution
FTCS	Farmer training center
GDP	Gross domestic product
GOE	Government of Ethiopia
HH	Households
IFDC	International Center for Soil Fertility and Agricultural Development
LDC	Less developed country
LPM	Linear probability model
MDGS	Millennium development goals
MES	Medium enterprises
MFIS	Micro financial institutions
MOFED	Ministry of finance and economic development
NBE	National bank of Ethiopia
NGO	Nongovernmental organizations
NORAD	Norwegian Agency for Development Cooperation
OCSSCO	Oromia credit and saving corporation

ORDA	Organization for Rehabilitation and Development in Amhara
REST	Relief society of Tigray
SACCO	Saving and credit cooperatives
SACCOS	Savings and Credit Cooperative Societies
SEEP	Small Enterprise Education and Promotion
TLU	Tropical livestock unit
UNDP	United Nations Development Program
VIF	Variance inflation factor
VSCA	Village saving and credit associations

ABSTRACT

The study was sought to ascertain factors affecting smallholder farmer's access to formal credit. A multi stage simple random sampling method was employed to select four out of twenty three rural peasant associations and 160 farm households were selected, out of these sample households 157 respond the questioner. Structured questioner was developed, pre-tested and used for collecting data for the study from the sampled farm households. Descriptive statistics and logit model were used for analyzing the data. The output from the study indicates that 72 (45.86%) of the sampled farm households were formal credit users, whereas the remaining 85 (54.14%) were non-users. It was also found out that credit access to female headed households indicates that 65.22% of the total female headed households were not accessed and 34.78% accessed, still access to formal credit were limited and the difference between the two household heads in accessing credit from the formal sources was statistically significant. Logit model was used to access factors affecting smallholder farmer's access to formal credit in the study area. the results of the model revealed that, out of the eighteen variables ten of them are significant namely age of the household, agricultural extension service, education level, Participating in extension package program, gender of household, size of the household, family labor, distance from the center, membership village saving and credit association, and off farm income were statistically significant. Those variables are the factors affecting rural household's access to formal credit. Seven from the remaining variables became insignificant namely, lack of opportunity to take second loan, group lending, loan repayment period, lending procedure, number of animals owned, farm size and farm record, was less powerful in explaining the variation in the two groups. The remaining one variable, experience in credit use were exclude from the model.

Key Words: Microfinance, rural households, Access to Credit, binary logit

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Access to finance refers to the possibility that individuals or enterprises can access finance service, including credit, deposit, payment, insurance and other risk management services. According to (Demirgüç et al., 2008), access to finance varies greatly between countries and ranges from about 5 percent of the adult population in Guinea and Tanzania to 100 percent in the Netherlands (for a comprehensive list of estimated measures of access to finance across countries). Diagne et al., (2000) stated that a household is said to have access to a type of credit if at least one of its members has a strictly positive credit limit for that type of credit. Similarly, a household is classified as credit constrained for a type of credit if at least one of its members is constrained for that type of credit.

Throughout the world, poor people are excluded from formal financial systems. Exclusion ranges from partial exclusion in developed countries to full or nearly full exclusion in lesser developed countries (LDCs). Lacking access to formal financial services, the poor have developed a wide variety of informal; community- based financial arrangements to meet their financial needs (Karlan, 2001). The provision of credit has increasingly been regarded as an important tool for raising the income of the rural population, mainly by mobilizing resources to more productive use. A good understanding of the determinants of households' access to credit is an integral part of poverty reduction efforts in poor countries (Gamal, 2007).

Rural credit markets in developing countries are often described as repressed imperfect and fragmented. It is common that different societies have different levels of access to certain type of credit institutions (Neguyen, 2007). In some markets potential borrowers may find themselves excluded from formal financial services. A number of empirical studies mentioned various reasons for these constraints; limited availability of formal rural credit, risky and uncertainty of rural credit market, asymmetric information problems between lenders and rural borrowers, weak enforcement and poorly developed economic infrastructure (Bending et al, 2009).

Ethiopia is one of the largest country in Africa in terms of area (1.12million k.m²) & population in million as the second most populated county in Africa(UNFD, 2005).The Ethiopian economy, agriculture which provides employment for 85% &45% to GDP 90%of export revenue (CSA, 2002). Which indicates that the economy have a capacity to contribute more to the national output. In spite of the huge agricultural potential, the growth in agricultural production has not been able to keep pace with that of the demand. In fact, a high population cultivated & is owned by subsistent farmers, who produce about 97% of the national agricultural output (Wolday, 1999). If the production of these households is subsistence there will be poverty in Ethiopia. The Cause of poverty in Ethiopia is related to in appropriate social & economic policy, mismanagement of national resources, lack of developed physical & human capital & lack of well organized & sustainable institutions is recognized to be the main bottlenecked that militate against any attempt of eradicating poverty. To reduce poverty agricultural production should be promoted. Strengthen agriculture is critical to tackling the challenges of rural poverty, food insecurity, unemployment and sustainability of natural resource (Acharya, 2006); this is because credit play a crucial role in amplifying the development of agriculture & the rural economy. As Oladeebo (2008), argued that it acts as a catalyst or elixir that activates the engine of growth, enabling it to mobilizing its inherent potential & advance in the planned or expected direction. Rahji (2000), also described credit /loanable fund or capital as more than just another resource. The limitation of self-finance, uncertainty in level output & time lag between inputs and output are justification for use off farm credit (Kohansal & Mansoori, 2009). They believed that credit access is important for improvement of the quality & quantity of farm output to increase farmer's income & reduce rural-urban migration.

To solve the problem mentioned above there will be accessibility of financial institutions to the poor peasant. In Ethiopia, the rural bank of Ethiopia & other formal institutions fail to cater to the credit need of small house hold due to their lending terms and conditions.

It is common argument that farm credit enhances productivity and promotes standard of living by breaking the vicious cycle¹ of poverty of small scale farmers. The provision of financial service

¹ a sever poverty that influence the society(all rounded poverty)

to the poor has a crucial role to household's food security and alleviating poverty. If the credit is adequately accessed and productively used, it positively influences the optimum allocation of resource and enables technology adoption (Vasthoff, 1968). It is usually considered as an essential input for increasing agricultural land and labor productivity, boosting food production and income level, encouraging employment and alleviating rural poverty.

The importance of credit for rural development even more pronounced for developing countries. Credit facilities to small scale farmers no doubt facilitate the development process by allowing for free transfer of resource between surplus and deficit unit of the economy (Adam, 1988). Thus the idea behind the government sponsored agricultural credit scheme is to make it possible for the farmer to use improved farm inputs which would enable them to increase their productivity and their level of income. While the sector continues to be characterized by very low level of input use, it is dominated by subsistence farming system and practiced on average farm size less than one hectare per household (IFDC, 2007), compared to other country.

It is generally a rule and regulation formal financial institution that has created the story that the poor are not bankable and since they cannot offer required collateral, they are considered as un-credit worthy (Andera, 1995). The formal and informal sector coexists with different accountability. The two sources continue to be the major source of rural credit, though their proportion is different.

According to Singh (1993), the basic distribution between the formal and informal is that the latter operates outside the rules and regulations imposed on the former by the formal financial and they are imperfectly substitute. In Ethiopia several micro financial institutions have been established and have been operating towards resolving the credit access problem the poor participatory, those who engage in petty business (Befkadu, 2007).

Despite the efforts to overcome the wide spread lack of financial service, especially among small holders in developing countries and expansion of credit in rural area of the country. The majority still have only limited access to bank service to support their private initiatives (Braver man & Guechs, 1986). Therefore to boost the production capacity of the rural poor financial accessibility

have a great importance in utilizing and adopting modern agricultural inputs that reduce poverty situation of the poor rural households.

1.2 Statement of the problem

Credit provision is one of the basic components of rural development, which helps the poor to attain rapid and sustainable economic growth in agriculture. To boost agricultural production and productivity, rural poor should have used improved agricultural inputs. However, the implementation of modern technology is reasonably expensive and small farmers cannot offer capital to self-finance, which results the utilization of agricultural technology extremely low. Briquette, (1999), argued that enhanced provision rural credit would accelerate agricultural production and productivity.

Schmidt & Krpp (1987), states that access to financial service by small holder is normally seen as one of the constraint limiting their benefit from credit facility. However, in most case the access problem, especially among formal institutions, is one created by the institutions mainly through their lending policy. This is demonstrated in the form of prescribed minimum loan amount, complicated application procedure and restriction on credit for specific purpose. They further argue that, the type of financial institution and its policy would often determines the access where credit duration, term of payment, required security and the provision of supplementary service do not fit the need of target groups, potential borrowers would not be apply for credit even where it exist and when they do , they would be denied access. In addition, formal credit schemes do not typically take gender into account in practice; they tend to be biased towards male. It is male headed households which is usually approached and registered for provision of institutional credit (Ellis, 1992). In Ethiopia there is gap between owned and required capital to finance agricultural activities of smallholder farmers, since the income from farm is subsistence agriculture does not yield much surplus beyond family consumption and other social obligations. The lack of access to capital in rural area is one of the major factors which hinder the development of agriculture (Tefera, 2004).

In providing micro-finance services to the rural poor, Dedebit Credit and Saving Institution (DECSI) have been encouraging the poor clients². However socio-demographic factors that determine poor households' participation in MFI are not still studied in the study area. And hence this study aims to identifying, understanding, describing those factors which determine poor households' participation in microfinance at the Woreda, is the main concern of this study .Research undertaking in such issues at the Woreda level are essential since the results may give spot of light to development planners, creditors, NGOS and others in order to design policies that help the poor peasants in reducing poverty situation at the Woreda level.

1.3 Research questions

- What is the level of access to credit by smallholder farmers in the study area?
- Which factor influence access to credit by smallholder farmers in the study area?
- What are the major constraints faced by smallholder farmers in the study area?
- What are the relevant policy implications that can enhance smallholder farmer's access to formal credit?

1.4. Objectives of the study

1.4.1 General objective

The main objective of the study was to assess major socio-economic determinants of small holders' farmers' access to formal credit in the study area.

1.4.2 Specific objectives

- ✓ determine the level of access to formal credit by smallholder farmers in the study area
- ✓ analyze factors that influence smallholder farmers access to formal credit
- ✓ identify the major constraints smallholder farmers faced in access to formal credit in the study area
- ✓ Examine the status of rural women access to formal credit.
- ✓ provide policy recommendations that improve accessibility of credit to the poor farmers

² borrowers that take credit from the institution

1.5 Significance of the study

There is a general consensus to address the issue of poverty and poverty alleviation programs in the development strategy of Ethiopia today. But the development of agriculture in all developing countries including Ethiopia affects by different factors. Many previous studies have shown financial market conditions affect economic growth and development of countries (Morduch, 1999). The lack of capital and the absence of eye-catching investment opportunity are considered as important reasons behind insufficient economic development in many developing countries. This is why an attempt is made in most developing countries to encourage, through development policy measures, capital formation as well as the supply of finance means in the form credit through official financial institutions (Manig, 1996). Because of lack of finance in the formal sector productive asset of the poor are washed-out³, means the asset of the poor is used as collateral to the local informal lenders and the asset of the households transferred to the wealthier informal lender. Currently food security and poverty alleviation is a prime objective of the countries as well as the regions. To achieve the intended objectives, the government has been making different efforts to reduce poverty, and food insecurity at household level, through development policy measures, capital formation as well as the supply of financial means in the form of credit through official institutions (MoFED, 2006). To solve the problem of access, study should be made to investigate the issue. However, still research is not made in the study area with regard to what factors affecting rural household's access to formal credit that promotes the economic performance of the poor rural households. If so the researcher is highly inspired to undertake an investigation that can solve the problem that the poor peasants face.

Therefore, the study, factors affecting small holder farmer's access to formal credit were assess the status of female & different wealthy groups in the study area is important in providing information that will enable to take effective measures by lenders and policy makers to improve access to credit and to identify innovative options and institutional arrangements that serve as an input in formulating rural credit policy. Above all, it can be a point of reference for further study.

³ move to the rural informal lenders as collateral

1.6 Scope and limitation of the study

The study aims at identifying factors affecting small holder farmer's access to formal credit and the status of women's and different wealth group's access to formal credit. The scope of the study is limited in Seharti Samre Woreda, south east Tigray. This is mainly because of limited availability of resource and time to undertake it in wide area. The main problem that the researcher faces in the study was respondents were not willing to give their suggestion and appropriate ideas which can be fit to the study.

1.7 Organization of the thesis

This thesis is organized into five chapters. Chapter one presents the introduction, which focuses mainly on the background, problem statement, objectives, hypotheses to be tested and significance of the study. Chapter two presents review of relevant study gaps. Chapter three discusses the research methodology used in the study. Chapter four presents the result and discussion of the significant variables and the last chapter is summary, conclusion and recommendation.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2. THEORETICAL LITERATUREREVIEW

2.1 Concept of Smallholder Farmer

The concept of smallholder farmers arises as a classification based on; the size of the landholding; the purpose of production which may be own home consumption or market and income levels of the farmer. Machethe et al. (2004) argues that limited purchased input and use of actual technologies often associated with small-scale and subsistence farming in resource-poor conditions are major characteristics of smallholder farmer. Nevertheless, smallholder farmers operate in different conditions which vary across geographic regions; whether a farmer is urban or rural and also whether a in a developed or a developing country. Though, there is no defined specific characteristics of smallholder farmer in Ethiopia, different statistics such as land scarcity, little use of input, purpose of production whether business or own consumption, rural population fall in category of smallholder farmers. Small farmer is defined as a farmer with a small piece of land, his homestead, which cannot produce enough food for the family's subsistence. He has to engage in other activities (trader, hauling, crafts etc...) or sell his labour to someone else to complement his farm output. Dixon et al. (2003) stated that smallholder farmers are the backbone of African agriculture. The author notes that majority of the population in Sub-Saharan Africa are considered as smallholder farmers and reside in the rural areas. According to Delgado (1998), smallholder agriculture is important to employment, human welfare, and political stability in Sub-Saharan Africa (SSA). Eicher and Rukuni (1996) pointed out that smallholder agriculture is a source of growth linkages by enlarging the market for industrial goods and moderation of the urban migration.

2.2 Rural Credit, Definitions and Concepts

According to a report from NORAD (2003), Microfinance can be defined as provision of a broad range of client-responsive financial services to poor people through a wide variety of institutions.

Micro credit is defined as an extremely small loan as small as birr100 provide to improve peoples to help them become self-employed. Micro credit was given to the poor individuals for income generating activities that will improve the borrower's living standard. The loan characteristics are too small, short term credit (a year or less), no collateral, required weekly repayment. Poor borrowers and mostly women's who are not qualified for conventional bank loan. Usually the loan pays high interest rate (18%) because of the high cost in running micro credit programs. Micro credit is also used as extension of very small loan to those who are in poverty that design to spur⁴ entrepreneurship and help them out from poverty group. These individuals lack collateral, steady employment and verifiable credit history, which cannot even meet the most minimal qualification to gain access to traditional credit.

Grameen bank define micro credit as small loan given to the poor for under taking self-employment project that would generate income and enable them to provide for the selves & their families. The target population comprises women micro enterprise from the low income households & the loan has no collateral. However micro finance is denied the provision of financial service to low income clients, including consumers and the self-employed, who traditionally lack access to banking and related service (Gonzalez Vega, 2008).micro finance is a place for the poor and near poor clients to get access to a high quality financial service, which include not just credit but also saving, insurance, and fund transfer.

According to Lendger wood (2002), micro finance provision of a broad range of financial service such as saving, credit ,insurance and payment service to the poor or low income groups, who are excluded from normal banking sector. Micro finance is a development approach that provide financial as swell as social intermediation. The financial intermediation includes organizing citizens group to voice their aspiration and raise concerns for consideration by policy makers and develop their self-confidence (Robinson, 2002). More over Cornoy (2002), explain that micro finance is the provision of a broad range of financial service such as deposit, loan, payment service, money transfer and insurance to poor and low income households & their Micro-enterprises. The term evolves from the concept of "micro credit and micro enterprise "finance, to include the importance of saving as well as borrowing. Although the terms are used inter

⁴ initiate individuals to involve in business activity to reduce poverty

changeably, micro finance represents the field as a whole, while the other two terms are more technical & preferably to credit provision (Maria, 2004)

2.2.1 Credit in Rural Development

At a certain stage in agricultural development, agricultural credit clearly does become a strong force for further improvement. When a man with energy and initiative who lacks only the resource for more and more efficient production is enabled by the use of credit to eliminate the one blocks on his path to improve the life style and living standard of himself and his family. Formal credit is the most flexible form of transferring economic resource to the poor. One can buy anything that is for sale with cash obtained through credit (Padananabhan, 1996).

According to the free on line dictionary (undated) credit transaction has been indispensable to the economic development of the modern world. Credit puts to use property that would otherwise i.e. idle, thus enables a country to more fully employ its resource.

According to Kebede (1996), credit makes traditional agriculture productive through the purchase of farm equipment's and other agricultural inputs, the introduction of modern irrigation system and other technical developments.

2.2.2 Prospective of rural credit

2.2.2.1 Traditional and new view of rural finance

Starting from 1950 to 1960 credit provision became a key in solving the problem of poor individuals but the emphasis was given to market oriented farmers & commercial agriculture than on peasants, from the second half of 1960s up to the recent time, small farmers rural poor individuals increasingly become the target of credit intervention.

According to Assefa (2004), the new rural financial approach assigned different roles to the government with less direct intervention of the government in credit allocation and credit delivery. Ellis (1992), states that post credit policies have tended to make assumption about peasant indicates that they are unable to save and their demand to credit is highly sensitive to the level of the interest rate they pay to the lenders.

2.1.2.2 Types of rural credit

There are two types of credits which are practiced in the market, the formal and informal, in the formal credit market institutions provide intermediation between depositors and lenders charge relatively low rate of interest that usually are government sponsored. In informal credit market money is lent by private individuals, professional's money lenders traders commission agents land lords friends and relatives (Moheldin & Writw, 2000).

The establishment of credit institutions in the agricultural based developing economy 40 or more years ago was among other reasons linked to the belief that local/ informal lenders such as merchants, land lords, and shop owners exploit small farmers by charging them exorbitant interest rate (Adams, 1984).

In considering the dichotomy between formal and informal segments of the credit market, it is important to note that rural credit market in Africa is mainly fragmented with the various segments serving the borrowers with different characteristics (Nissanke and Aryeetey, 1995). Because of the multiplicity of arrangement in the informal market the sector cannot aggregate (Adams, 1992). While the formal sector may have distinct characteristics especially with respect to the lending policies and its control by the central monetary authority, the informal sector is highly heterogeneous. This heterogeneity can be seen in terms of relationship between the borrower and lenders.

2.2.3 Finance Reform in Ethiopia

Following the Derg regime, change in economic policies as well as political administrative and institutional structure began to be introduced by the new government. Hence, financial liberalization is an important component of a successful development strategy.

Financial liberalization in Ethiopia began at the end of the 1990s. The financial reform undertaken in Ethiopia includes elimination of priority access to credit, interest rate liberalization, restructuring & introduction of profitability criteria. Reduce direct government control on financial intermediaries and limit bank loans to the government enhancement of the supervisory, regulatory and legal infrastructure of the NBE allowing private financial intermediaries through

new entry of domestic private intermediaries and introduction of Treasury bill through auction market. Restructuring of the financial institutions was felt necessary to promote competition, reduce government ownership and control, and balance the type of institutions and grade up service (Assefa, 2004).

2.2.3.1 Microfinance institutions in Ethiopia

Microcredit activities in rural and urban Ethiopia were initiated by local and international NGOs (Wolday, 2004). According to Pischke et.al, (1996), there were 30 NGOs in Ethiopia who were delivering microcredit services but concentrated in urban areas. Although the NGOs had contributed to testing innovative methodologies and products, they had the problem of combining the humanitarian objectives of the NGOs with the financial objectives of the microcredit program. In Ethiopia integration of the credit schemes initiated by local NGOs like the Relief Society of Tigray (REST) and Organization for Rehabilitation and Development in Amhara (ORDA) into the formal financial system contributed to the formulation of a regulatory and supervision framework for efficient delivery of services to the urban and rural poor and the issuance of a new proclamation for Licensing and Supervision of Micro-Financing Institutions in 1996 (Proclamation No.40/1996) (Wolday, 2004). Financial services, the Government has been refining the regulatory framework for the microfinance operations. The regulation that put a ceiling on the interest rate that micro-financial According to Getaneh (2005a), to further stimulate economic activities and provide opportunities for the majority of poor to escape poverty through availing more and appropriate institutions could charge from their credit clients no longer exists and a new liberal system is in operation (Directive No. MFI/92/98) whereby MFIs could decide the level of interest rate they charge as long as they can remain in the competitive market, thus opening up a new opportunity in the effort to ensure both operational and financial sustainability for MFIs.

Although most MFIs in developing countries aim to reach poor people, it has become increasingly apparent that they rarely serve very poor people. Most MFIs reach the “upper poor” in much greater numbers than the “very poor.” The extent to which microfinance programs are able to reach the poorest of the poor remains an open debate (SEEP network, 2006).

On the other hand, according to Wolday (2004), the Ethiopian microfinance industry has been growing in terms of its outreach as well as its asset and capital base. As of December 2003, the 23 MFIs through a network of 465 service outlets (called 'branches' or by some MFIs 'sub-branches') the number of 'active borrowers' (i.e., the number of loan clients with outstanding loan balance) has reached 753,084 and the number of active voluntary savers (i.e., the number of voluntary savers with outstanding savings balance) has reached 318,000. Because Ethiopian MFIs typically provide one loan per household (usually to the head of the household), an outreach of 753,084 households' means, the industry has reached around 3.8 million people. This figure is based on a conservative estimate that there are 5 members in a Household.

2.2.4 Access to rural financial service for poor rural house holds

2.2.4.1 Small holder farmers access to rural credit

Penchansky R. Thomas W.J. (1981), states that to same authors “access” refers to entry in to or use of the health care system, while to others it characterizes factors that influence entry or use”. More ever according to the free on line dictionary (undated) access can be define as, the right to obtain or make use of / take advantage of same thing /as a service or membership). Diagne et al (2000), states that a house hold is said to have access to a type of credit if at least one of the members has a strictly positive credit limit for that type of credit. Similarly, a house hold is classified as a credit constrained for that type credit.

Access to financial services by small holder is normally seen as one of the constraint limiting their benefit from credit facilities. However, in most case the access problem especially among formal financial institutions, is one created by the institutions mainly through their lending policy. This is manifested in the form of prescribed minimum loan amount, complicated application procedure & restrictions on credit for specific purpose (Schmidt and cropp, 1987).

For small scale enterprises, reliable access to short term and small amount of credit is more valuable and emphasizing it may be more appropriate in credit program aimed at such enterprises.

Women's are frequently discriminating against formal credit market in developing countries (Buvinic, Sebstand and Zeidenstein, 1979). The belief in discrimination against women in formal credit market, often based up on the limited number of women borrowers in the market, and is perceived as an outcome of lenders rejection of women's application for loan contract. Over decade ago, Buvinic, sebstand and zeidenstein emphasis that there are; " two major factors which restrict women's access to formal credit more than men's .these are related to women's lack of control over economic resource and the nature of their economic activity ".

Researchers are still trying to clarify the reason that limit women's access to formal credit. In her assessment of credit as a missing piece in micro enterprise development (McKee, 1989), emphasized the gender based credit constraints such as limited education, inferior legal status and unpaid reproductive responsibility exacerbated the problem women's face when operating small business

2.2.4.2 Recent development in small holder farmer credit

Many people in developing countries neither have their own bank account nor are they able to take out loan, transfer money, or insure their family against risk such as illness accident, or death. All too often, access to the financial service that are so crucial to sustain development are either difficult. Consequently, peoples have no choice but to resort to local money lenders charging usurious rate of interest or to use informal & therefore insecure ways of performing transactions.

Fafchamps (1992), Coate & Rovallion (1993), Udry (1994), Lund & Fafchamps (1997), Kodar (1997), found that poor households in developing countries use complex strategies to increase their productive capacity, share risk & smooth consumption over life cycle. These strategies generally work through self-enforcing informal contract among friend's neighbors & members of the extended family. It has a long held belief among policy makers that poor households in developing countries lack access to adequate financial service for efficient inter temporal transfer of resource & risk coping &that without well-functioning financial market,

These households do not have much prospect for increasing in any significant and sustainable way their productivity and living standard, because of these reasons ,and the fact that traditional commercial banks typically have no interest in lending to the poor rural households due to their

Lack of viable collateral and the high transaction cost associated with small loans that suit them, most developing countries have set up credit program aimed at improving rural households access to formal credit.

The vast majority of these credit programs, especially the agricultural development bank, which provided credit at subsidized rate, have failed to achieve their objective both to serve the rural poor & be sustainable credit institutions (Adams, Graham, Van Pischke, 1984, Adams & Voges, 1986). In response to these failures & in recognition of the critical role that credit can play in alleviating rural poverty in sustainable way, innovative credit delivery system are being promoted throughout the developing world as more efficient way of improving rural households access to formal credit with no or minimal government intervention. Micro finance refers to financial service like small loan, saving, and in recent time insurance and transfer payment service, provided to low income households and individuals. The motivation behind micro finance is that financial institutions can make micro credit; also known as extend loan to the poor, while at the same time, making reasonable profit, by charging high interest rate, micro finance institutions can offer the high transaction cost of processing large volume of loan as small as few thousand birr as well as the high risk from the lack of collateral.

2.2.5 Ethiopian Agriculture and Microfinance

Agriculture is the core driver for Ethiopia's economic growth and long-term food security. The stakes are high: 15 to 17 percent of the Government of Ethiopia's (GOE) expenditures are committed to the sector (Dercon et al., 2009); agriculture directly supports 85 percent of the population's livelihoods, 46.4 percent of gross domestic product (GDP), and over 90 percent of export value (Deressa, 2007). Thirteen million smallholder farmers account for 96 percent of total production, and five to seven million households are chronically food insecure. Ethiopia's agricultural sector has witnessed consistent growth since 2003: maize production has expanded at 6 percent per year, and the aggregate export value across all commodities has grown at 9 percent 12, underpinning an 8 percent annual growth rate in GDP. Public investment has expanded access to productive inputs, like hybrid maize seed and fertilizer. Concerted government spending in extension has also established nearly 10,000 Farmer Training Centers (FTCs) and trained over 63,000 Development Agents (DAs) from 2002 to 2008. The GOE has made marked

progress in agriculture over the past decade. However, the sector continues to face a set of constraints: markets are underdeveloped, federal and regional governments lack capacities to implement, safety nets account for a large proportion of agricultural spending, irrigation is below its potential, shortages of improved inputs hinder growth, and key areas of the enabling environment require improvement. From financial sector's point of view, agriculture is considered a less attractive field of business than other sectors of the economy such as construction, tourism and other activities. One cited reason for this is the sector's risk-return profile. In order to improve credit accessibility, in 1994/95 Ethiopia opened doors for microfinance institutions to operate as government's poverty alleviation strategy to achieve the Millennium Development Goals (MDGs) (Zaid, 2008, Gobezie and Umuz, 2009). Following policy prescriptions by the government of Ethiopia and various NGO initiatives more than a decade ago, microfinance institutions have come into the picture, filling the gap in access to credit. These institutions are also slowly moving towards solving issues of access to sustainable and affordable saving, and access to insurance and remittance services at the bottom end of the market. Importantly, microfinance institutions, with the support of NGOs and other stakeholders, are working at various levels to provide financial education and create financial awareness amongst poor households. These institutions are spread all over the country and are legally licensed by government to take deposits from the general public. Though operations of microfinance institutions (MFIs) started recently, their outreach and coverage of clients in Ethiopia is reasonably noticeable. There are over 30 licensed MFIs reaching over 2.2 million active borrowers with an outstanding loan portfolio of approximately 4.6 billion birr (Malepati and Gowri, 2011; Amha and Narayana, 2000; Tesfay, 2009).

Since 1996, Ethiopian microfinance is regulated under Proclamation No. 40/1996 (Licensing and Supervision of Microfinance Institutions). The National Bank of Ethiopia (NBE) is authorized to license, regulate and supervise MFIs, which are required to be incorporated as 'for-profit' companies, wholly owned by Ethiopian nationals or organizations owned by Ethiopian nationals (Micro Ned, 2007, p.10). The Ethiopian microfinance sector is characterized by its rapid growth, an aggressive drive to achieve scale, a broad geographic coverage, a dominance of government-backed microfinance institutions (MFIs), an emphasis on rural households, the promotion of both credit and savings products, a strong focus on sustainability and by the fact

that the sector is Ethiopian owned and driven. The regional state governments and many local NGOs are shareholders in many of the MFIs. The three largest micro finance institutions; Amhara credit and savings institute-ACSI, Dedebit credit and savings institute-DECSI and Oromia credit and savings-OCSSCO account for 65 per cent of the market share in terms of borrowing clients, and 74 per cent by loan provision (Deribe and Deribie, 2013). By having emphasis on the rural households, poor farmers are being targeted since the main activity in the rural Ethiopia is agriculture.

2.2.6 Tigray in context

Historically, Tigray is one of hardest hit regions in Ethiopia by recurrent droughts. Of the 39 major recorded droughts in the last 200 years in the country that are characterized by food shortages, famines and excess mortality, more than half of them occurred in parts of the country that include this region (Webb, 1992). Moreover, many of Ethiopia's historical cross-border wars (like the 1896 and 1935 Italian invasion), recent civil wars (the protracted civil war that ended in 1991) and border conflicts (the 1998-2000 with Eritrea) took place in this region. Coupled with decades of poor governance, all of this resulted in environmental and ecological imbalances in the region, which are manifested in degraded lands, poor resource bases, and population pressure, which led to further land fragmentations and mismanagement and hence to an even poorer performance of agriculture, also relative to the nation average (Woldenhanna and Oskam, 2001). To reverse this situation and help the poor in Tigray, the Relief Society of Tigray (REST) was established in 1978 and has been engaged in development programs, Principally in environmental rehabilitation, agricultural development, aid, social development, rural water supply and credit and saving services (Borchgrevink et al., 2003). The pillar objectives of these programs are to improve the economic situation of the low income and poorest people in the Tigray Region. Besides, to accomplish independence based on the participation of the people by embarking upon and surmounting the core grounds and consequences of poverty through advancing sustainable rural development.

In 1993, REST (Relief Society of Tigray), the main NGO in the region, launched a socio-economic poverty survey in rural areas. Lack of access to credit appeared as one of the major obstacles to the rehabilitation of the region and its development. This marked the birth of Dedebit

Credit and Saving Institution (DECSI), which dominates the area and is considered as one of the largest MFIs in Africa. This program of credit was created to help and increase agricultural production by providing regular, Agricultural Input and Agricultural Package Loans.

Although microfinance has been in operation in Ethiopia for 20 years, it has achieved less than three14 percent penetration, thus 2.4 million borrowers (Deribe and Deribie, 2013) in a population of over 90 million While the economy is improving by 10 per cent each year, the number of people living in poverty has reduced by a mere 10 per cent in 10 years. Given these facts clearly something is not working

2.3 Empirical study on factors affecting small holder farmer's access to formal credit

There are a numbers of studies on the factors that affect small holder farmer's access to credit. The following is same of the empirical studies taken by researchers.

A study by Antieno (2001); indicates that income level, distance to credit source past credit participation and asset owned were significant variables that explain the participation informal credit market. Hussein (2007); financial approach also indicates that farm households are more likely to prefer informal sector to the formal sector with respect to flexibility in rescheduling loan repayment in time of unexpected shocks. This is also supported by Padmanna Bhann(1996), comparing the informal credit sector from the formal stated that proximity comfortable atmosphere, quick credit , all time access , freedom of development , repayment flexibility and low transaction cost are some of the advantage of the informal sectors have made them almost indispensable, particularly to small farmers.

According to Hossain (1988), the Grameen bank experience shows that most of the conditions imposed by formal credit institutions like collateral requirement should not actually stand in the way of small holder and the poor in obtaining credit. The poor can use the loan and repay if effective procedure for disbursement, supervision and repayment have been established. On the other hand, Getaneh (2005a), stats that group of lending approach effectively ration out same groups of farm house holds. That is co-borrowers tend to self-select themselves into group of homogenous members that effectively discriminate against to reduce risk of carrying the burden of repayment in case of default of co-borrowers.

According to Assefa (1989), a set of socio economic and other important factors influencing agricultural credit use among small farmers aimed at differentiating borrowers from non-borrowers. Using discriminate analyses, Assefa found that large farm size, high investment, adoption of improved technology were significant variables in distinguishing borrowers from non-borrowers. Hussein (2007), Yehuala (2008), Adeola (2009), note that technology adoption & decision making ability of the farm house hold are significantly influence by extension contact. Owuor (2009) observe in Kenya that literacy and education level have a significant positive influence on farm house holds ability to access credit information.

According to Amjad & Hasnu (2007) the amount of formal credit used per hectare by small holder farmers increase as the size of land holding increase. This corresponds with Yadeve et al. (1992), finding that formal sector borrowing per unit of cultivate land initially increase then fall with farm size Nepal.

Kiiza and Pederso (2001), with objective of analyzing the factors that affect household's participation in micro programs and their investment behavior in Uganda adopting the bivariate logistics model; the result shows that proximity to the institution, dual source of income, and income stability were the significant factors influence the rural households participation in the credit program. The estimated model found that the likelihood of participation increase with the level of education, of the borrower and that farmers were less likely to participate probably because of the uncertain nature of farm income. Using logit model, the author acknowledged that it does not capture the underlying factors that are important in initiating design and implementation of credit program to reach poor households.

Shah et al (2008), using a binary logistic regression model in identifying the factors that affect households access to credit and participation in credit program In Pakistan, the study found that at household level, the participation to credit was influenced by age of the head of the household, year of schooling of households, income earners in a household and household size. The studies point out that the ownership of houses increase the probability of obtaining loan and the presence of formal financial institutions increased the access to credit by households. Also results show that the household were indifferent of the rate of interest, they prefer liquidity even at high rate of

interest. The author observed that major source of external financing was the informal credit market.

The study by Oboh and Kushwaha (2009), employing the multiple regression analysis on the data of 300 farm households revealed that income, distance between home and bank, farm size and evidence of previous loan as having significant effect on size of loan received. The study recommends that the government should increase the volume of loan facilities to the Nigerian agricultural cooperatives and rural development banks (NACRDB) for onward disbursement to qualified applicants. By so doing, the individual's loan size of farmers will increase and this may lead to increase farm output, productivity and income.

Sisay (2008) analyzed the determinants of smallholder farmers' access to formal credit in north Gondar, using a binary logit. The result show that the probability of accessing formal credit was positively and significant, cultivated land size, experience in credit use from the formal source and membership of households in multipurpose. However farmers' participation of group lending and number livestock in tropical unit (TLU) negatively and significantly affects access to credit from formal source.

Empirical evidence from the literature suggest that households access to financial service both in the formal and informal sector is influence by institutional factors,, product feature and households socio economic characteristics (Nwanna, 1995, Vaessen, 2001). From the institutional perspective, the location of the lender and its conditions for credit allocation greatly influence the probability of access. Dallimore and Mgimeti (2003), show that long distance and high transport cost constrained the poor rural households access to formal financial service mainly located in urban area.

Empirical evidence from the study by Kochar (1997), also shows that the likelihood of access to formal credit is positively and significantly influence whether personal guarantee are given for informal loans especially, if personal guarantee can serve as alternative collateral that is valued by informal lenders. The result further revealed that at household level, being part of the target group or living within the target geographical area also influence credit access. Educational level,

off- farm activity and access to network of information and recommendation are all positively and significantly influence the probability of access to credit.

Hence, based on the above explanations and the author's knowledge of the credit schemes of the study area the following conceptual framework depicted the most important variables expected to influence smallholder farmers' access to formal credit in the study are

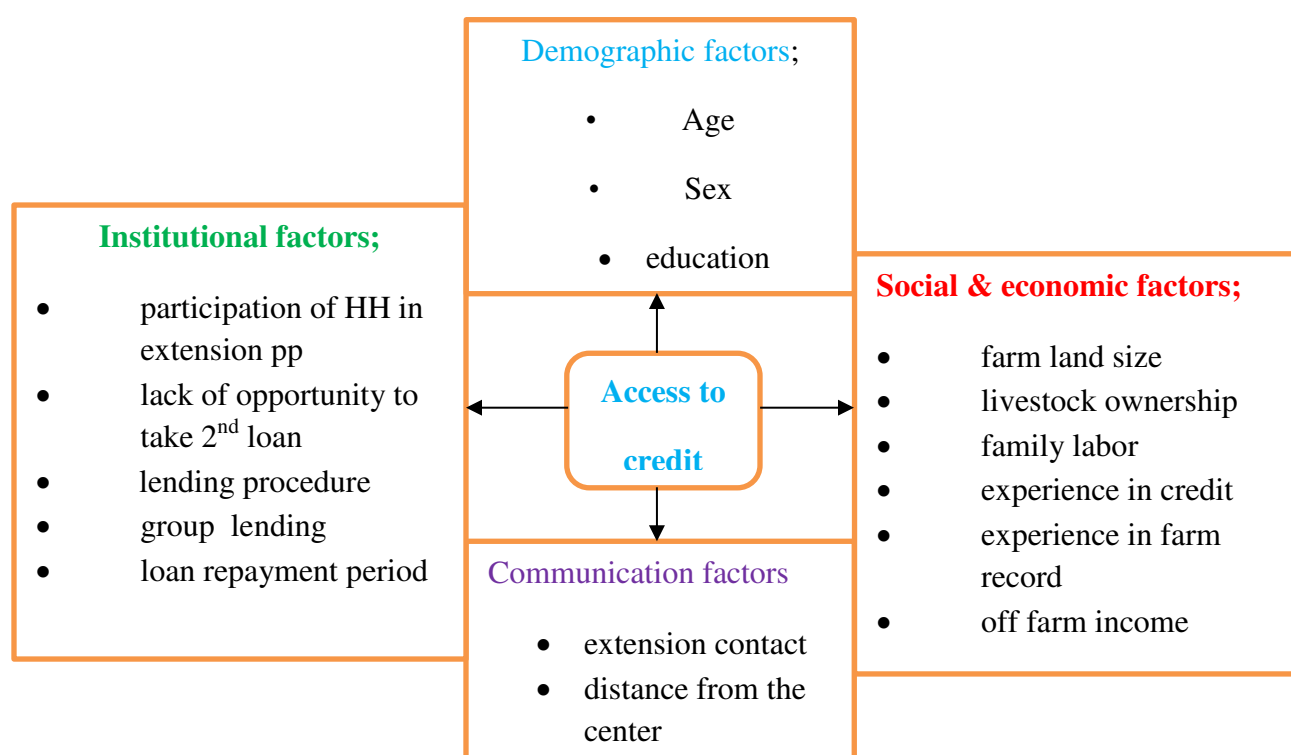


Figure 1: A Conceptual frame work showing factors affecting Access to Credit

Source: author

CHAPTER THREE

RESEARCH METHODOLOGY

This Chapter contains five sections. The first section describes the study area. In section two data types, data sources and data collection method are presented. Section three present sample and sampling procedure and section four provides definition of variables and working hypothesis. Finally section five method data analysis.

3.1 Description of the Study Area

Established by the Federal Democratic Republic's Constitution of Ethiopia in 1994, the Tigray Regional State is one of the nine regional states of Ethiopia (FDRE, 1994). Accordingly, the Tigray region is named as region one.

Tigray region is located in the Northern part of Ethiopia. The region is bounded by Eritrea in the Northern part, Amhara Regional State in the South and West, and Afar National Regional State in the East. The region has seven Zones; East Zone, South Zone, West Zone, Northwestern Zone, Central Zone, South East Zone, and Mekelle special Zone. The region has also 46 Districts. This study is be conducted in Seharti Samre District which is found in the South Eastern Zone of Tigray National Regional State. The economy of the Woreda was mainly dominated by agriculture and over 97% of people were earned their income from agriculture. This district was purposely selected because the production of agriculture and the application of modern agricultural inputs were very low. According to Seharti Samre office of agriculture and rural development, the Woreda has a total population of 151, 817, of the total population 50.3% are females and 49.7% are males. The District is bounded by Amhara National Regional State on the West and north by the central zone Tigray, on the northeast by Enderta, on the east by Hitalo-wejirat, and on the Southeast by southern zone. It has also 23 Tabia administrative. The District is found in the East $12^{\circ} 30' 00''$ - $13^{\circ} 02' 00''$ Latitude North $38^{\circ} 59' 00''$ – $39^{\circ} 26' 0''$ Longitude (Seharti Samre District office of Plan and Finance, 2011). The Woreda is generally categorized as Weina Dega.

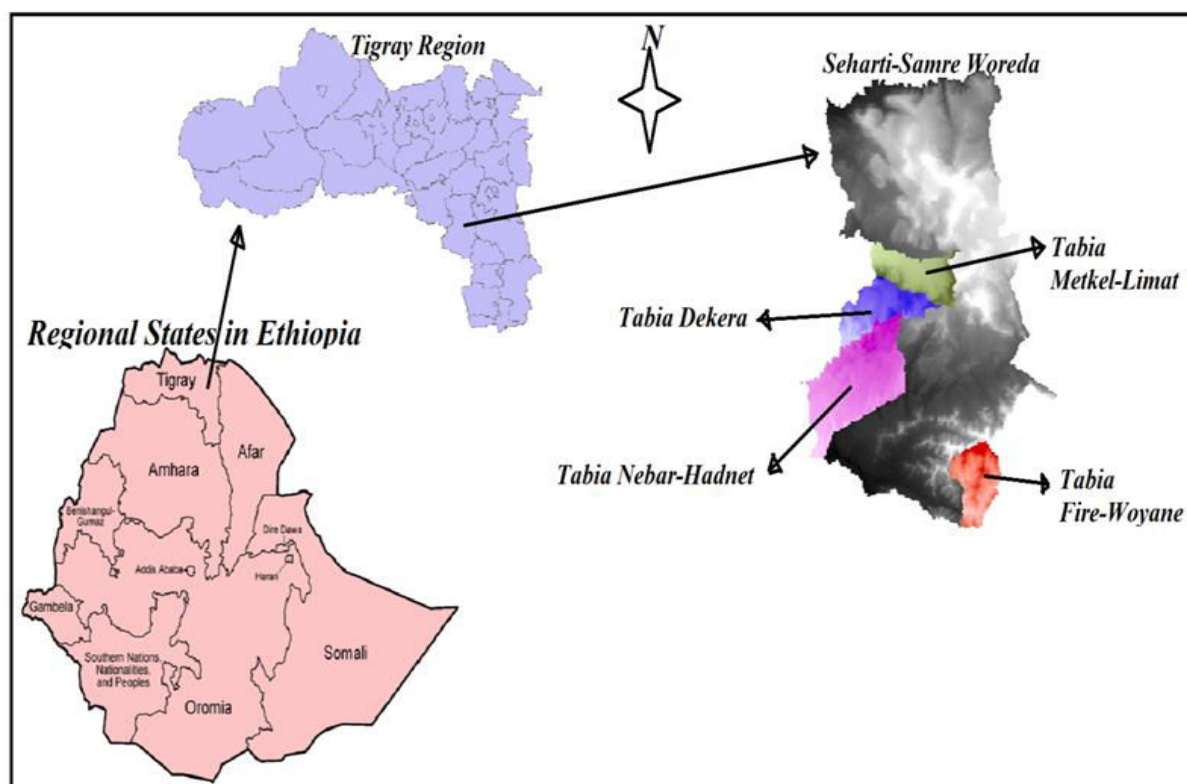


Figure 2: Location map of the Study Area

Source: Geographical Information System, (2016)

3.2 Data type, source and data collection method

Both qualitative and quantitative data were collected from primary and secondary data Sources. The qualitative data were analyzed using logistic regression and helps us to assess smallholder farmer's perception of the strengths and weaknesses of formal financial institutions in the study area were collected through personal observation and, semi structured questionnaires were prepared. To collect the data from the sample household's data collectors were selected and training was given to them, about how to collect the data and how to communicate with the households. The perception of farm households in the strengths and weaknesses of the formal financial institutions were assessed based on the operational modalities like, group lending, repayment period. Structured questionnaire were prepared to collect quantitative data for the study. Primary data sources were the sample farm households both male and female headed from different wealth groups, and other key informants. Secondary data was sourced office of

agriculture and rural development and Dedebeit credit and saving institution (DECSI) Samre sub-branch as well as other published and unpublished documents. The questionnaire was pre tested to evaluate for consistency, clarity and to avoid duplication and to estimate the time requirement during data collection.

3.3 Data collection method

3.3.1 Sampling procedure

In relation to sample size, more sample household heads might have better representation of the entire population. However, to make the study controllable both in time and resources, Multi-stage sampling method was employed so as to adequately represent the farmer households. Multistage sampling refers to sampling plans where the sampling is carried out in stages and it is better than others methods. Because it is effective in geographically dispersed population and has nature of flexibility. In the first stage, from the existing kebele (23), four kebele (Metkel Limat, Dekera, Nebar Hadnet and Fire-Weyane), were selected based on the distance they have from the center (the financial institution). The kebeles have a total population of 27,543, with a total household 5,364. out of these households 1343 (25%) are female headed households and 4021 (75%) were male headed households (source Seharti Samre office of agriculture and rural development, 2015). These Tabias⁵ were selected purposely to get the appropriate sample size from user & non user households which are female headed. In the second stage, 160 sample households were selected using simple random sampling from each kebeles being the population is homogenous. In the third stage, the samples respondents were distributed to each peasant association proportionally based on the population they have using Kothari proportional distribution formula.

$$n = n (n1/N)$$

Where, n=sample size

n1=target population of one tabia and

⁵ The smallest administrative level in Ethiopia which means kebele

N = the whole target population.

In the fourth stage, at village level target households were selected by using simple random sampling method.

3.4 Methods of data analysis

3.4.1 Descriptive analysis

Qualitative & quantitative techniques were used to analyze the data. The qualitative data were obtained using interview & observations as well as secondary data from the bureaus and documents. Quantitative data were analyzed using descriptive statistics such as mean, standard deviation, tabulation, percentage, ratio and frequency distribution. In addition t- test and Chi-square statistics was employed to measure the mean and percentage differences between credit users and non-users. A binary logit, model which best fits the analysis for factors affecting small holder farmers' access to formal credit were also employed.

3.4.2 Econometric analysis

Binary logistic regression model which best fit for dummy variables (credit user and non-user) were employed. The Binary logistic regression analysis was used to measure the determinants of rural households' access to formal credit in rural poor communities. This model was similar to a linear regression model but it was suited to models where the dependent variable was dichotomous. The logistic regression coefficient was used to estimate and adjust the odds ratios for each of the independent variables in the model.

3.4.2.1 Specification of the logit model

Access to credit in the study area refers to actual receiving of credit facility from a given source. The response variable in this case was dichotomous (binary choice variable) includes a 'yes' or "no" type variable. The three most commonly used approaches to estimate such dummy dependent variable regression models are 1, linear probability model 2, the logit model and 3, the probit model. They are applicable in a wide variety of fields (Gujarati, 2004). According to Brooks (2008), LPM is a simple and obvious, but unfortunately flawed, method for dealing with

binary dependent variable. It was based on the assumption that the probability of an event occurring, “ π_i ” is linearly related to a set of explanatory variable $x_{2i}, x_{3i}, x_{4i}, \dots, x_{ki}$. This linear regression model was estimated using ordinary least square (**OLS**) model. One of the econometric problems of LPM is that, it generates probabilities that lie outside the 0 or 1 range. This necessitates truncation probabilities at “0” or “1” resulting in to many observations for which the estimated probability is exactly zero or one. In addition, it is simply not plausible to suggest that probability is exactly zero or one.

According to Brooks both the logit and probit are nonlinear models and are estimated using maximum likelihood (ML) method these two models are able to overcome the limitation of the LPM. They do this by using a function that effectively transforms the regression model so that the fitted value are bounded within the (0, 1) interval. In addition, Wooldridge (2002), note that both logit and probit model guarantee that the estimated probabilities lie between the logical limit of zero and one due to this advantage, the logit and probit model are the most commonly or frequently used models when the dependent variable happens to be dichotomous (Lio, 1994; Maddala, 1998; Gujarati, 2004). The logit and probit models are quite similar in most applications. The main difference between the two is in the nature their distribution which is captured by cumulative distribution function (CDF). Probit has a normal distribution while logit has logistic (slightly flatter tails) distribution. The choice between logit versus probit regression lies largely on the distribution assumption one makes. The logit model in practice has been used by many researchers because of its comparative mathematical simplicity. Sirak and Rice (1994), argue that logistic regression is power full, convenient and flexible and is often chosen if the dependent variable is categorical nature or it is not normally distributed. Some of the predictor’s variables in the study objective are categorical and therefore, the study applies a binary logit model to identify factors affecting smallholder farmer’s access to formal credit in the study area.

According to Hosmer and Lemeshew (1989), the logistics distribution (logit) has got advantage over the other in the analysis dichotomous variables in that, it is extremely flexible and easily used model from mathematical point of view and results in a meaning full interpretation. So logit model were get priority over the others and was selected to analysis the variables. The model is mathematically explain as follow,

$$P_i = f(\alpha + \sum \beta_i x_i) = (1 / (1 + e^{-z_i})) \text{-----1}$$

Where: P = is the probability of individuals will use or not use credit

e = is natural logarithm

x_i = is the i^{th} explanatory variable

α and β = are parameters to be estimate

Hosmer and Lemeshew (1989) pointed out that the logit model could be written in terms of the odds and log of odds, which enables one to understand the interpretation of the coefficients. The odds ratio implies the ratio of the probability (pt) that an individual would choose an alternative to the probability and (pt) that the person would not choose it. But P_i is non-linear not only in x_i but also in α and β_i which creates an estimation problem. So, we cannot use the familiar OLS procedure to estimate the parameters (Hosmer and Lemeshew, 1989). But

$$(1 - p_i) = 1 / (1 + e^{z_i}) \text{-----2}$$

Therefore the odds ratio becomes

$$P_i / (1 - p_i) = (1 + e^{z_i}) / (1 + e^{-z_i}) = e^{z_i} \text{-----3}$$

Getting linearity, we take the natural logarithms of odds ratio, which results in the logit model as indicated below (Hosmer and Lemeshew, 1989):

$$Z_i = \ln(p_i / (1 - p_i)) = \alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n \text{-----4}$$

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

(ui) in to account the equation above become

$$Z_i = \alpha + \sum \beta_1 x_1 + u_i \text{-----5}$$

Hence, the above econometric model was used in this study and was treated against the potential variables affecting smallholder farmers' access to credit. The coefficient of the logit model presents the change in the log of the odds associated with a change in the explanatory variables (Hanushek and Jackson, 1977 quoted by Edilegnaw, 1997)

3.4.2.2 Definitions of variables and working hypothesis for the logit model

3.4.2.2.1 Dependent variable

The dependent variable for the logit analysis was smallholder farmer's access to formal credit (z_i) were dichotomous variable which can take value of one or zero. The sample was divided into credit user and noncredit users based on the question whether the household head applied for the credit or not. All of those who applied for credit but were not successful (rejected) and who did not apply were all classified as nonusers of credit while those respondents that got credit were classified as credit users. Distinguishing between those users or non-users of formal credit in the study area, the dependent variable takes value of "1" for users and "0" for non-users. The regression model was used to analyze some factors affecting access to credit by respondents.

3.5.2 The following independent variables are used in the model

Based on literatures and past researches and the researcher knowledge on credit outreach of the study area were used to establish working hypotheses of the study. The following are some of the factors affecting small holder farmer's access to formal credit; the following factors were hypothesized as:

1. Age respondents (age): it is continuous variable, defined as farm household headed age. Increase at the time of study those farmers having higher age due to life experience will have much better association with formal institutions and it was hypothesized that, farmers with higher age may have more access to credit from the formal sector.

2. Sex of respondents (sex): this is a dummy variable that assume a value of "1" for male and "0" otherwise and it was hypothesized as male headed households more accessed than female headed households in the study area.

3. Literacy level (edlvl): it is categorized into illiterate and able to read and write or literate. Farmers who can read and write expected to have more exposure to the external environment and accumulate knowledge. They have the ability to analyze cost and benefit. The more educated the house hold headed the more credit was used for consumption purpose.

4. Experience in credit uses from the formal source (exprifs): this refers to the number of years the house hold head use credit from formal financial institutions. A farmer having more experience in formal credit have higher tendency towards using formal credit. There for it was expect to have positive influence on farmer's access to credit.

5. Farm size in hectare (fash): it is total land size cultivated by the house hold. It is continuous variable. The larger the cultivated land size the more lobar require that demand more additional capital that may be obtained through credit. There for it was hypothesized that the more land cultivated the more capital utilized and would demand more credit.

6. Total livestock ownership (TLU): this refers to the total number of animals owned by the house hold measured in tropical livestock unit (TLU) live stock is considered as an asset which is liquid and secured against crop failure. As the total number of livestock in the house hold increase wealth and income base of farm house holds which makes more money available in the house hold that minimize demand for credit. This was expected the variable have a negative influence on the accessibility of formal credit.

7. Size of Household (SIZEH): The family size has been defined as the number of people under the same roof. On production side, according to Bizoza et al. (2007), the size of household is synonym of labor endowment for business enterprise in Rwanda. From his study, the more the labor force available from the larger the family members, there is possibility of more income to overcome credits risk (Schereiner and Nagarajan, 1997). On the consummation side, a family size may increase with an increase of dependence rate and loss of potential to attract lenders despite more need to spend and demand for credit. Therefore, it was hypothesized to have positive or negative impact on access to credit

8. Family labor (famlab): this refers to the total number of family members of the house hold who have the potential to work on the farm which is measured in frequency. The larger the

number of the family, the less the demand for hired labor, leads to decrease cost of labor. There for family labor was hypothesized to have negative impact on access to credit

9. Extension contact (extcon): refers to the number of contacts that makes with the extension agent that the respondent made in month. Farmers who have frequent contact with extension agent are expected to have more information that would influence farm house hold demand for credit. There for it was hypothesized as it positively influences famer's access to formal credit.

10. Participation of households in extension package program (ppp): this is a dummy variable which takes value "1" and "0" for participants and nonparticipants in extension package program. If a household participate in extension package program, then it is expected to have credit for the purpose of farm input. There for the variable positively influence farmer's access to formal credit.

11. Lack of opportunity to take second loan (laopplon): loan taken by farmers are expected to repay based on the agreement made. According to the rule of the region failure by farmers to repay their loan in time / to repay at all will forbidden them from getting further loan. This is a dummy variable which takes value of "1" for nom defaulters and "0" otherwise. There for it was expect that farmers who did not repay their loan would not have access to additional credit from formal credit institutions.

12. Distance from the center (distc): farmers near to the center have a location advantage and can contact the lenders easily and have more information about loan than those who live more distant location. There for, it was hypothesized that, farmers who have location advantage was expected to increase access to used credit from formal institutions.

13. Loan repayment period (loanrep): credit institutions have rules and regulations that limit the time at which the borrower will repay the loan. The farmers fail to repay on the time, was sent to the court. Due to this reason farmers fear taking loan from formal credit sources. This variable represents the borrower perception of how the loan repayment period and time discourage farmers from participating in credit market. This is dummy variable which takes value "1" for those who perceive it as constraint and "0" otherwise. It was hypothesized that, it can negatively influence the dependent variable.

14. Membership of village saving and credit association (memvsca): Village banking is a kind of financial services model that assists poor communities to establish their own credit and saving associations, or village banks and non-collateralized loans to its members and a place to invest savings and promote social solidarity (Mohammed and Mohammed, 2007). It is a dummy variable that takes the value of “1” for member households and “0” otherwise. This variable was hypothesized as, it negatively influence the access of formal credit to farmers

15. Off-farm income (offi): it is defined as the amount of off-farm income by the house hold. Off-farm income on one side, may build confidence to borrowers and it can be major source of finance to secure repayment (Sharma and Zeller, 1997), on the other side, higher off-farm income may reduce households borrowing need because such households may be able to meet their investment need, without having resort to borrowing. According to Diagne (1999), Bhuiya et al, (2001), Marge (2003), and Johnston and Marduch (2007) the increase income raise access to credit. So the expected effect of off-farm income on access to credit is either negative or positive.

16. Keeping Farm Records (farrec): This is a dummy variable which takes a value “1” and “0” for keeping farm records and non-keeping farm records respectively. When applying for credit a borrower is required to produce finance documents that relate to his financial position. Therefore, the household which keeps regularly its finance records such as cash flow; income statement and balance sheet fulfill one of the lenders conditions. Such as household is aware about its strengths and weakness and is more likely to access credit. Having already those documents can show the capacity of household in management of its finance.

17. Lending procedures (LENPRO): To get formal loans farmers are expected to pass through different processes, which is time-taking, bulky and sometimes difficult to understand. Rather they prefer to take from the informal credit institutions for the sake of ease even if it charges higher interest rates. Schmidt and Kropp (1987) also reported that in most cases the access problem, especially among formal financial institutions, is one created by the institutions mainly through their lending policies. This is manifested in the form of complicated application procedures and restrictions. This variable represents the borrower's perception of difficulty of the lending procedure. It is a dummy variable which takes a value “1” for those who perceive it

as a constraint and “0” otherwise. Therefore, it was expected that, this variable negatively affects smallholder farmer’s access to credit from the formal credit sources.

18. Group lending (grulen): smallholder farmers are expected to form a group (that can serve as collateral) to take credit from the formal credit sources. But farmers perceived that group lending is difficult to access credit from these sources. It is a dummy variable which takes a value “1” for those who perceived group formation was a constraint and “0” otherwise. Therefore, it was expected that farmers who are unable to form a group or deprived of membership by the group were not able to use formal credit.

3.4.2.3 Econometric Models Diagnostic Tests

Green (1993) noted that the data in hand for a researcher rarely conform exactly to the theory underlying the model. Therefore, before proceeding, the use of economic theories, logic of small scale farmer and stress econometric realization in modeling has been imperative for analyzing factors affecting access to formal credit. The process started with testing the degree of correlation among explanatory variables (multicollinearity), their relationship with the random term (Heteroscedasticity) and the viability of specified model itself (fitness of the model). So the researcher was highly inspired to assess the correlation between the explanatory variables and their relation with the random term.

3.4.2.3.1 Multicollinearity

The correlation coefficients were used to identify any variables that may be correlate and the variables which were found to be highly correlate were either matched or one of them were excluded from the model. Koustoyiannis (1973) stated that multi-collinearity refers to the presence of linear relationships (or near linear relationships) among the explanatory variables. He argued that multi-collinearity is always present in sample data and the degree of its severity in the exogenous variable should be tested. According to Kennedy (1985), for no continuous variables, a value of 0.8 or higher in absolute terms in one of the correlation coefficients indicates a high correlation between the two independent variables. Gujarati (1995) contributed also by arguing that if the Variance Inflation Factor (VIF) of a variable exceeds 10 (this will be happen if R^2 exceeds 0.90), that variable is said to be highly collinear (rule of thumb) and it can

be concluded that multi-collinearity is a problem. Therefore, contingency coefficient and Variation Inflation Factors (VIF) were used to measure multi-collinearity.

The result of the degree of the Variance Inflation Factor (VIF) technique was calculated as:

$$\text{VIF}_{x_j} = (1 / (1 - R_j^2)), \text{ if the vif is greater than 10 there is multi-collinearity}$$

(Where: x_j = the j^{th} explanatory variable regressed on the other explanatory variables. R_j^2 = the coefficient of determination in the (auxiliary) regression of on the remaining regressor)

The results from the application of the contingency coefficients test were calculated as:

$$C = \sqrt{x^2 / n + x^2}$$

Where: C = Contingency Coefficient; x^2

= Chi-square statistic and n=total sample size.

3.4.2.3.2 Heteroscedasticity Test

Kennedy (1985) states that heteroscedasticity is the tendency of the disturbances to vary with some or all the explanatory variables. As a result of violation of constant variance assumption of the disturbance term, this tendency renders the parameter estimates inefficiency in independent variable prediction (Greene, 1993). This study tested for heteroscedasticity.

H_0 : Constant variance (homoscedasticity)

H_1 : Not constant variance (heteroscedasticity)

3.4.2.3.3 Model Specification Errors Test

The conventional goodness of fit, R^2 is not particularly taken meaning full in binary regression and model. Instead of R^2 , pseudo R^2 available and there are varieties of them (Gujarati 2004). However there are no fixed points to judge the model as best or bad predictor

yet it is generally agreed that a model with over all predictive power of three percent or more is good (Andres, Ari and Manus 2006).

In addition inclusion of unimportant or omitting important variables renders the parameter estimates inefficient. The linear predicted values which are linear predicted value ($\hat{y}$) and linear predicted value squared ($\hat{y}^2$) were computed to find out whether the model has correctly specified or whether it could be improved if extra variables is added.

CHAPTER FOUR

RESULT AND DISCUSSION

This chapter presents results and discussions. It is alienated in to two main sections. The first section deals with the descriptive statics and the second deals with econometric analysis of the variables affecting small holder farmers' access to formal credit.

4 .1 Descriptive Analysis

4.1.1 Access to credit by smallholder farmers

The following table 1 shows the level of access to formal credit of the sample respondents in the study area. In the table 1.below, presents the frequency and percentage of respondents who are credit users and who are noncredit users.

Table 1: Sample respondents Access to credit

Access to Credit	Frequency.	Percent
Non users	85	54.14
Users	72	45.86
Total	157	100.00

Source: survey data, 2016

From the table 1, above we can revealed that Out of the total respondents 85 (54.14 %) were noncredit users and 72 (45.86%) of them are credit users. From this we can see that the number of non-credit users respondents were more relative to those households who are credit users.

4.1.2 Level of access to credit by small holder farmers

Following up the proceeding section, results were analyzed using descriptive analysis and categorized them in to four peasant associations. The result in the figure 3, below indicates that from the total 48 Metkel Limat respondents, 22 of them are credit users and 25 of them are noncredit users. In addition the figure shows that, from the 35 Dekera respondents16 of them were credit users and the remaining 19 respondents were noncredit users, while from the total of

26 fereweyane respondents 12 of them are credit users and 14 Of them are noncredit users. Finally the figure shows that from a total of 51 Nebar Hadnet respondents 22 of the respondents were credit users and 27 of them were noncredit users. The result revealed that in each peasant association there is similar trend in access to credit.

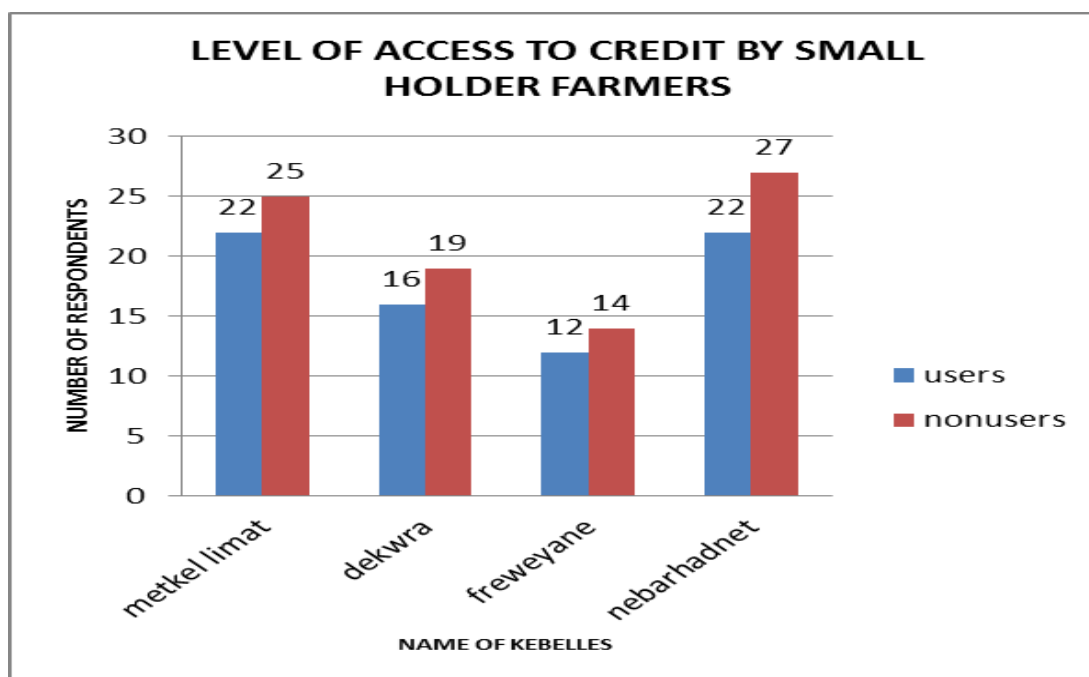


Figure 3: level of access to credit by small holder farmers

Source: survey data (2016)

4.1.2 Demographic characteristics of respondents

4.1.2.1 Access to credit by sex

In this study respondents were categorized in to two categories based on their sex and discussed how much of them were credit users and noncredit users. It was hypothesized that, male headed households were more credit users than female headed households.

Table 2: Access to credit by sex

Access to Credit	Sex of HH		
	Female	Male	Total
Non users	45(65.22)	40(45.45)	85(54.14)
Users	24(34.78)	48(54.55)	72 (45.86)
Total	69(43.9)	88(56.1)	157

Pearson chi2 (1) = 6.0839 *** Pr = 0.01,

Source: survey data, 2016

Note: Significant at 1% probability level, number in parenthesis is %

As shown in table 2 above, out of the 157 respondents, 88 (56.1%) are males and 69 (43.9%) are females. from the total male respondents 48 (54.55%) are credit users while the remaining 40 (45.45%) are noncredit users. when we see the female respondents out of the 69, 24 (34.78%) were credit users while the remaining 45 (65.22%) were noncredit users .moreover, this result coincides with the established hypotheses. The chi2 statistical analysis chi2= 6.0839, pro = 0.01 shows there is statistically significant association between sex and access to credit. This result confirmed the empirical which states male headed households are more credit users than female headed households. From this we can inferred that male headed households are more credit users than female headed households. Women's are frequently discriminating against formal credit market in developing countries (Buvinic, Sabstan, and Zeidenstein, 1979). The belief in discrimination against women in formal credit market often based up on the limited number of women borrowers in the market and is perceived as an outcome of lenders rejection of women application for loan contract. McKee (1989) emphasized that the gender based credit constraint such as limited education; inferior legal status and unpaid reproductive responsibility exacerbated the problem women's face when operating a business.

4.1.4 Access to credit by education of households

Education is one of the key factors that can influence the behavior and attitude of borrowers towards credit. In this study it is hypothesized that education has a positive impact in access to

credit. As households become educated, they start accumulate knowledge and skill how to invest and utilize finance and this positively affect credit.

Table 3: Access to credit by education of households

Access to Credit	Education of HH		
	Illiterate	Literate	Total
Non users	68(98.8)	17(19.76)	85 (54.14)
Users	3(4.2)	69(80.24)	72 (45.86)
Total	71(45.2)	86(54.8)	157 (100)

Pearson chi2 (1) = 90.4929*** Pr = 0.000

Note: significant at 1% probability level

Numbers in parenthesis were %

Source: survey data, 2016,

AS shown in the table 3 above, from the total respondents 86 (54.8) are literate and 71 (45.2%) are illiterate. When we deal with access from the total literate and illiterate respondents 69 or 80.24% and 3 or 4.2% are credit users respectively and the remaining 17 (19.76%) of the literate and 68 or 95.8% of the illiterates were not credit users. The chi2 statistics analysis chi2 = 90.4929, pr = 000, show that there is statistically significant association between level education and access to credit. This means educated individuals were more credit users than less educated individuals. From this, the researcher can conclude that literate individuals are more accessed than those illiterate individuals. Empirical evidence from the study by Kochar (1997) shows that the likelihood of access to formal credit is positively and significantly influences by educational level. The study by owuor (2009) observes in Kenya that literacy level and education level have a significant positive influence on farm household's ability to access credit information.

4.1.2. Access to credit by family size of respondents

The number of family size was another important factor considered in this study which indicates the number of labor force that has direct participation in agricultural productivity. As family size increase, the number of labor increase and the family does not incur more capital which can be paid for hired labor.

Table 4: Access to credit by family size

Access to Credit	Family size							Total
	3	4	5	6	7	8	11	
Non users	12	22	23	15	5	7	1	85
Users	18	18	15	5	3	13	0	72
Total	30	40	38	20	8	20	1	157

Pearson chi2 (6) = 10.5803 Pr = 0.102

Source: Survey data, 2016

The table 4 above shows the family size of the sample respondents. Accordingly, the average family size of the sample respondents was found to be 7 people. The largest family size was 11 and the smallest was 3. The result from the table shows that from the total sample households about 84.7 percent of the credit non-users and 77.7 percent of the users had the family size that ranges from 3-6. From the data explained, households who have more family size were not more accessed relative to households who have less family size. More over the Pearson chi2 statistics, chi2 =10.5803, pro =0.102, show that there is no significant association between access to credit and family size. From this result it can be summarized that there is no association between access to credit and family size. This result was contradict with the empirical evidence from the study by shah et al (2008) using a binary logistic regression model in identifying the factors that affect households access to credit and participation in credit program in Pakistan, the study found that at household level, the participation to credit was influence by family size of the households.

4.1.2 Socio-economic and institutional characteristics of the sample household's

4.1.2.1 Access to credit by extension contact of households

Extension contact refers the number of contacts that made with the extension agents. It influences access to credit to small holder farmers. Farmers who have frequent contact with extension agents are expected to have more information that can influence farm households' demand for credit.

Table 5: access to credit by extension contact of households

Extension Contact								
Access to credit	0	1	2	3	4	5	6	Total
Non users	8	22	23	13	13	3	3	85
Users	7	18	17	16	12	1	1	72
Total	15	40	40	29	25	4	4	157

Pearson chi2 (6) = 2.6588 Pr = 0.850

Source: survey data, 2016

The results of the survey indicated that 90.4% of the respondents had extension contact, while 9.6% did not have any contact with extension agents. An average number of extension contact days for credit user and non-user sample households were the same (3) days per three months. When we see the extension contact with access to credit, from the total respondents 90.6% of the non-credit users and 90.3 % of the credit user households made extension contact while 9.4% of the non-credit users and 9.7% of the credit users were never made any contact with extension agents. This data does not show any significant difference between the two groups. The Pearson chi2 statistics, chi2 2.6588, Pr = 0.850, shows that access to credit and extension contact have no any significant relation. From this it can be conclude that, there is no significant association between access to credit and extension contact. the empirical evidence from the study by Hussein,(2007), Sisay,(2008), Adeola (2009), note that technology adoption and decision making ability of the farm households are significantly influence by extension contact.

4.1.2.2 Access to credit by farm size in hectare

It is the total land size cultivated by the household. The larger the cultivated land size the more labor required that demand more additional capital that can be obtained through credit. Table 6 below show the farm size of the respondents, the average land or farm size of the respondents were 2 hectare for those noncredit users and 2.375 hectare for credit users.

Table 6: Access to credit by farm size

Access to credit	Farm size								
	0	0.75	1	1.5	2	2.5	3	4	Total
Non users	4	1	25	12	25	0	15	2	85
Users	0	1	1	0	12	8	41	8	72
Total	4	2	26	12	37	8	56	10	157

Pearson chi2 (8) = 65.7673 ***, Pr = 0.000

Note: significant at 1% probability level,

Source: survey data, 2016

This indicates that households with more farm land hold by the credit users relative to the noncredit users. in this study , it is hypothesized as it has a positive impact in access to credit and the land cultivated by the household increase the more capital utilized and it demand credit. The data were confirmed with prior expectation. The Pearson chi2 statistics, chi2= 65.7673, Pr = 0.000, shows that there is a significant relationship between farm size and access to credit. The study by Oboh and Kushwaha (2009), employing the multiple regression analysis on the data of 300 farm households revealed that distance and farm size have significant effect. Therefore, based on the above result it is possible to conclude that there is significant relationship between farm size and access to credit.

4.1.2.3 Access to credit by participation of households in extension package program

Participation in package program helps poor peasants to gate knowledge, skill and experience in the utilization of modern agricultural technologies. If a household participates in extension package program, then it is expected to have credit for the purchase of farm inputs or

technologies. the table 7 below, shows that ,the number of years that the sample respondents experienced in package program and it indicates 87% of the non-credit users and 84.7% of the credit users respondents participate in the program while the remaining 13% Of the non-credit users and 15.3% Of the credit users respondents never made any participation in the program. It was expected that, this variable positively influences farmer's access to credit from the formal sources. However the Pearson chi2 statistics, $\chi^2 = 7.5753$, $Pr = 0.751$, shows that there is no significant association between participation in package program and access to formal credit, since the difference is statistically insignificant. A study by Sisay (2008) shows that participation in package program and access to credit has positive significant association and this contradict with result of this study.

Table 7: Access to credit by participation of households in package program

Access credit	Participation in package program												Total
	0	1	2	3	4	5	6	7	8	9	10	15	
Non users	11	4	12	14	12	14	10	4	1	1	1	1	85
Users	11	3	18	10	10	13	4	1	1	1	0	1	72
Total	22	7	30	24	22	27	14	5	2	2	1	2	157

Pearson χ^2 (11) = 7.5753 Pr= 0.751 **Source:** survey data, 2016

4.1.2.5 Access to credit by membership of village saving and credit association

This refers to an association that can establish by individual for saving and credit purpose. Members of the association make a contribution to the association permanently based on the agreement they make in return to get credit from the association. Those associations do not provide credit for nonmembers. The tables below shows, from total respondents 157, 89 of them are nonmembers and 68 of them are members. 59.5% of the nonmembers and 47.1% of the members were noncredit users while 40.5% of the nonmembers 52.9% of the members were credit users.

Table 8: Access to credit by membership of village saving and credit association

Access to Credit	member of village saving \$ credit association		
	Non member	Members	Total
Non users	53(59.5)	32(47.1)	85 (54.14)
Users	36(40.5)	36(52.9)	72(45,86)
Total	89(100)	68(100)	157 (100)

Pearson chi2 (1) = 2.4227 *** Pr = 0.120

Note: significant 1 % probability level, numbers in parenthesis is %

Source: Survey data, 2016

In this study, it was hypothesized that village saving and credit association have a negative relation with credit from formal sources. However, chi2 statistical analysis, Pearson chi2, chi2= 2.4227, Pr = 0.120 shows that there is no statistically significant association between village saving and credit association and access to credit.

4.1.2.6 Access to credit by experience in credit use

This refers to the number of years the household head use credit from formal financial institution. A farmer having more experience in formal credit use would have higher tendency towards using formal credit.

Table 9: Access to credit by experience in credit use

Access to Credit	Experience in credit use		
	have no experience	have experience	Total
Non users	74 (96.1)	11(13.75)	85(54.14)
Users	3 (3.9)	69(86.25)	72 (45.86)
Total	77 (49)	80(51)	157 (100)

Pearson chi2 (1) =107.1759 *** Pr = 0.000

Note: significant at 1% probability level

Source: survey data, 2016

Table 9 above, shows from the total respondent 157, 85 of them are noncredit users and 72 of them credit users. The experience of the respondent 96.1% of the noncredit users and 3.9% of the credit users, they have no experience and 13.75% of the non-credit users and 86.25% of the credit user's respondents said that they have experience in credit use. The chi2 statistics, $\chi^2 = 107.1759$, $Pr = 0.000$, shows that there is significant relationship between access to credit and experience in credit use and this coincides with the prior expectation of the study. Empirical evidence from studies by Sisay (2008), analyze the determinants of small holder farmers access to formal credit in north Gondar, using a binary logit. The result shows that the probability of accessing formal credit was positively and significant with experience in credit use from formal source. A study by Antieno (2001) indicates that past credit participation is significant variable that explain the participation in formal credit market.

Therefore, based on the survey data and the empirical evidence it is possible to conclude that there is significant relationship between past credit experience and access to credit.

4.1.2.7 Major constraints small holders face in accessing credit

This section presents major constraints face smallholder farmers access to financial service in the study area. The method of data analysis used descriptive statistics and result were presented in figure 3 below.

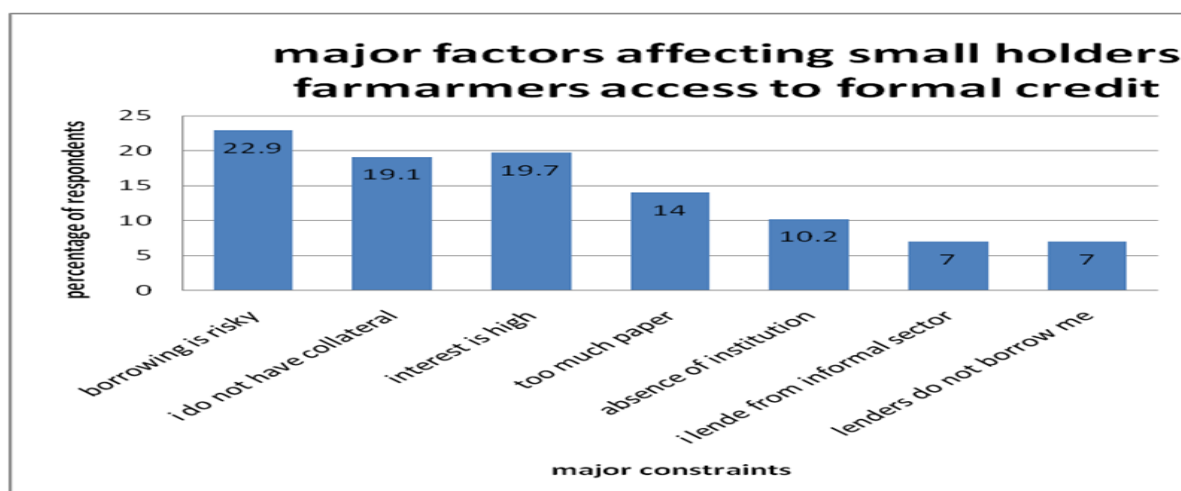


Figure 4: major constraints face by small holder farmers access to credit

Source: survey data (2016)

Figure 4 above shows 22.9% of the total respondents felt that borrowing from de debit saving and credit institution was very risky, 19.1% of the total respondents felt that I do not have collateral used as guarantee for the loan taken from the institution. 19.7% of the total respondents cited that high interest rate was a factor constrained from borrowing. On the other hand 14% of the respondents' replay that too much paper was a factor, while 10.2% of the respondents noted that unavailability of financial institution as a major factor.

4.1.2.8 Access to credit by wealth category and wealth status of households

There are no modern criteria used to categorize farmers in to different wealth groups. In the study area farmers were grouped in two different wealth groups using different traditional mechanisms, like the production capacity of the farmer, number of oxen owned, cattle, goats sheep and the type of house owned by the household (grass or steel) etc. are some of the criteria used to categorized the peasants in to different wealth groups. Based on the criteria set by the traditional wealth ranking groups, farmers with greater than 2 pair of oxen, greater than 5 cows, greater than 4 hectare and house with corrugated iron were categorized as very rich farmers. Farmers with 2 pair of oxen, 3-5 cows, 3-4 hectare and house corrugated iron were considered as rich farmers. Farmers with one pair of oxen, 1-3 cows, 2-3 hectare and house corrugated iron or grass were treated as medium farmers. Farmers with less than one pair of oxen, with one or two cows, less than one hectare and live in grass house were considered as poor farmers. However peasants with no oxen, with less or equal one cow, have less than half of a hectare and live in a grass house were categorized as very poor. According to the wealth ranking groups as the wealth status of the farmers increase their management system as well improved.

The result of the study shows that the very poor small holder farmers were the most disadvantaged group. While the medium rich households were the most favored in accessing credit from the formal source in the study area as far as access to credit is concerned (table 10). The difference between the two groups in terms of access to formal credit was statically significant at 1 % probability level.

Table 10 Access to credit by wealth category of respondents

Access to credit /sex	Wealth category of respondents					Chi2	total
	Very Poor	Poor	Medium	Rich	Very Rich		
Non users	12(14)	41(48.2)	23(27)	5(5.9)	4(4.7)	50.7***	85(100)
Users	1(1.4)	5(6.9)	38(52.8)	20(27.8)	8(11)		72(100)
Total	13 (8.3)	46(29.3)	61(38.9)	25(15.9)	12(7.6)		157(100)
Male	2(2.3)	18(20.5)	40(45.5)	17(19)	11(12.5)	23.9***	88(100)
Female	11(15.9)	28(40.6)	21(30.4)	8(15.6)	1(1.5)		69(100)

*** represents level of significant at 1%

The number in parenthesis were percentages

Source: computed from filed survey (2016)

The table above shows, from the total of very poor class 7.7 % was credit users and 92.3% were noncredit users and 10.9 % poor, 62.3 % medium rich, 80 % of the rich and 66.6% of the very rich were credit users. But 89.1 % of the poor, 37.7 % of the medium rich, 20 % of the rich, and 33.3% of the very rich were noncredit users. From this result, there is statistically significant difference between the two groups in access to credit in the study area.

In addition the table above identifies the wealth status of respondents by their sex. The result shows that 2.3% of the male respondents and 15.9% of the female respondents were categorized as very poor and 20.5% of the males and 40.6% of the female respondents were categorized as poor. The remaining 45.5%, 19% and 12.5% of the male respondents and 30.4%, 15.6% and 1.5% of the female respondents were categorized as medium rich, rich and very rich respectively.

Table 11: Summary statics for continuous variables

Characters	Non Credit users		Credit users			Sig. Level
	Mean	Standard Deviation	Mean	Standard deviation	t value	
Age HH	39.78	10.47	58.47	7.85	45.9***	.000
Farm size of HH	1.78	0.94	2.86	0.85	28.8***	.000
Family size of HH	5.01	1.55	4.9	1.8	37.9***	.000
Family labor of HH	2.5	1.065	1.16	0.47	21.9***	.000
Extension contact	2.25	1.5	2.2	1.36	19.5***	.000
Participation in extension package program	3.74	2.57	3.09	2.11	17.9***	.000
Distance from center	6.74	2.36	2.57	1.53	20.7***	.000
Off farm income	5300.4	411714	5533.8	2782.6	19.3***	.000
TLU	7.24	1.86	7.24	2.02	47.7***	.000

Note: ***indicates significance level at1%

Source: Survey data, 2016

As shown in the table 11 above, the average age of the sample respondents was 58.47 for credit users and 39.78 for credit nonusers. Thus there is high difference in mean age of the respondents. The t. statistics shows that it is statistically significant factor influence access to credit. In the study area the sample respondent have a maximum family size of eleven and minimum family size of three. As shown in the table 11 above the average family size of the respondents was 4.9 for credit users and 5.07 for credit non users. As cited by Mohammed report of (MOFED2006), the average family size the country is 4.8 (4.9 in rural area and 4.3 in urban area). Therefore, the average family size of the respondents was greater than the average of the nation. The result of the study indicates that 44.59 % of the respondents have a family size of 3 to 4, 36.9 % of them have family size of 5 to 6 and the remaining 18.48 % have family size of 7 to 11 members. This indicates there is mean difference between credit users and noncredit users, this implies family size has a relation with credit and can regulate its access.

In the study the sample respondents have a maximum family labor of 6 and a minimum of 1. As show in the table above the average family labor of the respondents were 1.16 for credit users and 2.5 for noncredit user. This indicates there is mean difference in family labor between credit users and the average family labor in noncredit users was higher than the credit users. Which indicates that family labor have a negative relation with access to credit. The extension contact per three month made by sample households has maximum of six days and minimum of zero days and the mean of the contact which they made were 2.25 for noncredit users and 2.2for credit users. The mean difference between the two groups was significant at 1%. Distance is the sample households traveled to reach in the nearest financial institution measured in hour in order to access credit. The survey result shows that the average distance traveled in hours was 6.74 for noncredit users and 2.57 for credit users. The mean difference for the two groups was significantly higher and statistically significant at1%. Indicates those respondents who have location advantage are more accessed than those who traveled long distance.

4.1.2.8 Non participants' perception about joining in DESCI microfinance loan program

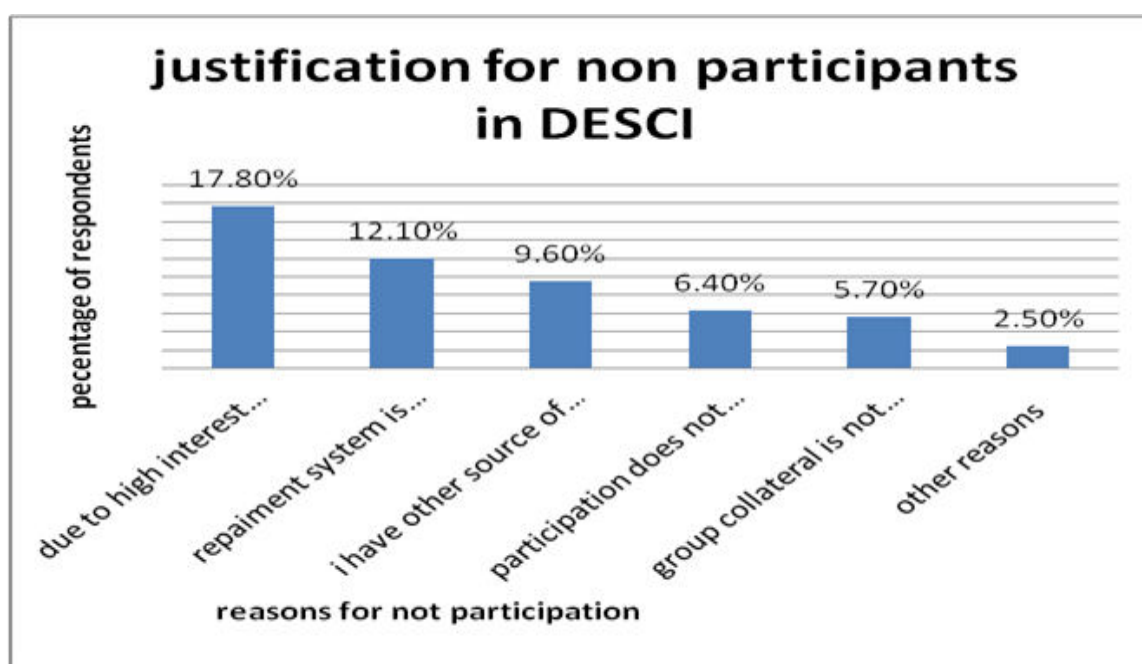


Figure 5: justification for nonparticipants in DESCI

Source: survey data2016

Nonparticipant respondents have many justifications for not participating in DESCİ MFI loan program. From the reasons 17.8% of them reported that it is due to high interest rate that they are not participants. 12.1% of the nonparticipants replay that DESCİ repayment system was not appropriate and flexible. On the other hand 9.6% of the nonparticipant respondents reported that they have other source of income. Additionally 6.4 and 5.7% of the nonparticipants reported that participation does not bring tangible change on the participants and group collateral is not appropriate for poor individuals respectively. Finally 2.5% of the nonparticipants have reported other justifications for not participating DESCİ micro finance program.

4.2 Econometric Analysis

As it is discussed in chapter three, logistic model was selected to identify the determinants of access to credit in the study area. Access to credit has affected by numerous variables which reviewed from many of the previous empirical studies. Similarly in this study the selection and incorporation of the explanatory variables guided by the review of related literature stated in this study. Therefore, emphasis was given in including variables that are possibly determining access to credit and are tested in the current context. Therefore, the binary logistic regression is used to estimate the potential effect of each explanatory variable on the dependent variable (access to credit). However, before fitting the logistic model, it was important to check where there is a serious problem of multicollinearity, hetroskedsticity, and goodness of fit the model based on the theoretical assumption.

4.2.1 Test for Multicollinearity

As indicated in Chapter 3, there are two measures that are often suggested to test the presence of multicollinearity. These are: Variance Inflation Factor (VIF) for association among the continuous explanatory variables and contingency coefficients for dummy variables Gujarati (2003). From Table 12, as suggested by Kennedy (1985) and Gujarati (1995), they hypothesis that there was high degree of association between the variables was rejected. The decision is based on the fact that the high coefficient correlation was 0.20

Table 12 Contingency coefficient for discrete variables

	Sex	Educ	Laopsc	Memv.s.ca	Farrec	Lenpro	lonrep	Grup
Sex	1.00							
Educ	0.20	1.00						
Laopscl	0.04	0.06	1.00					
Memvsca	-0.11	0.05	-0.04	1.00				
Farrec	0.02	-0.09	-0.09	-0.06	1.00			
Lenpro	-0.07	0.03	-0.07	0.23	-0.00	1.00		
Lonrep	-0.01	0.16	0.01	0.0358	-0.09	-0.03	1.00	
Gruplen	-0.17	-0.12	0.09	-0.09	-0.06	0.06	-0.11	1.00

Source: computed from field survey data, 2016

Contingency coefficients were computed to check the existence of multicollinearity problem among the discrete explanatory variables. The decision rule for contingency coefficients is that when its value approaches 1, there is a problem of association between the discrete variables. The negative sign shows the negative relationship between variables that is an increase in one variable will cause a decrease in the other. From table 12 the hypothesis that there was high degree of association among the discrete variables was rejected since the highest coefficient correlation was 0.20

Table 13: Variance Inflation Factor

Variable	VIF	(1/VIF)
Age hh	2.53	0.395165
Distance	2.22	0.451116
Family labor	1.72	0.580322
Farm size	1.57	0.637682
Participation in package program	1.13	0.884274
Family size	1.12	0.894063
Off farm income	1.11	0.900050
Extension contact	1.05	0.951687
TLU	1.04	0.958784
Mean VIF	1.50	

Source: Computed from the field survey data, 2016

Variance inflation factor (vif) was used to check for multicollinearity problem among the explanatory variables. The larger the VIF_i is the more collinear the variable X_i is. As rule of thumb, if the value VIF of a variable exceeds 10, there is a multicollinearity problem (Gujarati, 2003). However, as shown in the table above. VIF result shows that, it is below 2.53. Therefore, it can be conclude that there is no multicollinearity problem.

4.2.2 Test for Heteroskedasticity

Kennedy (1985) states that heteroscedasticity is the tendency of the disturbances to vary with some or all the explanatory variables. As a result of violation of constant variance assumption of the disturbance term, this tendency renders the parameter estimates inefficiency in independent variable prediction (Greene, 1993). If the p value is very small i.e. $pro < 0.05$ (95% confidence interval) the hull hypothesis will be rejected and accept the alternative hypothesis that the variance is not homogenous (Gujarati, 2004). Based on the Breusch-Pagan and Cook-Weisberg test which resulted to $pro=0.1882$, that means fail to reject the null hypothesis, no heteroskedasticity problem in the model (see appendix B).

H₀: Constant variance (homoscedasticity)

H₁: Not constant variance (heteroscedasticity)

Therefore we concluded that there is no violation of the assumption of homoscedasticity; that is the variance of the error term is constant.

4. 2.3 Model Specification Errors Test

From the result of the logistic regression, the pseudo R² indicates that the logit model explains about 71.5% of the variation in the dependent variable by the independent variable.

To test where, important variables are omitted or not the link test was used and it explains how much the independent variable explains the dependent variable. The predicted value (_hat) indicates how level the dependent variable is explained by the independents variables that were included in the model and the predicted value square (_hatsq) indicates how important the omitted variables are.

Table 14: Link test analysis

Access	Coef.	Std. Err.	T	P>t	[95%Conf.	Interval]
Predicted hat	.5470311	.2511439	2.18	0.031	.0508993	1.04
Predicted hat squared	.5437069	.279586	1.94	0.054	-.0086	1.096
_cons	.0001387	.0368149	0.00	0.997	-.07258	.07286

Source: Computed from the field survey data, 201 6

From the Table 14 the coefficient of (_hat) and (_hatsq) were statistically significant at 5 %. Therefore, data were well fitted and that some variable (s) might have been omitted were rejected.

4.3 Discussion of Significant Variables

In the preceding section, variables characterizing the farm households and their differences among the user and non-user groups were identified. However, in the logit model analysis, we

emphasize on considering the combined effect of variables between formal credit user and non-user farm households in the study area. Therefore, the emphasis is on analyzing the variables together, not one at a time. By considering the variables simultaneously, we are able to incorporate important information about their relationship. Eighteen variables were hypothesized to explain factors affecting smallholder farmer's access to formal credit. Out of these ten of the Variables were found to be significant, while seven of the remaining were less significant in explaining the variations in the dependent variable. One of them was excluded from the model. The maximum likelihood estimates of the logistic regression model show that, age of households, sex, education, family size, family labor, extension contact, participation in extension package program, distance from the center, membership of village credit and saving association and off farm income were important factors influencing smallholder farmers access to formal credit in the study area (Table 4.15). All the remaining variables farm size, lack of opportunity to take second loan, farm record, lending procedure, loan repayment, group lending, the number of animals owned by the smallholder (TLU) were less powerful in explaining smallholder farmers' access to formal credit, indicating that the two groups were homogeneous with regard to these variables. Experience in credit use from formal source (DESCI) was excluded from the model.

Table 15: Result of the logit model

Access to credit	Coefficient	Robust Std. Err	Z	P>z	[95%Conf	Interval]
Age of HH	.0747267	.0344927	2.17	0.030**	.0071221	.1423312
Sex of HH	1.620912	.7583738	2.14	0.033**	.134527	3.107297
Level of Education	3.276992	1.063458	3.08	0.002***	1.192652	5.361331
Farm size of HH	-.1253666	.6138549	-0.20	0.838	-1.3285	1.077767
Family size of HH	.7929839	.300789	2.64	0.008***	.2034484	1.382519
Family labor of HH	-1.161148	.3279242	-3.54	0.000***	-1.80386	-.5184289
Extension contact	.5495054	.2728717	2.01	0.044**	.0146868	1.084324
Participation In package program by	-.306796	.169718	-1.81	0.071*	-.639437	.0258451
Lack opportunity to take	-1.3329	1.021557	-1.30	0.192	-3.33511	.6693145

2nd loan						
Lending procedure	.1887327	.8748008	0.22	0.829	-1.52584	1.903311
Distance from the center	-.4789966	.1818905	-2.63	0.008***	-.835495	-.1224978
Member of vsca	1.488249	.8208376	1.81	0.070*	-.120563	3.097062
Off farm income	-.0001332	.0000755	-1.77	0.078*	-.000281	.0000147
Farm record	1.175807	1.036627	1.13	0.257	-.855944	3.207558
Loan repayment	.0913115	1.052136	0.09	0.931	-1.97084	2.15346
Group lending	.3736774	1.040148	0.36	0.719	-1.66497	2.412329
TLU	-.1614264	.2346371	-0.69	0.491	-.621307	.2984539
_cons	-6.760742	3.043039	-2.22	0.026	-12.7249	-.7964956

***, **and * represent level of significant at 1%, 5% and 10% respectively.

Source: Computed from the field survey data, 2016

4.3.1 Elaboration of Significant Explanatory Variables

1. Age of households (age): the result of the logit model shows that, access to credit affected by age positively and it is consistent with the prior expectation. The variable is statistically significant at 5% probability level. The odds ratio 1.077 shows that ceteris paribus the probability of access to credit for aged household heads were 1.077 times higher than less aged household heads. The marginal effect .0098 indicates that as the age of respondents increase by one more year the probability of access to credit increase by 0.98 %. The result were coincide with the finding of Joshua(2013), find and conclude that older household heads are more likely to desire credit, whereby an increase in the age of the household head increases their need for credit. This might be because of experience gathered over the years. However the result contradict with result of Mansah (2014), find and conclude at intermediate age demand for credit increase with respect to age but it declines as the age of the individual advances since they tend not to like leaving debts for their children after their death.

2. Sex of households (sex): the result of the logit model shows that sex affects access to credit positively. This is consistent with the prior expectation. This variable is significant at 5 % level of significance. This is due to the fact that male headed households have the ability to get more

information and control resource than their female counter part. Other variables being equal the odds ratio 5.058 shows that the probability of access to credit is 5.058 times higher for male than female households. The marginal effect .277 indicates that, as the number of male borrowers increase by one more borrower the probability of success increase by 27.7%. This result is consistent with the empirical of Sisay (2008), Christopher et al (2014) and Joshua (2013), they find and conclude that sex significantly influence access to credit. However in the presence of social tie female headed households should access to credit to increase their economic activity.

3. Education of household (educ): Education was found to be a factor positively influence access to credit and the result is statistically significant at 1% significant level and it is consistent with the result found in the descriptive statistics. Households with higher education level tend to have more knowledge in overall economic activities. Such human capital makes individuals more accessed relative to those less educated household. As the number of schooling for individual increase by one year the odds that an individual probability of access to credit increase 26.5 times. The marginal effect of .469, also shows, as the household's level of education increase by one more year the probability of access to credit increase by 46.9 %. This result is consistent with the empirical of Mensah (2014); Sisay (2008) and Jomei (2013), they find and conclude that education have positive and significant relation with access to credit. Although the result was contradicted with empirical of Joshua (2013), who find and conclude that education, have a negative and significant relationship with access to credit, as the level of education increase individuals need to wards credit were decrease and they want to involve other business.

4. Family size of households (falsize): family size was found to be a factor negatively or positive influence access to credit and the result of the logit model shows, the variable have positive relation with access to credit and is statistically significant at 1 % probability level and it is consistent with result found in descriptive statistics. A household with more family size may increase consumption pattern, with an increase of dependence rate and loss of potential to attract lenders despite more need to spend and demand for credit. For an individual household head as the family size increase by one child, the odds that probability of access to formal credit increase 2.21times. The marginal effect of .14 also shows that, as the number of family size increase by one more child the probability of access to increase by 13.9%. This result were contradict with

empirical of Wanyama et al. (2006) and Christopher et al (2014), they find and conclude that family size have significant negative relationship with access to credit.

5. Family labor of households (fallab): family labor was negatively influence access to credit. The result is significant at 1% significance level and it is coincides with the prior expectation and the result of the descriptive statistics. The larger the number of family labor, the more the labor force available for production purpose. The more the labor force available, the lower, the demand for hired labor, this means no or low cost for hired labor. If demand for hired labor decreases due to availability of family labor the need for credit will also decreases. The odds ratio 0.31 indicates that, other things remain the same, the probability of access to credit 0.31 times higher for those households with large number of family labor than those households with less family labor. The marginal effect of -.163 shows that, as the number of family labor increase by one more labor , the probability of access to credit decrease by 16.3%. There for family labor have a negative significant relationship with access to credit. This result contradicts with the empirical of Benjamin Tetteh A.et al (2015). They find and conclude that a household with greater labor force is often associated with higher social and economic standing in most rural communities.

Note that, as far as this study is concerned, it is impossible to conclude that the impact of family labor on access to credit were in adult equivalent.

6. Extension contact (extcon): extension contact was a factor positively influences access to credit and the result is significant at 5% significance level. The result of the logit model coincides with the prior expectation. Farmers who have a frequent contact with extension agents are expected to have more information that influence farm household's demand for credit from the formal sources. As frequency of contacting with extension agents made by individual increase by one more day, the odds that the probability of access to credit for individuals increase 1.73 times. The marginal effect .1209 shows that, as the extension contact made by households increase by one day per three month the probability of access to credit increase by 12.1%. The result was coincides with some empirical of Joshua (2013), Joyce Chemei (2013), Christopher (2014) and Dzadze p. et al (2012) find and conclude that extension contact have a significant positive relationship with access to credit.

7. Participation in extension package program (ppp): participation in extension package program was a factor found to be negatively influence access to credit and it is significant at 10% significance level and the result is not consistent with the prior expectation. If a household participates in extension package program, then it is expected to have credit for the purchase of farm inputs or technologies. As the frequency of participating in extension package program by individuals increase by one year the odds that an individual probability of access to credit increase 0.74 times. The marginal effect-.0516 shows that; other things remain constant, as the number of extension service gets by individual household increase by one year the probability of access to credit decrease by 5.16 %. This result was contradict with the empirical studies of Joyce Chemei (2013) and Mohammed A (2010), they find and conclude that participation in extension package program have a positive relation with access to credit.

8. Distance from the center or financial institution (Distac): distance from the center was a factor found to be negatively influence rural households access to credit. The result was consistent with the prior expectation. The result of the logit model shows that the variable is significant at 1% significant level. Farmers near the lending institutions have a location advantage and can contact the lender easily and have more access to information than those who live more distant locations. For an individual who traveled short distance on foot to get credit frequently, the odds that the probability of access to credit was 0.62 times higher than their counterparts. the marginal effect of -.072 shows that, as the distance traveled by respondents reduce by an hour the probability access to credit increase by 7.2%. This result consistent with empirical studies of Gebrat Kidie (2013), find and conclude that distance have a negative significant relation with access to credit. However the result contradict with the empirical of Joshua (2013), Joyce Chemei (2013) and Christopher Sebatta et.al (2014) , They find and conclude that distance from the center and access to credit have positive significant relationship.

9. Membership of village saving and credit association (memvsca): this is a variable found to negatively influence the households access to credit and this result is not consistent with prior expectation. The result of the logit model shows that the factor is significant at 10% probability level and has a positive relationship with access to credit. For an individual who became member of village saving and credit association the odds that the probability of access to credit 4.43 times higher than its counterpart. The marginal effect .278 shows that other things remain the same,

being the respondent becomes membership of the association the probability access to credit increased by 27.8%. The result of the study was consistent with the empirical of Christopher (2014), he find and concludes that saving habit were significantly and positively influences access to credit. In addition, Eoin Wrenn (2005) states that village banks are community-managed credit and savings associations established by NGOs to provide access to financial services, build community self-help groups, and help members accumulate savings.

10. Off farm income (offi): off farm income is a variable found to have positive or negative impact on access to credit. The result shows off farm income have a negative impact on access to credit. The result of the logit model shows the variable is significant at 10% probability level and has a negative relation with access to credit. The odds ratio .999 indicates that other things remain the same, households who earn or participate in off farm income has a probability of access to credit .999 times higher than its counterpart. The marginal effect -.0000304 shows that other things remain constant, being the household participate in off farm income, his/ her probability access to credit decrease by 0.003 %. This real effect indicates that the two groups are almost the same in accessing credit. The result of this study was contradicted with the empirical of Christopher (2014), Joyce (2013) and Wivine Muhangayir et al (2013), they find and conclude that off farm income has positive and significant relationship with access to credit.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary of the finding

Ethiopia is one of the countries, where the smallholder farming dominates the overall national economy and its population is subject to extreme poverty. Small farmers of the country who do not have access to capital, encompasses the largest portion of the population. This lack of access to financial services is one of the reasons for rural households to live in the vicious circle of poverty for long period. The formal financial sector in Ethiopia is not well developed to provide their services to the rural poor farmers.

The purpose of this study was to assess factors affecting household access to formal credit in the study area, primary data were used. A total of 157 households were interviewed. The data were collected using structured and semi-structured questionnaires that were administered to the sample of households' heads via person-interviews. The data was analyzed using STATA 12, spss version16 program and excel. The Chi-square and t-test statistics were employed to compare credit user as participant and noncredit user as nonparticipant farmer group with respect to the explanatory variables hypothesized to influence access to credit. The binary logit model was used to estimate factors which influenced household access to credit.

Out of 157 interviewed households 72 (45.5 %) of the sampled farm households were credit users, whereas the remaining 85 (54.5%) were non-users. The logistic regression analysis results show that, ten explanatory variables which were included in the model namely age of the household, gender of household, education, size of the household, family labor, agricultural extension service, Participating in extension package program, distance from the center, membership village saving and credit association, and off farm income were statistically significant. Seven from the remaining variables namely, lack of opportunity to take second loan, group lending, loan repayment period, lending procedure, number of animals owned, farm size and farm record was less powerful in explaining the variation. The remaining one variable was excluded from the model. It was observed that household's credit users and nonusers were

significantly different. The households' formal credit users were mainly male headed than their female counterparty. From the User's credit (90.7 %) received agriculture extension service more than noncredit users (90.3 %).

Binary Logit model was used to assess the factors influencing household participating in formal credit use with the dependent variable taking the value of 1 for participant and 0 for no-participant. The results of the logit model show that participating in agricultural extension services affect positively and significantly to access to formal credit at 10%. The farmers who use modern agricultural technologies are those who got more access to credit facility than does who do not participate in agricultural extension services. In addition it was found that educational level of household affects access to formal credit positively and it was significant at 5 % probability level.

It was observed that farmers who are educated have more facilities accessing formal credit. This result differs with Shah et al (2008) who found that education level has a negative effect on credit participation which also similar to Nguyen, (2007). Household's heads possessing higher degrees were showing almost no participation, because higher education may help head of households to easily find a paid job. Finally, gender, family size, family labor, participation in package program, distance from the center, membership of village saving and credit association and off farm income are significant variables that influence access to credit.

5.2 policy implication

The study recommends the following policies aimed at improving farmers' access to formal credit.

- The findings of this research discovered that there is still a long way to go if the rural smallholder farmers in study are going to access and fully utilize agricultural finance. Much of the work is lying on the assumes of the government to put in place policy frameworks and reforms in the financial sector to qualify more outreach of the existing institutions to rural areas as well as emergence of new players. To achieve this, the regional government should expanding micro financial institutions and strengthening the supervision of rural formal banking institutions so as to safeguard access to credit.
- Farmers who participate in agricultural extension services were found to be more likely to access credit. This might be because of the fact that those farmers who have received the extension service have developed the skills of using new agricultural technologies that would increase access to credit use. In other words, encouraging farmers to participate in the uptake of new technologies on regular basis would improve the availability of loan to the farmers. Hence, government agencies should promote agricultural extension services that geared towards increasing training to the farmers in the study area in collaboration with agriculture and rural development bureau.
- The result of the study shows that educated farmers have a higher likelihood of accessing credit. The government and other development agencies should amplify or intensify efforts to improve education level in the study area. Since education enhances people to arrive at more informed decisions about loans. Hence, the government and development agencies need to invest more in educational efforts that reduce the illiteracy level of the rural households by expanding adult literacy program.
- Village saving and credit association was found to be one imperative factor which increase access to credit. May be these farmers who become member of those associations can get credit that can be used for loan repayment borrowed from formal financial institution or finance their business, Which increase their saving habit and are able to accumulate wealth and earn interest from the deposit other than spending it as black money, the Woreda multipurpose cooperative and regional government should

emphasize on activities aimed at increasing the establishment of those village saving and credit associations. This can be enhanced through creation of an enabling environment and supporting for the connotations by preparing and providing formats used for saving and lending process as well as providing supervision and training to members.

- As expected female headed households were more discouraged from borrowing than their male counterparts. Despite this, females were more likely to be successful in their application for credit. To this regard, government intervention should be directed to encourage more female headed households to apply for credit. It is established that female heads are able to affect the poverty level of the household than their male counterparts given some financial support.
- As expected youths were more discouraged from borrowing than older applicants for credit. So there for the government and lending institutions should give priority to the economically active individual so as boost the economic performance of the nation.
- although off farm income have a negative relation with access to credit , the government should create awareness on small holder farmers about the effect of credit on production and productivity

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APPENDICES

APPENDIX A: correlation and vif

```
. pwcorr acccre age sex educ farsize falsize famllab extcon ppp laopscl distac memvsca offi farrec lenpro lonrep
> en tlu
```

	accacre	age	sex	educ	farsize	falsize	famllab
accacre	1.0000						
age	0.7075	1.0000					
sex	0.1969	0.1313	1.0000				
educ	0.7592	0.6956	0.2010	1.0000			
farsize	0.5429	0.5647	0.2460	0.6426	1.0000		
falsize	-0.0381	-0.1351	-0.1175	-0.0938	-0.1188	1.0000	
famllab	-0.6212	-0.5749	-0.1012	-0.6158	-0.4114	0.2773	1.0000
extcon	-0.0135	-0.0212	0.0253	-0.0780	-0.0643	0.1362	0.1404
ppp	-0.1349	0.0407	-0.0498	-0.0395	0.0540	0.0326	0.0961
laopscl	0.0387	0.0443	0.0438	0.0556	-0.0213	0.1274	-0.1079
distac	-0.7159	-0.6903	-0.1018	-0.7193	-0.5138	0.1269	0.5189
memvsca	0.1242	0.0310	-0.1066	0.0452	0.0870	0.0244	-0.0316
offi	0.0328	-0.0039	0.0582	0.1234	0.0615	-0.0616	-0.1051
farrec	-0.1055	-0.1201	0.0233	-0.0890	-0.0717	-0.0367	0.1234
lenpro	0.0588	-0.0400	-0.0663	0.0336	-0.0499	0.0323	-0.0089
lonrep	0.1244	0.0378	-0.0118	0.1590	0.1935	0.0783	-0.1537
gruplen	-0.1054	-0.0644	-0.1692	-0.1161	-0.1471	0.0430	0.0566
tlu	0.0019	0.0478	0.0231	-0.0195	0.0018	0.1619	0.0730
	extcon	ppp	laopscl	distac	memvsca	offi	farrec
extcon	1.0000						
ppp	0.1084	1.0000					
laopscl	0.0300	-0.0384	1.0000				
distac	0.0518	0.1318	-0.0467	1.0000			
memvsca	-0.0682	-0.1152	-0.0379	-0.1116	1.0000		
offi	-0.0844	-0.2480	0.0338	-0.1586	-0.0479	1.0000	
farrec	0.0281	0.0453	-0.0872	0.1973	-0.0629	-0.0701	1.0000
lenpro	0.0687	-0.1996	-0.0656	-0.0868	0.2334	0.0468	-0.0017
lonrep	-0.0959	-0.0862	0.0097	-0.0425	0.0358	-0.0130	-0.0896
gruplen	-0.0240	0.0366	0.0995	0.0279	-0.0983	0.0354	-0.0571
tlu	0.0761	0.0500	-0.0175	-0.0237	-0.0223	-0.0346	-0.0339
	lenpro	lonrep	gruplen	tlu			
lenpro	1.0000						
lonrep	-0.0329	1.0000					
gruplen	0.0590	-0.1046	1.0000				
tlu	-0.0476	-0.0841	-0.0519	1.0000			

vif for continous variables

```
. vif
```

Variable	VIF	1/VIF
age	2.53	0.395165
distac	2.22	0.451116
famllab	1.72	0.580322
farsize	1.57	0.637682
ppp	1.13	0.884274
falsize	1.12	0.894063
offi	1.11	0.900050
extcon	1.05	0.951687
tlu	1.04	0.958784
Mean VIF	1.50	

APPENDIXES B: heteroskedasticity

```
. hettest
```

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of acccre

chi2(1) = 1.73

Prob > chi2 = 0.1882

APPENDIX C: result from logistic regression

```
. logit acccre age sex educ farsize falsize famllab extcon ppp laopscl distac memvsca offi
    farrec lenpro lonrep gruple tlu
```

```
Logistic regression                                Number of obs   =       157
                                                    Wald chi2(17)   =       80.11
                                                    Prob > chi2     =       0.0000
Log pseudolikelihood = -30.818763                Pseudo R2      =       0.7154
```

acccre	Coef.	Robust Std. Err.	z	P> z	[95% Conf. Interval]	
age	.0747267	.0344927	2.17	0.030	.0071221	.1423312
sex	1.620912	.7583738	2.14	0.033	.134527	3.107297
educ	3.276992	1.063458	3.08	0.002	1.192652	5.361331
farsize	-.1253666	.6138549	-0.20	0.838	-1.3285	1.077767
falsize	.7929839	.300789	2.64	0.008	.2034484	1.382519
famllab	-1.161148	.3279242	-3.54	0.000	-1.803868	-.5184289
extcon	.5495054	.2728717	2.01	0.044	.0146868	1.084324
ppp	-.306796	.169718	-1.81	0.071	-.6394372	.0258451
laopscl	-1.3329	1.021557	-1.30	0.192	-3.335114	.6693145
distac	-.4789966	.1818905	-2.63	0.008	-.8354955	-.1224978
memvsca	1.488249	.8208376	1.81	0.070	-.1205629	3.097062
offi	-.0001332	.0000755	-1.77	0.078	-.0002811	.0000147
farrec	1.175807	1.036627	1.13	0.257	-.8559438	3.207558
lenpro	.1887327	.8748008	0.22	0.829	-1.525845	1.903311
lonrep	.0913115	1.052136	0.09	0.931	-1.970837	2.15346
gruplen	.3736774	1.040148	0.36	0.719	-1.664974	2.412329
tlu	-.1614264	.2346371	-0.69	0.491	-.6213067	.2984539
_cons	-6.760742	3.043039	-2.22	0.026	-12.72499	-.7964956

APPENDIX D: Marginal effect of the independent variable after logit

```
Marginal effects after logit
y = Pr(acccre) (predict)
= .24900511
```

variable	dy/dx	Std. Err.	z	P> z	[95% C.I.]		X
age	.0098234	.008	1.23	0.220	-.005864	.025511	48.3567
sex*	.2767891	.14926	1.85	0.064	-.015761	.569339	.56051
educ*	.4687848	.19732	2.38	0.018	.082049	.855521	.547771
farsize	-.0881255	.12707	-0.69	0.488	-.337175	.160924	2.27707
falsize	.139339	.07551	1.85	0.065	-.008655	.287333	5.01274
famllab	-.1631205	.09703	-1.68	0.093	-.353291	.02705	1.89172
extcon	.1209874	.05784	2.09	0.036	.007623	.234351	2.2293
ppp	-.0515772	.02882	-1.79	0.074	-.108063	.004908	3.44586
laopscl*	-.1998198	.12607	-1.59	0.113	-.446904	.047265	.178344
distac	-.0721528	.03923	-1.84	0.066	-.149037	.004731	4.82675
memvsca*	.2776322	.17478	1.59	0.112	-.064935	.620199	.433121
offi	-.0000304	.00002	-1.66	0.097	-.000066	5.5e-06	5407.43
farrec*	.1503942	.13951	1.08	0.281	-.123033	.423821	.821656
lenpro*	.0161245	.15822	0.10	0.919	-.29398	.326229	.426752
lonrep*	.0225923	.17028	0.13	0.894	-.311154	.356338	.77707
gruplen*	.0363533	.18303	0.20	0.843	-.322389	.395095	.808917
tlu	-.0328381	.0437	-0.75	0.452	-.118493	.052817	7.23955
eprcu*	.4474867	.28619	1.56	0.118	-.113436	1.00841	.509554

(*) dy/dx is for discrete change of dummy variable from 0 to 1

APPENDIX E: odds ratio and TLU conversion factor

Logistic regression

```
Number of obs      =      157
```

Wald chi2(17) = 80.11

```
Prob > chi2      =    0.0000
```

Log pseudolikelihood = -30.818763

Pseudo R2 = 0.7154

	Robust					
accres	Odds Ratio	Std. Err.	z	P> z	[95% Conf. Interval]	
age	1.07759	.037169	2.17	0.030	1.007148	1.152958
sex	5.057702	3.835628	2.14	0.033	1.143996	22.36053
educ	26.49594	28.17733	3.08	0.002	3.295811	213.0083
farsize	.8821734	.5415265	-0.20	0.838	.2648742	2.938111
falsize	2.209981	.6647379	2.64	0.008	1.225622	3.984929
famllab	.3131264	.1026817	-3.54	0.000	.1646607	.5954553
extcon	1.732396	.4727218	2.01	0.044	1.014795	2.95744
ppp	.7358007	.1248786	-1.81	0.071	.5275893	1.026182
laopscl	.2637115	.2693962	-1.30	0.192	.0356105	1.952898
distac	.6194046	.1126638	-2.63	0.008	.4336596	.8847079
memvsca	4.429334	3.635764	1.81	0.070	.8864213	22.13282
offi	.9998668	.0000755	-1.77	0.078	.9997189	1.000015
farrec	3.240758	3.359456	1.13	0.257	.424882	24.71866
lenpro	1.207718	1.056513	0.22	0.829	.2174372	6.708066
lonrep	1.09561	1.152731	0.09	0.931	.1393402	8.614611
gruplen	1.453068	1.511406	0.36	0.719	.1891955	11.15993
tlu	.8509292	.1996596	-0.69	0.491	.537242	1.347773
_cons	.0011584	.003525	-2.22	0.026	2.98e-06	.4509064

TLU conversion factor

Livestock Type	TLU	Livestock Type	TLU
Ox	1.10	Sheep	0.01
Cow	1.0	Goat	0.09
Heifer	0.50	Donkey	0.5
Bull	0.6	Mule	0.7
Calves	0.20	Poultry	0.01

Source: Berhe Ybeyn (2016):

