



BAHIR DAR UNIVERSITY
COLLEGE OF BUSINESS AND ECONOMICS
DEPARTMENT OF ECONOMICS

**DETERMINANTS OF ACCESS TO CREDIT AMONG SMALL
SCALE IRRIGATION USER FARMERS IN DANGLA WOREDA,
AMHARA NATIONAL REGIONAL STATE, ETHIOPIA**

BY
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**A THESIS SUBMITTED TO THE DEPARTMENT OF ECONOMICS, COLLEGE OF BUSINESS
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DECLARATION

I, the undersigned, declare that the thesis comprises my own work. In compliance with internationally accepted practices, I have duly acknowledged and referenced all materials used in this work. I understand that non-adherence to the principles of academic honesty and integrity, misrepresentation/fabrication of any idea/data/fact/source will constitute sufficient ground for disciplinary action by the University and can also evoke penal action from the sources which have not been properly cited or acknowledged.

Signature

Tigist Tesfaye

BDU0803142

Place and date

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LIST OF ACRONYMS

ACSI	Amhara credit and saving institution
CBB	Construction and Business Bank
CBE	Commercial bank of Ethiopia
CSA	Central Statistical Agency
DBE	Development bank of Ethiopia
FMSC	Farmer's multipurpose Service cooperatives
GOE	Government of Ethiopia
IWMI	International water management institute
ILSSI	Innovation lab for small scale irrigation
MFI	Micro Finance Institution
SME	Small and medium enterprises
SSI	Small scale irrigation

ABSTRACT

The main objective of this study is to determine factors affecting access to credit among small scale irrigation user farmers. The study used both primary and secondary data. The primary data were collected through structured interview questionnaire from 329 irrigation user farmers from two kebeles. The sample households selected by using multistage random sampling method. The study used both descriptive analysis and econometrics models. Logistic regression method is applied to examine factors that affect access to credit. Based on the econometrics estimation result, cost of irrigation technology, households attitude towards risk (risk), income from irrigation, lending procedures, repayment period, age of the household (age) and livestock ownership were important factors influencing smallholder farmers access to formal credit in the study area. farmers face challenges to access credit; repayment period, repayment time, peer group formation, interest rate and loan size challenges to access credit. According to the kebele's FMSC Revolving fund benefit farmers to access irrigation credit by providing credit in commodity, and the interest rate and the repayment time and repayment period of this fund is three year and it also benefit women. Therefore, policy aimed to increase irrigation development in the area could be successful if these factors and problems are taken into consideration to increase farmers' access credit from the formal financial sources.

Key words: Credit access, Small-scale irrigation, Agriculture finance

CHAPTER ONE: INTRODUCTION

1.1 Background

Ethiopia economy has grown at a rate between eight percent and eleven percent annually for more than a decade and Ethiopia is also the fifth fastest growing economy among the 188 international monetary fund (IMF) member countries; Sustained progress in the agricultural and service sectors motivates this growth World Fact Book (2017). The agriculture, services and industry sectors accounted for 38.8%, 46.6% and 15.2% of real gross domestic product (GDP), respectively African Economic Outlook (2016).

According to World Fact Book report (2017) despite progress toward eliminating extreme poverty, Ethiopia remains one of the poorest countries in the world, due to rapid population growth and a low starting base. Services have surpassed agriculture as the principal source of GDP, but approximately 80% of the population is still employed in the agricultural sector. Desta (2004) found that Agriculture in the country is mostly rainfall dependent, small- scale, traditional and subsistence farming with limited access to technology and institutional support services.

The development of small-scale irrigation is one of the major mediation areas to boost agricultural production in the rural parts of the country. irrigation overcome water and rainfall limitation by providing a sustainable supply of water for cultivation and livestock, strengthen the base for sustainable agriculture, provide increased food security to poor communities through irrigated agriculture and contribute to the improvement of human nutrition FAO (2003).

In Ethiopia, traditional irrigation was practiced before centuries Bekele et al. (2012). seleshi et al. (undated) Irrigation is practiced in Ethiopia since ancient times producing subsistence food crops. Nevertheless, modern irrigation systems were started in the 1960s with the objective of producing industrial crops in Awash Valley. Dereje and Desale (2016) also documented that Irrigation use in Ethiopia dates back several centuries, but modern irrigation began in the 1950s through private and government-owned schemes in the middle Awash Valley and in the 1960s the main purpose of irrigation development was to provide industrial crops for agro-industries in the country. The agro-industries were established by foreign investors with the objective of increasing export earnings.

Numerous modern and large-scale irrigation schemes have been established in the country. As a result, there is a growing interest in small-scale irrigation (SSI) development for food as well as for rural development Dereje and Desale (2016).

Government emphasis is to develop the irrigation sub-sector by assisting and supporting farmers to improve irrigation management practices and the promotion of modern irrigation systems on small less than 200ha, medium 200 to 3000 ha and large-scale over 3000 ha schemes African development fund (2001).

The Government of Ethiopia and its development partners improve financial access and financial support to the agricultural sector over the past 40 years. A large amount of financial resources have been injected in the form of credit and donations through development banks, commercial banks, NGOs, and agricultural development programs to support agricultural production, increase productivity, and create employment in rural areas African development fund (2001). Farm input supply; including improved seeds Short- and medium term credit is necessary to develop profitable irrigated agriculture Olaf Verheijen (2011).

However the financial service contributions to agricultural sector players in Ethiopia face gaps in terms of access to financial services, product quality, and quantity. In terms of access, only few financial institutions serve rural areas in Ethiopia, this leads to low levels of financial inclusion Wikipedia (2017). This study attempts to find out the determinant of access to credit among small scale irrigation user farmers.

1.2 Statement of the problem

According to Knife et al. (2012) In Ethiopia irrigation covers only 0.16 million ha or about 5 percent of the total irrigable land from 4.5 million ha of potential irrigable land. Most of the farmers dependent on rain fed agriculture, and this made the country's agricultural economy extremely fragile and vulnerable to the impacts of weather and climatic inconsistency leading to partial or total crop failure, which in turn resulted in food deficiencies.

Adugna (2014) on the constraints of small scale irrigation schemes in Ethiopia stated that, Regardless of relatively abundant surface and ground water resources and presence of the four major river basins of the country and Lake Tana, more than 95% of Amhara Region's agriculture,

both crop and livestock sector is dependent on inconsistent and uncertain rainfall. Amhara region is endowed with relatively higher amount of rainfall; there is a need to explore fully the ground water potential Zainul et al. (no date).

Rahel (2008) and International Water Management Institute report (2010) shows that Realizing the potential irrigation development can contribute to food security and improved welfare. And if successful irrigation in Ethiopia could represent a foundation of the agricultural development of the country, it will contributing up to 140 billion ETB to the economy and potentially moving up to 6 million households into food security. Teshome (2006) also states that less than 3% of the total food production Irrigated agriculture produces.

Different factors contribute for farmers to participate in irrigation; Access to financial services is one of the factors. It can enable smallholders to invest in irrigation technology. However, In Africa less than 10 percent of the population currently enjoys access to financial services and few financial products are available to finance small-scale irrigation. Broadening and deepening the variety of private sector financial services available to finance small irrigation infrastructure carries great potential to capitalize on the promise of the region's 700,000 uncultivated hectares Joseff and Maren (2008).

Amha (2011) and Peck (2010) found that Access to finance is considered as one of the key elements in addressing development issues in Ethiopia. Improving financial access benefits smallholder farmers to improve production and productivity through investment in irrigation. Similarly a recent study by Tilahun (2015) discussed that the economy of Ethiopia is characterized by its dependence on subsistence agriculture and the existence of underdeveloped financial institutions, especially in rural areas.

Ayen (2004) and Ali and Feininger (2012) found that credit system has likely been improved along with the agricultural extension system in the region; the supply of credit is still insufficient. Almost half of small holder farmers in Amhara region are credit constrained. Kinfel et al. (2012) Adugna (2014) and Gebremedhin (2015) found that the key constraints hindering the success of small scale irrigation are financial shortage; Poor economic background of users for irrigation infrastructure development; to access irrigation technologies and agricultural inputs.

Fałkowski et al. (2010) Shortage of credit has long been identified as a vital factor determining farm development not only in transition and developing countries but also in developed economies.

Based on the report of financial sector in Ethiopia (2008) In Ethiopia among other things, lack of finance is one of the fundamental problems hindering production, productivity and income of rural farm household's. A study on the Challenges and opportunities of irrigated crop production by Lijalem (2013) also revealed that 88.6% of farmers faced shortage of money in irrigated crop production. Agerie (2014) and Muez (2016) conclude that access to credit is one of the important determinants for participating in small scale irrigation and there is systematic association between irrigation participation and credit access.

Diogo and Lisa (2015) studied the Ethiopia irrigation market brief and found that Access to credit is one of the biggest barriers to the smallholder irrigation sector's expansion in Ethiopia. For small-scale farmers living under the poverty line, it is hard to pay for the cheapest irrigation pumps. A number of NGOs (non-governmental organizations) and MFIs (micro finance institution) work with small-scale farmers to help them secure financing for irrigation pumps and equipment, but even these have limited capacity.

According to the agriculture office of Dangla Woreda Amhara credit and saving institution and farmer's multipurpose cooperative provide the credit service to the agriculture sector. And farmer's multipurpose cooperatives provide credit for Irrigation user farmers.

Based on the above studies, there is insufficient access to credit for small scale irrigation user farmers in Ethiopia and in Amhara region and there is a relationship between access to credit and participation on irrigation. The productivity impact of credit and irrigation among farmers in Ethiopia has been researched in a large extent Example Tesfa worku (2011) kinfe et al. (2012) Muleta (2015) and Dereje and Desale (2016).

Yusuf et al. (2016) review different studies on the determinants of demand for credit and found that most of the findings are inconclusive, due to the contextual, socio-economic, geographical, environmental and other variations across the study areas. And the paper call the need for more empirical studies on the determinants of credit for a specific region for better

policy that may be suitable for that particular region. So, it is rational to validate this study the factors that affect small scale irrigation user farmers' access to formal credit with particular reference to Dangla woreda farmers. This paper try to answer the following questions what factors affect small scale irrigation user farmers' access to formal credit; challenges of formal financial institutions in the study area and how the revolving fund approach is helpful to fill gaps related to access of irrigation credit.

1.3 Objectives Of The study

1.3.1 General Objective

- To examine the factors that affect access to credit among small scale irrigation user farmers.

1.3.2. Specific Objectives

1. To identify factors that affect small scale irrigation user farmers access to formal credit.
2. To assess the constraints to access credit from formal financial institutions.
3. To Explain how the revolving fund approach is helpful to access irrigation credit.

1.4 Significance of the Study

This research would fill the gap in empirical literature on the determinants of access to credit particularly on small scale irrigation user farmers; as stated earlier in the problem statement, there is no empirical literature in Ethiopia on the factors that affect small scale irrigation user farmer's access to credit.

This study would provide information that enable financial institutions to understand how credit is related with irrigation and thus formulate appropriate lending policies for small scale irrigation user farmers. Also, better understanding of challenges towards irrigation credit may assist policy makers in designing sustainable financial systems for small scale irrigation users. It can be used as a reference to the other researchers who desire to assess the determinants of access to credit on small scale irrigation user farmers at zonal or national level.

1.5 Scope of the Study

The scopes of the study limited to examining the determinants of access to credit among small scale irrigation user farmers in Dangla Woreda. The study considered only those variables which

determine access to credit like the household socio economic characteristics, and the institutional characteristics. Since the study focus on determinants of access to credit among small scale irrigation user farmers from formal institution, other forms of credit is excluded from the study and the study includes irrigation user farmers only.

1.6 Limitation of the Study

The limitation was some of the farmers were reluctant to frankly respond to some of the questions, and also farmers do not keep records.

1.7 Organization of the thesis

The thesis is organized into five chapters. Chapter one constituted the introduction, which focuses mainly on the background, statement of the problem, objectives, the scope and limitation and significance of the study. Review of the theoretical and empirical literature presented in Chapter two. Chapter three describes the research methodology that includes a brief description of the study area, data collection procedures and analytical techniques. Chapter four constituted on results of the study along with discussion. Finally, conclusion and recommendation presented in the last Chapter five.

CHAPTER TWO: REVIEW OF RELATED LITERATURE

2.1 Theoretical Reviews

It includes definition and concepts of credit and irrigation, the relationship between credit and Agriculture, credit access in Africa and the development of irrigation in Ethiopia.

2.1.1 Definitions and Concepts of Credit and irrigation

According to the Investopedia Credit is a promised agreement in which a borrower receives something of value now and agrees to repay the lender at some date in the future.

Agricultural credit defined by Ellis (1992) that credit is a sum of money in favor of the person to who control over it is transferred, and who accepts to pay it back. Furthermore, Beckman and Forster (1969), defined as the power or ability to obtain goods or services in exchange for a promise to pay later. Also, it is a power or ability to obtain money by the borrowing process, in return for a promise to repay the debt in the future.

It was also defined by Nwaru (2004) the present and impermanent transfer of purchasing power from a person who owns it to a person who wants it, permitting the later the opportunity to command another person's capital for agricultural purposes but with confidence in his willingness and ability to repay at a specified future date. It is the monetization of promises and exchanging of cash in the present for a promise to pay in future with or without interest.

According to Joseph and Maren (no date) rural finance refers to financial services presented and used in rural areas by people of all income levels. Agricultural finance is a subset of rural finance dedicated to financing agricultural activities, such as loans to buy fertilizer or for marketing crops, or insurance products designed to meet the specific wants of farmers and agricultural workers. Financing small scale irrigation categorized into this.

Christopher et al. (2014) defined credit access as when a household is able to borrow from a particular source although it may not borrow at all and the amount of access measured by the maximum amount it can borrow. But, a household is said to be participating if it is borrowing from a source of credit.

For the purpose of this research access to credit and participating in credit considered as the same.

Lijalem (2013) Credit can be provided in kind or cash based on the type of institutions and their rules and regulations.

On the other hand, According to FAO (1994) irrigation is defined as the artificial application of water to the crop for the purpose of food and fiber production overpowering shortages in rainfall and help in creating stabilized agriculture.

According to Fuad (2002) irrigation schemes in Ethiopia can be grouped into three; large scale schemes, medium scale schemes and small scale schemes. Large-scale schemes which irrigate 3000 hectares of land normally constructed and managed by the state; medium-scale schemes possibly irrigating an area of 200-3000 hectares of land and mostly managed by state farms and enterprise. The third category is small-scale schemes irrigating up to 200 hectares of land mainly owned and managed by organized community or water-use associations. Tesfa (2011) also define small scale irrigation as Small scale irrigation is Irrigation, usually on small plots, in which farmers have the major controlling influence and using a level of technology which the farmers can effectively operate and maintain.

For the purpose of this research, Adugna (2014) definition is used. Small scale irrigation usually designates irrigation practices on small plots, in which small farmers have the major controlling effect, and using a level of technology which the farmers can effectively operate and maintain. Small-scale irrigation schemes are understood to include traditional and modern communal schemes up to 200 ha.

2.1.2 Relationship between Agriculture & Finance

Agriculture sector is a major contributor of GDP of agriculture based economies as compared to other sectors of the economy and it is a primary source of living for more than half of their total workforce Mondiale (2008).

On the other hand, Agricultural finance is financial services ranging from short, medium and long term loans, to leasing, to crop and livestock insurance, covering the entire agricultural value chain input supply, production and distribution, processing, wholesaling and marketing Patrick and Thorsten (2007).

Modern agriculture is central for economic development and Engaging modern agriculture is possible when credit provided for purchasing modern inputs Schultz (1964). Saboor et al. (2009) also argue that Use of modern technology increased demand for credit and resulted in increase in agricultural productivity of small farmers and Access to credit supported the adoption of yield improving technologies.

Lijalem (2013) indicated that Access to credit for financing investment and farm operations is crucial for the commercialization of small holder agriculture and it provides the facility of accessing inputs to the farmers and produce good and sufficient production without limit by shortage of money.

Credit is needed as an important indirect input among others to raise efficiency in the agriculture sector Das et al. (2009). Access to improved inputs largely depends on the availability of timely and adequate credit. The limited access to sufficient credit for farmers to purchase improved inputs remains a major challenge in the agricultural production process Tadesse (2014).

Christopher (2014) also indicated that the purpose of access in agricultural finance for smallholder farmers would be to facilitate operational and capital investment where farmers get credit to buy seed, fertilizer and other equipment during the planting season. But, in many cases this is not the case, to the extent that many interventions aimed at facilitating farmers' access to credit have failed to bring it at the right time and in the right proportions.

With modernization and mechanization of farming systems, farming communities need more farm investment. Since most of the farmers in developing countries are small and marginal with fragmented land holdings, they require credit for such investment. Due to lower rate of savings in these economies, the farmers lack adequate owned equity and later resort to external borrowings Chisasa & Makina (2012).

Rural and agricultural financial services are providing by formal and informal financial institutions as well as through financial arrangements within the agricultural value chain. The majority of Africa's population lives in rural areas and depends on agricultural production; the supply of financial services to the sector is insufficient, on average 5% of domestic resources being allocated to the agricultural sector Patrick and Thorsten (2007). Singh et al. (2001) also

found that Most of the farming households are challenged with shortage of funds and to fulfill their credit requirements, both institutional and non-institutional of finance are accessible in a developing economy.

According to the dangla woreda office of agriculture, in dangla woreda both the formal and informal institutions are available and the informal institutions are iqub, edier, and church. And the formal institutions are Multipurpose Cooperative and Amhara Credit and Saving Institution.

According to Reddy (2012) when credit is not available on time and at reasonable rates from institutional or formal sources, farmers are enforced to pay unnecessary rates of interest to non-institutional or informal lenders.

According to Patrick and Thorsten (2007) Reasons for the lack of access to finance in rural areas and in the agricultural value chains are various; among them slow and uneven entry of formal financial institutions into rural areas is one of them and it leads to rural clients often remaining beyond the reach of financial outlets, unwillingness of financial institutions to provide financial services to agricultural and rural activities, whose risk profile is frequently not fully understood and which are often informal in nature. Other Factors such as poor infrastructure and widely spread populations in rural areas raise transaction and information costs, therefore further hindering the spread of financial services. Title and property rights can be problematic to verify in rural areas, posing problems in the use of collateral.

Joseph and Maren (un dated) the challenge for agricultural finance in agricultural development lies in the support for solving the real sector challenge by creating rural financial markets that provide the economic actors with sustainable financial services.

Farmers and agricultural companies typically face seasonal income and long maturation periods and are open to considerable risks. Seasonality requires specifically tailored financial services and conditions, such as longer repayment and grace periods, less frequent repayments, or leasing products. Agricultural risks are price instabilities for inputs and products or crop failure due to pests and diseases, temperature or variable rainfall. Despite these difficulties, formal rural and agricultural finance has been making advances in the continent, with innovative financial services and improved risk management on both the client and institution sides. The most promising approaches include flexible credit schemes, value chain finance, insurance products, promotion of financial literacy and the use of new technologies Patrick and Thorsten (2007).

Bashir et al. (2010) indicated that extensive and suitable use of inputs is determined by access to credit. There is, consequently potential to improve agricultural productivity through access to credit.

Diogo and Lisa (2015) reports that, Ethiopia agricultural sector is underperforming. The sector's commercialization and modernization are severely constrained by a lack of financing. Lack of access to inputs and financing Commercial banks, microfinance institutions (MFIs), and cooperative societies provide financing to the agricultural sector.

2.1.3 Access to Finance in Africa

According to Joseph and Maren (un dated) Access to finance refers to the obtainability of financial services in the form of deposits, payments credit, or insurance to individuals or enterprises. The availability of such services can be constrained for instance by physical access, affordability or eligibility.

Wolday et al. (2010) conclude that a sound financial sector is critical for sustainable economic growth, and consequently poverty reduction and food security. financial sector development plays an independent and fundamental role in promoting economic growth" and is pro-poor in the sense that it is associated with more rapid growth in the incomes of the poor, helping them catch up with the rest of the economy as it grows".

Boubacar et al. (2012) report on the Agriculture Finance in Africa, in developing countries Farmers and rural populations have always found it difficult to obtain credit financing. Most farmers in developing countries have no access to any kind of financial service such as, payments, safekeeping and saving, credit, insurance, which hinders the efficiency and security of their operations.

Christopher (2014) Farmer access and efficient use of credit finance is very vital in increasing farm productivity, increasing rural household incomes and reducing poverty levels in agrarian societies. And Christopher report that, in Zambia in particular and Africa in general, farmer access to agricultural finance is still low.

Burritt (2006) also reported that the majority of households in Malawi lacked access to finance from either from formal Banks, NGOs, and others. or informal sector sources money lenders,

family and friends, Rotating Savings and Credit Associations. In many economies households depend on a combination of formal and informal sector suppliers of finance, often making tradeoffs in terms of convenience (informal sector players tend to be better positioned) and depth of services offered (formal sector players tend to offer a wider variety and more stable sources of finance). In the absence of formal intermediaries, but informal suppliers provide deposit, credit and transfer services that provide value to clients for which clients are often willing to pay dearly to access.

A study on credit accessibility in Ghana by Kuwornu et al. (2013) the result shows that 95% of maize farmers lack access to credit.

Large-scale farmers who own collateral in the form of land and other assets like livestock and cocoa farms are the main receivers of credit. They constitute only 20% of the farming population. Small-scale farmers are constrained in adopting improved inputs and modern technologies Owusu- Antwi and Antwi (2010).

Boubacar et al. (2012) Lack of finance is one of the reasons why agricultural productivity in developing countries and sub-Saharan Africa in particular is very low. Many farmers struggle to pay their seasonal harvest inputs, and investing in agricultural technology. Sumelius et al. (2008) Also shows that the informal rural financial service institutions play a significant role particularly in sub-Sahara Africa as the poor people in general, and women in particular depend almost exclusively on the informal financial market. Smallholders in sub Saharan Africa usually face difficulties with obtaining credits. One way to overcome these problems is through utilization of farmer controlled cooperatives, sometimes alternatively called producer organizations.

Sumelius, J. and Tenaw, S. (2008) studied the Cooperatives as a tool for poverty alleviation and food production and found that the semiformal sector often plays an innovative role on rural financial market services. However, this sector does not have the capacity to replace neither the informal nor the formal rural financial sector. Cooperatives constitute a border case; in some sub-Saharan African countries, the rural financial service activities of cooperatives are subject to control banking laws, central bank supervision. In these cases the cooperatives would be classified as formal financial institutions. In other countries this is not the case and the cooperatives would be classified as semi-formal financial institutions.

According to the African development fund (2001) In Africa, on average, less than 20 percent of households have access to formal financial services, with low population densities, poor transport and limited communications infrastructure contributing to a lack of supply in extensive regions of the continent. Even where such services are available, low income individuals and small and medium businesses may have struggle in meeting eligibility criteria such as strict documentation requirements or the ability to provide collateral, cost barriers, in the form of high transaction fees or substantial minimum requests for savings balances or loan amounts.

Meyer (2011) stated that the reasons why agricultural finance has not been able to meet the requirements and expectations of clients was in terms of both sustainable access and appropriateness of financial products and services are mainly; reluctance of financial institutions to lend to the agricultural sector, high risks associated with lending to the agricultural sector particularly smallholder farmers who lack collateral and production and political risks prevalent in Africa.

According to Getnet et al. (2013) Ethiopia's financial sector is also fairly underdeveloped. Since then several banks and financial institutions have been established with different proclamations and regulations. The three state owned enterprises, namely the Commercial Bank of Ethiopia (CBE), the Development Bank of Ethiopia (DBE), and the Construction and Business Bank (CBB) dominate the financial sector. DBE is a specialized financial institution, which delivers finance for agricultural and industrial development projects.

According to the African development fund (2001) In the Amhara Region, only 30% of the need for micro-credit is satisfied.

According to the World Bank, Ethiopia has one of the lowest financial addition ratios of Sub-Saharan Africa, with only 14% of adults having access to credit. Also, the rural areas are largely underserved as bank branches are aggregated in urban areas. Many farmers access credit through informal financial providers.

2.1.4 Overview of Irrigation in Ethiopia

According to Gebemedhin and Peden (2002), Bekele et al. (2012) and seleshi et al. (undated) Irrigation is practiced in Ethiopia since ancient times producing subsistence food crops. And

modern irrigation systems were started in the 1960s with the objective of producing industrial crops in Awash Valley.

Dereje and Desale (2016) also documented that Irrigation use in Ethiopia dates back several centuries, but modern irrigation began in the 1950s through private and government-owned schemes in the middle Awash Valley where big sugar, fruit and cotton state farms are found. The main purpose of irrigation development in the 1960s was to provide industrial crops for agro-industries in the country. The agro industries were established by foreign investors and had the objective of increasing export earnings.

Irrigation is practiced in Ethiopia since ancient times producing subsistence food crops. But, modern irrigation systems were started in the 1960s with the objective of producing industrial crops in Awash Valley. Private concessionaires who operated farms for growing commercial crops such as cotton, sugarcane and horticultural crops started the first formal irrigation schemes in the late 1950s in the upper and lower Awash Valley. In the 1960s, irrigated agriculture was expanded in all parts of the Awash Valley and in the Lower Rift Valley. Certain aspects of the development during the pre Derg era have wrong doings in terms of property and land rights; there has been a remarkable emergence of irrigation development and establishment of agro-industrial centers. The government is giving more stress to the subsector by way of improving the food security situation in the country. Efforts are being made to involve farmers gradually in various aspects of management of small scale irrigation systems Seleshi et al. (2007).

Ethiopia has a significant irrigation potential identified from both available land and water resources. The country has developed irrigation schemes in many parts of the country at different scales. Amhara is one of the 11 regional states of Ethiopia. Amhara region has a geographical area of about 153,000 Km². Ethiopia's largest inland body of water, Lake Tana, as well as the Semien Mountains National Park, which includes the highest point in Ethiopia, Ras Dashan are located in Amhara region. There are 310 irrigation schemes developed in Amhara region. The irrigation schemes developed have covered an irrigated area of 8,469.26 hectares with 17,443 people beneficiaries. Out of these total irrigated areas, 5,718.68 hectares is from small scale and 2,750.58 are from medium-scale irrigation schemes Seleshi et al. (2007).

The recent study by Dereje and Desale (2016) also indicate that many modern and large-scale irrigation schemes have been established in the country. As a result, there is a growing interest in small scale irrigation (SSI) development for food as well as for rural development. SSI in the Ethiopian context refers to smallholder farms with the size of scheme amounting to less than 200 ha. SSI schemes can be adapted easily to suit local socioeconomic and environmental conditions.

Desta and Almaz (2015) The country's irrigation potential is estimated at 3.7 million hectare, of which only about recent estimates indicate that the total irrigated area under small-scale irrigation reached to 853,000 ha during 2009/10.

Ethiopia's groundwater potential for irrigation remains uncharted and underdeveloped. The development of groundwater, in particular shallow well groundwater, for small-scale irrigation development at national and regional level are importantly and seen as a major avenue for rural poverty reduction. There are broad plans and visions about water resources for irrigation to augment irrigated plots via using different sources or technologies Steenbergen et al. (2015).

Access to credit is one of the biggest barriers to the smallholder irrigation sector's expansion in Ethiopia. For small scale farmers living under the poverty line, it is hard to afford even the cheapest irrigation pumps. A number of NGOs and MFIs work with small-scale farmers to help them secure financing for irrigation pumps and equipment, but even these have limited capacity Diogo and Lisa (2015).

As irrigated agriculture is input intensive by nature both labour and other inputs irrigation may aggravate the liquidity constraints of poor farm households to access main agricultural inputs. Consequently, access to credit reduces problems of liquidity and enhances the use of agricultural inputs. This indicates the contribution of rural credit institutions is greatly important in providing credit to create financial capital alternatives to the farm households to investment on their irrigated agricultural activities. So, access to credit is crucial to boost investments in agricultural sector to increase productivity or to expand the economic activities of rural farm households. Credit predominantly used for the purchase of livestock, farm inputs such as fertilizer, seed and pesticides and in some case for the construction of house Muleta (2015)

Joseph and Maren (un dated) lack of adequate finance has been identified as the biggest stumbling block preventing an even faster adoption of the new technologies. To stress the point

there is not only a lack of financial products, but in many parts of SSA there are only very few rural financial intermediaries working and supporting the potential market for SSI development.

2.2 Empirical Review of Literatures

2.2.1 Determinants of access to credit

In this section a thorough review of empirical literatures is presented. It shows the relationship between household's socio economic, demographic and institutional characteristics that affect access to credit by farmers, by women and among small scale enterprise. It covers both evidences from studies outside and within Ethiopia. Empirical evidence from the literature suggests that household access to finance is influenced by institutional factors and household socio-economic characteristics.

The study by Sisay (2008) on determinants of smallholder farmer's access to formal credit in metema woreda found that 43.1% of the sampled farm households were formal credit users, whereas 56.9% were non-users. Participation in extension package programs, Experience in credit use from the formal sources, total cultivated land size, number of livestock, collateral or group formation and membership of farmer's multipurpose cooperatives (FMSC) were highly important in influencing access to formal credit. And it was also found credit access to female headed households is still limited and the difference between the wealth groups in accessing credit from the formal sources was also statistically significant.

The study on Factors Influencing Access to Credit Services by Women Entrepreneurs in Kenya by John et al. (2014) indicated that majority of the women entrepreneurs does not access credit from financial institutions because of lack of friendliness in the lending procedures. Lending procedures were found to be rigid and does not accommodate the needs of women entrepreneurs. Similar study by Francis (2015) on Small Scale Sugarcane Farmers in Kenya also found that the lending terms and conditions prevent Small Scale Sugarcane Farmers from seeking credit. The lending terms term focus on concerns with default risk and high transaction costs.

John et al. (2014) found that Collateral requirements, purpose of the loan and inflexibility in the lending amount by the financial institutions affects the demand for credit services by women borrowers. majority of the households agreed that all aspects of collateral requirements are the

main reasons that make them not seek for credit from financial institutions; that various aspects of the purpose of the loan were agreed among many respondents to be not favorable and does not attract women entrepreneurs and The effect of inflexibility in the lending amount by the financial institutions affects the demand for credit services by women borrowers.

Gabriel (2011) examined factors influencing small and Medium Enterprises' Access to Funding in Kenya and found that size and age of the firm, entrepreneur characteristics and firm's financial Characteristics were found to have an influence on funding. The startup business, very young and smaller firms were found to have a major setback in accessing credit especially because of lack of collateral and information opacity. The firm's financial Characteristics; lack of proper book keeping system, lack of asset tangibility and lack of standard measures of performance And the fear of risk associated with borrowing also locks out even those who Have asset tangibility. The entrepreneur characteristics are education background, previous experience and ability to form linkages. The business skills that the entrepreneur has influence his/her ability to access credit. The study by Wagemu (un dated) on Determinants of Access to Bank Credit by Micro and Small Enterprises in Kenya and found that entrepreneurial orientation is a direct determinant of access to credit by MSEs.

Stephen et al. (2015) investigated Determinants of Access to Credit by Agribusiness Operators in Ghana using logistic regression analysis of 151 respondents. The result showed that credit access was influenced significantly by variables; extra income earned by respondents, firm size, borrower experience, credit management skills, and possession of collateral security. Factors such as years of business experience of Agri-SME operators, proximity to financial institution and gross monthly sales were insignificant and did not influence access to credit. The study also revealed that factors that influence access to credit by Agri-SME operators were similar to those in the mainstream small business sector or non-agricultural related businesses.

Ma-azu (2015) studied determinants of access to credit and its impact on household food security in karaga district of the northern region of Ghana. The study employed multivariate tobit model that estimated the determinants of credit. The study revealed that access to credit has significant impact on the household food security status of the farmers. Multivariate tobit estimates also revealed that socio-economic factors such as age, sex, household size, education, farm size and farmer based organization membership positively affect access to credit and then food security.

Also, institutional factors such as credit worthiness and guarantor had positive effects on access to credit and food security.

The study by Cuong H. (2007) on the determinants of credit choices and to measure impacts of borrowing activities on borrower's consumption. Contrary to Ma-azu (2015), Cuong H. (2007) Found Education level of household has an inverse U-shape effect on credit taking possibility. There exists uniform access to formal credit among rural households in Vietnam. Households' financial activity is found to be determined by household size and agricultural work rather than education or distance from the commune to the nearest bank branch. There is evidence of money lenders being crowded out by formal institutions by means of competition. The study also demonstrates that formal credit positively affects borrowers' consumption while informal finance has mixed results.

Ricardo (2004) studied the determinants of the access to credit on 140 Argentine small and medium firms. The result from study showed that the acceptance of overdraft lines at high interest rates and very short maturity is an important factor regarding the probability of getting a bank loan, while the availability of collateral does not seem to affect such probability. Liquidity, the lack of statistical significance of asset tangibility, and the effect of overdraft to facilitate the external financing of SMEs has a negative impact on the probability of getting credit.

Alexander et al. (2003) found that banks are the main source of credit for larger firms while, non-banking credit trade plus informal credit remains the leading source of funds for smaller firms. Furthermore, own funds and informal credit is a leading form of credit for newly created firms. It is also found that the probability of having banking credit and the fraction of banking credit or total debt is mostly affected by characteristics of the firm and not by those of their owners. Certainly, the firm's value and age, and whether it keeps formal accounting procedures appear as the most relevant determinants of access to banking credit. With respect to the starting up finances of firms, it suggests a negative relationship with the previous entrepreneurship experience of the owner.

Sunday et al. (2013) investigate factors that determine poultry farmers' access to credit facilities and actual amount borrowed in Ikot Ekpene, southern Nigeria. The analysis was based on the data collected from 90 poultry farmers by Using Probit model regression. The result from

Analysis revealed that age, gender, education, household size, membership of a social group, extension agent contact, farm size and the perceived distance from the farmer's resident to the credit source are statistically significant decision variables influencing the probability of accessing credit by poultry farmers in the study area. However, the magnitude of farm size, membership of social organization, extension agent visits, distance from the farmer resident to the lending source were the most important policy variables that affect the decision of poultry farmers to access credit sources in the study area.

Sisay and Fekadu (2013) used cross-sectional data obtained from a sample of 150 respondents selected through multi-stage sampling techniques from Deder district in eastern Ethiopia and the data were analyzed using probit and Heckman-two step econometric models. The estimation from probit show that sex of the household head, access to credit and extension services have significant positive effect whereas the financial constraints restrains participation in irrigation water utilization. The result from the ordinary least square also show that credit access, livestock holdings and proportion of land allocated to irrigation have significant positive effect on household income. The more land is allocated to irrigation the higher will be the income. The study also, pointed out that local institutional failure was a more important challenge than hydrological factors in managing the irrigation system.

The study by Collins et al. (2016) examined determinant of farmers' participation and credit rationing reasons for participation and non-participation in credit programs and factors influencing farmers' participation and credit rationing status in the Nkoranza districts of Ghana. Probit and Garrett Ranking Technique was applied to analyze the data. Farm households Reasons for participation or non-participation in credit programs were analyzed using the Garrett Ranking Technique and a probit regression model was applied to estimate factors influencing farm households' participation in credit programs. The result form probit regression show that mobilizing savings and accessing loans for agricultural purposes are the most important reasons influencing farm households' decisions to participate in credit programs. The fear of loan default and lack of savings potential are the most important reasons for farm households who did not participate in credit programs. Gender of the household head, formal education level, farm size, and membership in associations are among factors that significantly influence farm households' participation in credit programs. The probability of a farm household being credit rationed is

influence by Membership in associations, household previous year income, and distance to the nearest MFI.

M.H. Quach (2005) studied access to credit and household poverty reduction in rural Vietnam by using cross-sectional data and found that household credit contributes positively and significantly to the economic welfare of households in terms of per capita expenditure, per capita food expenditure and per capita non-food expenditure. The positive effect of credit on household economic welfare is regardless of whether they are poor or better-off households. And also, credit has a greater positive effect on the economic welfare of poorer households and age of the household head, the household size, land ownership, and savings and the availability of credit at village level are key factors that affect household borrowing.

Abi Kedir (2003) studied the Household level of credit rationing using the Fourth Round Ethiopian Urban Household Survey and found that geographical location of households, current household resources, schooling of the household head, and value of assets, collateral, number of dependents, marital status and outstanding debt as significant factors.

Awotide et al. (2015) studied the impact of access to credit on agricultural productivity in Nigeria using the Endogenous Switching Regression Model. The result revealed that Total livestock unit and farm size are positive and statistically significant in determining the farmers' access to credit. In explaining the variations in cassava productivity among the farmers that have access to credit reveals that total livestock unit and farm size are negative and statistically significant, while household size, farm size, and access to information assets are negative and statistically significant in explaining the variation in cassava productivity among the farmers without access to credit. Access to credit has a significant positive impact on cassava productivity.

The study by John et al. (2012) analyzes factors influencing agricultural credit allocation and constraint condition of maize farmers in the Upper-Manya Krobo District in the Eastern region of Ghana. The study uses primary data solicited from 130 maize farmers. The result revealed that the amount of credit received was significantly lower than the amount of credit demanded by farmers. The results from Probit regression model reveal that gender, household size of farmers, annual income of farmers and farm size have significant influence on credit constraint conditions

of the farmers. The Tobit regression model also reveal that age, bank visits before credit acquisition and the amount or size of credit received have significant influence on the rate of agricultural credit allocation to the farm sector.

The study by Paul M. (2008) *Constraints in Access to and Demand for Rural Credit in Uganda* The study used the Uganda household surveys. probit, tobit and multinomial logit model estimations was applied. The result shows that credit market is highly segmented. The rural peasant producers are largely served by relatives/friends and self-help credit associations and their loan applications are less likely to succeed, and of those that do, smaller loans are granted. The educated and the young are more likely to demand credit while women are less likely to, and to apply for smaller loans.

Gideon & Hirotaka (2015) identified the determinants of credit accessibility to more effectively aid alleviate poverty using cross-sectional data. A probit model was used to analyze the factors that determine households' access to credit. The results show that livelihood diversification, household productivity, savings accounts and household size are factors that have a significant influence on households' ability to access credit. In addition, improving household productivity and diversifying livelihoods in rural households will, to a large extent, address the problem of credit constraint.

Sebatta (2014) studied factors affecting smallholders' decision to access rural finance and the intensity of their participation in the financial markets by using a household survey Data. Data was analyzed using a double huddle model. Results indicated that education level of household head, size of household and number of daily meals served significantly influenced decision to access finance while loan payback period, having a phone and personal savings influenced the intensity of participation in the rural financial market.

Akudugu (2012) estimates the determinants of credit in his study using Logit and Tobit models. the logit results for credit demand show that age, literacy, cash crop growing, farm size, gender (male), political affiliation and social group membership have significant positive effects on credit demand. On the other hand, the Tobit results show that having a savings account is the only significant positive factor that influences credit supply.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Description of the Study Area

Agew Awi zone is one of ten the Zones in the Amhara Region of Ethiopia. Agew Awi is named for the Awi sub-group of the Agaw people. Agew Awi is bordered on the north by Semien Gondar Zone, the west by Benishangul-Gumuz Region, and on the east by Mirab Gojjam. Injibara is the administrative centre of Agew Awi; other towns include Chagni, and Dangila.

Agaw Awi is relatively fertile and flat, whose elevations vary from 1,800 to 3,100 m above sea level, with a middling altitude of about 2,300 m. The Zone is crossed by about nine permanent rivers which drain into the Abay or Blue Nile; other water landscapes include two crater lakes, Zengena, Tirba, and Zimbiri marsh which are located 5 km south-west of Addis Kidan. Local forests include Dukima and Apini, which are located on either side of the town of Kidamaja, Zengena forest around Lake Zengena and Goobil forest which is on a dome-shaped hill next to Kessa. The Agaw have traditionally practiced a land-management system which is well adapted to the local ecology, which enable them to endure the fertility of the soil and minimize erosion; this area is documented as one of the most productive in the Amhara Region.

dangla woreda is one of the woredas in the Amhara Region of Ethiopia and dangla woreda is Part of the Agew Awi Zone, bordered on the south by Faggeta Lekoma, on the southwest by Guangua, on the northwest by the Jawi, and on the northeast by the Mirab Gojjam Zone.

This study was carried out in Dangla woreda, Amhara national regional state. dangla woreda is consists of 27 kebeles and based on their geographic location the twenty kebeles Are categorized in to six ketenas; Zuria , Chara, Gesa, Lay Kuakura, Afesa (Kuakura) and Abadra (Tumuha) ketenas.

Based on the 2007 national census accompanied by the Central Statistical Agency of Ethiopia (CSA), Dangla woreda has a total population of 158,688, an increase of 6.44% over the 1994 census, of whom 80,235 are men and 78,453 women; 27,001 or 17.02% are urban inhabitants. With an area of 918.40 square kilometers, Dangila has a population density of 172.79, which is greater than the Zone average of 107.44 persons per square kilometer. A total of 35,610 households were counted in this woreda, resulting in an average of 4.46 persons to a household, and 34,635 housing units. The two largest ethnic groups reported in Dangila were

the Amhara (78.65%), and the Awi (21.13%), one of the Agaw peoples; all other ethnic groups made up 0.22% of the population. Amharic was spoken as a first language by 83.24%, and 16.65% spoke Awngi; the remaining 0.11% spoke all other primary languages reported

According to the Dangla Woreda office of agriculture the main crops are maize, teff, millet, and wheat. Potato, red peeper, cabbage, tomato, onion, garlic, carrot, avocado, mango, coffee and other vegetables and fruits also produced using small scale irrigation technology and non-governmental organization also involved in credit by providing a revolving fund.

3.2 Data Source and Method of Data Collection

Both qualitative and quantitative data collected from primary and secondary data sources. Qualitative data helps to assess small scale irrigation user farmer's perception of the constraints of financial institution and how the revolving fund approach is helpful to fill gaps related to access of irrigation credit in the study area. Quantitative data collected to examine the factors that affect access to credit.

Primary data collected from small scale irrigation user farmers and from creditors. Secondary data was collected from literature, books, office of agriculture, Amhara credit and saving institution (ACSI), farmer's multipurpose cooperatives and savings and credit cooperatives.

The primary data collected from small scale irrigation user farmers by using structured interview and primary data collected from creditors using key informant interview.

Structured interview administered by trained enumerators. Five trained enumerators were employed to conduct the survey under the close supervision of the researcher and other two employed supervisors.

3.3 Sampling Method and Sample Size

To select sample the researcher used multistage random sampling method. In dangla woreda there are 27 kebeles and this kebeles categorized in to 6 ketenas, Chara ketena, Gesa ketena, Zuria ketena, Abadra ketena, Afesa ketena, and Lay Kuakura ketena. And the number of small scale irrigation user farmers within the ketenas is 1637, 1711, 1248, 2144, 2013 and 1161 respectively. Within each ketene there are 3-5 kebeles. Chara, Gesa, Zuria and Afesa ketenas

has five kebeles each, Abadra has four kebeles and Lay Kuakura has three kebeles. On average the number of small scale irrigation user farmers in each kebele is similar.

The researcher randomly selects 2 of this ketene Zuria Ketena and Lay Kakura Ketena and from each ketena 1 kebele was randomly selected. From zuria Ketena Dangishta kebele and from Lay Kuakura ketene Gumdire kebele was selected. And from each kebele 195 and 142 samples were selected respectively from the total population of 394 and 233 respectively. A total of 337 samples were selected.

The sample size was determined based on Yamane (1967) sample size calculation formula which is;

$$n = \frac{N}{1 + N(e)^2} \dots\dots\dots [1]$$

Where n= sample size, N= population size and e=level of precession. e=5%

The sampling frame of each Kebeles small scale irrigation user farmers was collected from agriculture office of the kebele's.

For the key informant interview one key informant was selected from each credit cooperatives and institution. In dangesta kebele there are two credit provider; dengeshta Alebina farmer's multipurpose cooperative and one credit institution Amhara Credit and Saving Institution. In Gumdire kebele also there is two credit providers Amhara credit and saving institution and farmers' multipurpose cooperative. A total of four key informants were selected.

3.4 Method of Data Analysis

Both qualitative and quantitative techniques were used to analyze the data. Quantitative data such as the socio-economic characteristics of the small scale irrigation user farmers were analyzed using descriptive statistic such as mean, percentage, tabulation, ratio and frequency distribution. In addition, the inferential statistics the t-test and Chi-square statistics were employed to measure the mean and percentage differences between credit users and non-users. Binary Logit Regression which best fits the analysis for identifying factors that affects small scale irrigation user farmers access to formal credit was employed.

3.5 Model Specification

The study identifies the factors that affect small scale irrigation user farmer's access to credit in Dangla by using Logistic regression model. Access to credit in this study refers to actual receiving of credit financial service from a formal source. The response variable in this case is dichotomous (binary choice variable); includes a "yes" or "no" type (those that received or those that did not receive the credit) variable. The three most commonly used approaches to estimate such dummy dependent variable regression models are the linear probability model, the logit, and the probit Gujarati (2004).

The Linear probability model is plagued by several problems, such as; non-normality of error term, heteroscedasticity of error, probabilities lying outside the 0–1 range, and the generally lower R^2 values. But these problems are manageable. But even then the fundamental problem with the LPM is that it is not logically a very attractive model because it assumes that $P_i = E(Y=1|X)$ increases linearly with X, that is, the marginal or incremental effect of X remains constant throughout Gujarati (2004).

Due to the above problems of LPM the analysis of this study has to be made by logit or probit models. Sisay (2008), Joyce.C et al. (2015) and Ololade et al. (2013) Uses logit model to examine the determinants of smallholder farmers' access to formal credit. Tran Thi et al. (2015) studied Determinant of Access to Rural Credit and Its Effect on Living Standard using Probit and Tobit models. Probit model is used to determine the factors affecting probability to require formal credit by the poor. Tobit model studies the relationship between the degrees (quantity) of dependent variables fluctuate with the independent variables. And use to investigate the factors that affect the loan amount of poor households. Benjamin et al. utilized Heckman selection model and Probit model to determine Factors influencing smallholder farmers' access to agricultural microcredit in Northern Ghana the Heckman selection model was chosen as the analytical tool for addressing the possible presence of sample selectivity bias in the loan size regression.

Gujarat (2004) In most applications the models are quite similar, the main difference being that the logistic distribution has slightly fatter tails; the conditional probability approaches zero or one at a slower rate in logit than in probit. And In practice many researchers choose the logit model because of its comparative mathematical simplicity. Due to this advantage, the logistic model was used for this study.

Therefore, the cumulative logistic probability model is econometrically specified as follows:

$$P_i = F(Z_i) = F(\alpha + \sum B_i X_i) = 1 / (1 + e^{-Z}) \dots \dots \dots [2]$$

Where, P_i is the probability that an individual will use formal credit or does not use given X_i ,

e denotes the base of natural logarithms, which is approximately equal to 2.718; X^i represents the i^{th} explanatory variables; and α and β_i are parameters to be estimated. By taking the natural logarithms of odds ratio equation (2), which results in the logit model as given by:

$$Z_i = \ln(p_i / (1 - P_i)) = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} \dots \dots \dots + \beta_n X_{ni} \dots \dots \dots [3]$$

3.6 Description of Variables

Review of literatures on factors influencing smallholder farmers' access to formal credit, past research findings and the author's knowledge of the credit Access of the study area will be used to establish working hypotheses of this study. In other words, among a number of factors, which have been related to small scale irrigation user farmers' access to formal credit, in this study, the following demographic, socio-economic, communication and institutional factors will be hypothesized to explain the dependent variable.

1. Sex of the household head (sex): this is a dummy variable that assumes a value of “1” if the farmer is male and “0” female. According to Benjamin et.al (2015) gender alterations exist in most rural communities concerning access to resources. Men usually expect to have social and political power than female and dominate in ownership and access to productive resources in most rural communities than women. So, it was expected that male household have more access to credit than female.
2. Age of the farm household head (AGE): It is a continuous variable, defined as Age of household head (years) at the time of interview measure. Lloyd J. et al. (2014) finds that Age is considered an important variable in terms of experience and responsibility. Those farmers having a higher age due to life experience will have much better association with cooperatives and other formal credit institutions, and it was hypothesized that farmers with higher age may have more access to use credit from the formal sources.
3. Educational attainment of the household head (EDC): It is categorical data. Farmers with a higher level of educational attainment expected to have more contact to the external

environment and accumulate knowledge. They have the ability to investigate costs and benefits. Lloyd J et.al (2014) founds that Smallholder farmers having access to credit tend to have higher levels of education than those without access to credit. It was hypothesized that farmers with a higher level of education may have more access to use credit.

4. Participation of households in extension package program (EXTPACKAGE): This is a dummy variable which takes value “1” for participation and “0” for non-participation in extension package program. If a household participates in extension package program, then it is expected to have credit for the purchase of farm inputs or technologies. So, it was expected that, this variable positively influences farmer’s access to use credit from the formal sources.
5. Membership of farmer’s multipurpose cooperatives (MEMCOOP): This is a dummy variable which takes a value “1” for membership and “0” otherwise. Members of the multipurpose service cooperatives get different services including credit, agricultural input credit is channeled through cooperatives and therefore cooperatives have to lend to both members and non-members. Nevertheless, for other agricultural activities credit is provided for members only. Therefore, it was hypothesized that farmers who are members of cooperatives have more access to credit from cooperative source. Ma-azu (2015) found that farmer based organization membership positively affect access to credit.
6. Attitudes towards Risk (RISKTAKE): attitude towards risk affects the household’s access to formal credit. Many farmers, as can be expected, are very risk-averse that even when credit is available, they do not like to undertaking into activities. This is due to risks of repaying loans that come from loss of crops due to seasonal changes, pest and insect damage. It will be measured based on the farmer’s positive or negative perception. This is a dummy variable which takes “1” if they respond as they don’t fear risk to take loans and “0” otherwise. Therefore, it was expected that farmers who are risk averse will not demand credit and it negatively affects access to use credit.
7. Income from irrigation (INIRR): income from the sale of output produced using irrigation Affect the farmer’s access to credit. It is a continuous variable and it is the income from the last crop season and it was expected that farmers who get a higher income from irrigation will accessed credit and it positively affects access to credit.

8. Cost of the irrigation technology (CIRR): it is the cost of small scale irrigation technology the firm adopted. As the farmer adopted more expensive technology it requires external finance and it increase the probability of the farmer access to credit and vice versa. Therefore, it was expected that farmers who adopted expensive technology will demand credit and it positively affects access to use credit from the formal credit institutions.
9. Total livestock ownership (TLO): Lloyd J et.al (2014) finds that the value of productive assets has a statistically significant negative effect on smallholder farmer access to credit. As the total number of animals in the household increases, the household would be less probably to go for credit. This can be attributed to increase wealth and income base of farm Households which makes more money available in the households that minimizes Demand for credit. It was expected to have a negative influence on access to credit.
10. Household savings (SAV): it refers to the farm household saving. The higher the households' savings, the more likely that a credit agent will lend to it. It was expected to have a positive influence on access to credit.
11. Physical distance of farmers from lending institutions (DINST): 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. So, location advantage was expected to increase access to use credit from the formal institutions.
12. Farmers' perception of Loan repayment period (REPAY): Formal credit institutions have rules and regulations that limit the time at which the borrower should repay the loan. If farmers fail to repay on time they will be sent to the court or their property may be taken away. Due to this, farmer's fear taking loans from formal credit sources. This variable represents the borrower's perception of how the loan repayment periods and time discourages farmers from participating in credit market. This is a dummy variable which takes a value "1" for those who perceive it as a constraint and "0" otherwise. And it was hypothesized that, this variable negatively influences the dependent variable.
13. Farmers' perception of Lending procedures (LEPROC): 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.

4. CHAPTER FOUR: RESULTS AND DISCUSSION

This chapter discusses the results of the analysis that has been conducted to address objectives of the research. The chapter is divided into three major sections. The first section of this chapter presents the descriptive and econometric analysis of factors affecting access to credit among small scale irrigation user farmers. In the second section, smallholder farmer's perceptions of the constraints of formal financial institution are analyzed. The importance of revolving fund for irrigation credit is analyzed in the third section.

4.1 Descriptive Analysis of Continuous Variables

The result from table 4.1 shows that Average Monthly saving for credit user household is 142.89br and 98.57br for non-credit user households. The mean difference in the monthly savings between the households who had access to credit and had no access to credit was statistically significant at 1% level.

Table: 4. 1 average monthly saving of household by credit access

Group	Observation	Mean	Std. Err.	Std. Dev.	t-value
No access	265	98.56	7.58	123.40	-2.6***
Access	64	142.89	14.60	116.82	
Combined	329	107.19	6.79	123.24	
Difference		-44.32	17.01		

Source: Owen Computed from Household Survey data, 2017

*** represent level of significant at 1%.

There is also difference between average monthly saving of male headed households and female headed households, which is 116.21br for male and 47.21 for female households. The average monthly saving of male headed household is large; it is almost more than double than female headed household. The mean difference in the monthly savings between male and female headed household was statistically significant at 1% level.

The result of the study shows that the average cost of irrigation technology for household who had access to credit is 5663.984 with the minimum cost of 1200 and the maximum cost of 15000 and the average cost of technology for non-users is 237.7736 with the minimum cost of 0 and the maximum cost of 11,000. There is a big difference between the average cost of irrigation between households who had access to credit and had no access to credit. The mean difference in cost of irrigation technology between the household who had access to credit and who had no access to credit was statistically significant at 1% significance level.

Table: 4. 2 cost of irrigation technology by credit access

Group	Obs	Mean	Std. Err.	Std. Dev.	t-value
No access	265	237.77	82.40	1341.499	-18.53***
Access	64	5663.98	457.01	3656.105	
Combined	329	1293.32	162.08	2939.978	
diff		-5426.21	279.53		

Source: Owen Computed from Household Survey data, 2017

*** represent level of significant at 1%.

The maximum income from irrigation for credit user household is 4500 and 4300 for household who had no access to credit. But, there is a significant difference between the average incomes from irrigation among the two groups, which is 377.79 and 1588.28 for non-users and users respectively. And the minimum income for users is 0 and the minimum income for non-users is 200. The mean difference in income from irrigation between the household who had access to credit and who had no access to credit was statistically significant at 1% level.

Table: 4. 3 Income from irrigation by access to credit

Group	Obs	Mean	Std. Err.	Std. Dev.	t-value
No access	265	377.79	36.39	592.42	-10.52***
Access	64	1588.28	147.39	1179.14	
Combined	329	613.26	48.68	883.07	

Diff. -1210.48 103.40

Source: Owen Computed from Household Survey data, 2017

*** represent level of significant at 1%.

The number of Livestock owned by households calculated using tropical livestock unit. The average livestock is 7.37, and the minimum number of livestock is 1 and the maximum number of livestock is 18.87. The average number of livestock possessed by households who had access to credit is 8.69 and 7.07 for households who had no access to credit. The mean difference in the number of livestock between the household who had access to credit and who had no access to credit was statistically significant at 1% significance level.

Table: 4. 4 Number of livestock by access to credit

Group	Obs	Mean	Std. Err.	Std. Dev.	t- Value
No access	264	7.07	.21	3.57	-3.86***
Access	64	8.69	.40	3.26	
Combined	328	7.39	.19	3.56	
Diff		-1.62	.48		

Source: Owen Computed from Household Survey data, 2017

The result of the survey shows that the average distance of the credit institutions from the respondent's house is 1.44hr. 0.083hrs and 3.5hrs are the minimum and the maximum hours from the credit institution. The average distance of the credit institution from the respondent's house for non-credit users is 1.44hr and 1.46hr for credit users. The mean difference in the distance between the household who access to credit and who had no access to credit was not statistically significant.

Table: 4. 5 Distance from the credit institution by access to credit

Group	Obs	Mean	Std. Err.	Std. Dev.	t- value
No access	264	1.441	.045	.73	0.61
Access	64	1.462	.088	.71	
Combined	328	1.445	.040	.73	
Diff.		-.020	.101		

Source: Owen Computed from Household Survey data, 2017

The mean Age of the household head who had access to credit is 42.2 and it is 43.12 for farmers who had no access to credit. The mean difference in the average age between the household who had access to credit and who had no access to credit was not statistically significant.

Table: 4. 6 age of household by access to credit

Group	Obs	Mean	Std. Err.	Std. Dev.	t- value
No access	265	43.12075	.6535094	10.63836	-4.73
Access	64	42.20313	1.086346	8.690772	
Combined	329	42.94225	.5668969	10.28258	
Diff.		.9176297	1.433435		

Source: Owen Computed from Household Survey data, 2017

Table: 4. 7 summary of mean comparisons of continuous variables for credit users and non-users

Variables	all sample	access	no-access	mean difference	t-value
Age	42.94	42.20	43.12	.92	-4.73
Distance from Credit institution	1.44	1.46	1.44	.020	0.61
Cost of irrigation Technology	1293.32	5663.98	237.77	-5426.28	-18.53***
Income from Irrigation	613.26	1588.28	377.79	-1210.48	-10.52***
Livestock	7.39	8.69	7.07	-1.62	-3.86***
Monthly saving	107.19	142.89	98.56	-44.32	-2.6***

Source: Owen Computed from Household Survey data, 2017

*** represent level of significant at 1%.

4.2 Descriptive Analysis of the Dummy Variables

Among the total sample households 43 or 13.1% are female and 286 or 86.9% of the households are male. Out of 43 female headed households only 3 females had access to credit for irrigation and 40 female headed households had no access to credit. among 286 male headed households 61males headed households had access to credit for irrigation and 225 male headed household had no access.

female headed households were 4.69% percent of the users and 15.1 percent of the non-users. On the otherhand, male headed households were 95.3% of the users and 84.9% of the non-users. The number of credit user female headed households is lower than the credit users male headed household. It implies that male headed households had more access to credit than female headed households. The difference between access to credit by sex categories was statistically significant at 1% significance level.

Table: 4. 8 sex of the household by access to credit

sex of the hh	credit access of hh		X ² -value
	no access	access	
female	40	3	7.25***
male	225	61	

Source: Owen Computed from Household Survey data, 2017

*** represent level of significant at 1%.

Based on the resut from table 4.3 among the sample households 7.6% of households attain secondary school, 20.1% households were illiterate, 33.1% households were attained primary school and 39.2 % of the households can write and read.

Among the total households who had access to credit 42% can write and read and 10.9% of the household were illiterate. Among the total households who had no access to credit 41.1% of the household can write and read, and 6.1% were attained secondary school. The implication is that households who can write and read had more access to credit than illiterate and households who attained secondary school had the lower proportion among households who had no access to

credit. The difference among the educational level of households in accessing credit was significant at 1% level.

Table: 4. 9 educational attainment of household by credit access

education attainment	credit access of hh		X ² -value
	no access	access	
illiterate	59	7	8.05***
write and read	102	27	
primary	88	21	
secondary	16	9	

source: Computed from the field survey data, 2009

*** represent level of significant at 1%.

As shown from table 4.2 About 44.2% of female headed households were illiterate and no female headed households attained secondary school. 16% of male headed households were illiterate and 39.51% of male headed household can write and read. The percentage difference between male headed household and female household heads in terms of education attainment may mean that female headed households have less access to use credit due to the fact that their low level of education. The difference in sex of households in education attainment was significant at 1% level.

Table: 4. 10 educational attainment of household by sex

sex of the hh	education attainment				X ²
	illiterate	write and read	primary	secondary	
female	19	16	8		22.19***
male	47	113	101	25	

Source: Computed from the field survey data, 2009

*** represent level of significant at 1%.

The number of respondents who participated in the extension package programs was 98 percent. As the figures in Table 4.4 indicated, out of the total respondents, 100 percent from the credit users and 98.11 per cent from the non-users have participated in agricultural extension package program. The participation on extension package programs is very high; this was because farmers in the study area participate on modern farming system (use of fertilizer), irrigation, and on

animal fattening. The difference in accessing credit between extension package participant and non-participant was not statistically significant.

Table: 4. 11 extension package participation of households by credit access

Extension Package	credit access of hh		X ² -value
	No access	access	
No	5	0	1.06
Yes	260	64	

source: Computed from the field survey data, 2009

As shown from the result of the survey 98.5 % of the respondents are members of their kebele multipurpose cooperative and 1.5% of the respondents are not members. Among the respondent households who are members of the multipurpose cooperatives 80.24% had no access to credit and 19.75% had access to credit. 100% of the respondents who are not members of the multipurpose cooperative had no access to credit.

The number respondent households who are members of the multipurpose cooperative is very large, because farmers could get fertilizer, seed and other additional benefit only if they are members of the cooperatives. But, membership of the multipurpose cooperative doesn't affect farmers to have credit access or not. Male and female headed households had almost the same percentage of membership. The difference in accessing credit between farmer's multipurpose cooperative members and non-members was not statistically significant.

The risk of borrowing came from the farmers don't want to put their land, livestock and other assets on danger and the natural disaster facing with seasonal changes like excess rain and drought, pest and insect damage influence farmers' attitude towards credit use that may be difficult to repay their debt due to the changes that may occur. The result from table 4.4 shows that 71.1% percent did not want to take risk by borrowing from formal financial and 28.87% don't fear risk. 58.95 % of the respondents didn't fear risk had access to credit and 41.1% of the respondents don't fear risk had no access to credit. 96.58% of the respondents fear risk to take a loan had no access to credit. The implication is that respondents didn't fear risk to take credit. The difference in accessing credit between farmers's who fear risk and who didn't fear risk was statistically significant at 1% level.

Among the sample household who don't fear risk 11.58% are female and 86.79% are male. This implies that female households don't want to take a loan because of risk than male. But, the difference in risk taking behavior between male headed and female headed household was not statistically significant.

Table: 4. 12 risk taking behavior of household by access to credit

risk taking bahviour of the hh	credit access of hh and sex of the hh				
	no access		access		X ² -value
	female	male	female	male	
otherwise	32	194		8	109.4
dont fear risk	8	31	3	53	

source: Computed from the field survey data, 2009

The result from the survey shows that from the total sample household 67.48% of the respondent had a repayment period constraint and 32.5% of the households had not constraint by repayment period. 51.4% of the respondent who had not constraint by repayment had no access to credit and 48.59% of the respondent not constrained by repayment period had access to credit.

On the other hand, 94.59% who constrained by repayment period had no access to credit, only 5.41% of the household constrained by repayment had access to credit. It implies that, repayment period time and constrained farmers from accessing credit. The difference in accessing credit between household who constrained by repayment period and not-constrained by repayment was statistically significant at 1% level.

When we compare the constrained and non-constrained female headed households with male headed households, the constrained household's proportion is greater than the non-constrained but, for male headed household the proportion of non-constrained is greater than the constraint. However, the difference in constraint and non-constraint between male headed and female headed household was not statistically significant.

The result from table 4.3 shows that 72% of the sample household's constraint by the lending procedures to access credit and 27.96% not constrained by the lending procedures to access credit. 44.47% of the household not constrained by lending procedures, had no access to credit

and 55.43% of households not constrained by lending procedures had access to credit. On the other hand, 94.51% of households constrained by the lending procedures had no access to credit and only 5.49% of households constrained by the lending procedures had access to credit. So, lending procedures such as collateral, group formation affect the household's access to credit. The difference in accessing credit between household who constrained by lending procedures and not-constrained was statistically significant at 1% level.

Among the household who respond lending procedures not constrained them to access credit 15.22% are female headed households and 78 or (84.78%) are male headed households. On the other hand, among the household who respond lending procedures constrained them to access credit 29% are female headed household and 87.76% are male headed households

Table: 4. 13 lending procedures by sex and credit access

lending procedures constraint	credit access of hh and sex of the hh				X ² -value ***
	no access		access		
	female	male	female	male	
no	12	29	2	49	53.69
yes	28	196	1	12	

source: Computed from the field survey data, 2017

Table: 4. 14 mean comparison of continuous variables for credit users and non-users

Variable	Credit user		non-user		X ² -value ***
	N	%	N	%	
Sex					7.25
Female	3	4.69%	40	15.1%	
Male	61	95.3%	225	84.9%	
Education					8.05
Illiterate	7	10.9%	59	22.26%	
Write and read	27	42%	102	22.26%	
Primary	21	32.8%	88	32.21	
Secondary	9	14.1%	16	6.1%	
Ex-package					1.06

No	0	0	5	1.89%	
Yes	64	100%	260	98.1%	
Multipurpose CO.					
Membership					
Member	57	100%	267	98.16%	
Non-member	0	0%	5	1.84%	
Risk taking beh.					109.4
Fear risk	8	12.5%	226	85.3%	
Don't fear risk	56	87.5%	39	14.7%	
Repayment					76.8***
Constrained	12	21.1%	217	79.78%	
Not-constrained	45	78.95%	55	20.22%	
Lending procedure					53.69***
Constrained	18	31.58%	217	79.78	
Not-constrained	39	68.42%	55	20.22%	

source: Computed from the field survey data, 2009.

*** represent level of significant at 1%.

4.3 Model specification and goodness of fit test

4.3.1 Model specification test

Proper specification of the model is particularly crucial because parameters may change magnitude and even direction when variables are added to or removed from the model. The Stata command `linktest` is used to detect a specification error.

`linktest` is that if the model is properly specified, one should not be able to find any additional predictors that are statistically significant except by chance. `linktest` uses the linear predicted value (\hat{y}) and linear predicted value squared (\hat{y}^2) as the predictors to rebuild the model. The variable \hat{y} should be a statistically significant predictor, since it is the predicted value from the model. This will be the case unless the model is completely misspecified. On the other hand, if our model is properly specified, variable \hat{y}^2 shouldn't have much predictive power except by chance. Therefore, if \hat{y}^2 is significant, then the `linktest` is significant. This usually means that we have omitted relevant variable(s).

Based on appendix table 7.2, the hat is statistically significant predictor at 1% significance level and the variable hatsq is insignificant. It implies that model has no specification error.

4.3.2 Goodness of fit test

The Hosmer and Lemeshow's goodness-of-fit test is that the predicted frequency and observed frequency should match closely, and that the more closely they match, the better the fit. The Hosmer Lemeshow goodness-of-fit statistic is computed as the Pearson chi-square from the contingency table of observed frequencies and expected frequencies. If the p value is small, this is indicative of poor fit.

Based on Result from appendix table 7.3 that the p-value is 0.98 it is large and it indicates that the model fit good.

4.3.3 Multicollinearity diagnosis

Variance Inflation Factor (VIF) measures are suggested to test the presence of multi-collinearity. Variance Inflation Factor used to test for association among the explanatory variables. The technique of variance inflation factor (VIF) was employed to detect the problem of multi-collinearity. According to Gujarati (2003), VIF can be defined as: $VIF(x_i) = 1/1-R^2$

Where, R_i^2 is the square of multiple correlation coefficients that results when one explanatory variable (X_i) is regressed against all other explanatory variables. The larger the value of VIF, the more troublesome or collinear are the variables. As a rule of thumb, if the VIF Of a variable exceeds 10, there is a multi-collinearity problem.

Based on result from; appendix table 7.4 all the explanatory variables have no serious multi-collinearity problem. The data were found to have no serious Problem of multi collinearity and therefore the variables were retained in the model.

4.4 Model output

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.

Thirteen variables were hypothesized to explain factors affecting smallholder farmer's access to formal credit. Out of these six of the variables were found to be significant, while multipurpose cooperative membership and extension package participation excluded from the model, because two variables did not show variation among sample farm households. And the other five were less significant in explaining the variations in the dependent variable.

The maximum likelihood estimates of the logistic regression model show that cost of irrigation technology (irrcost), income from irrigation (irrincome), lending procedures (dlend), repayment period (drepayment_period), age of the household (age) and livestock ownership (livestock_ownership) were important factors influencing smallholder farmers access to formal credit in the study area.

The demographic variables education and sex, and distance from the institution, risk and monthly saving were less powerful in explaining smallholder farmers' access to formal credit indicating that the two groups were homogeneous with regard to these variables.

Table: 4. 15 maximum likelihood estimates of logit model

creditaccess	Coefficients	Std. Err.	z	P> z
IRRCOST	.00113	.0002	4.28	0.000
SEX	.40903	1.0487	0.39	0.697
RISK	2.3702	.7873	3.01	0.003
IRRINCOME	-.00172	.0005	-2.90	0.004
LENDING PRO	-3.0905	.8863	-3.49	0.000
REPAYMENTPERIOD	-3.4194	.9142	3.74	0.000
SECONDARY	-1.8580	1.351	1.37	0.169
PRIMARY	.31098	.9327	0.33	0.739
WRITEREAD	.16986	.9074	0.19	0.852
AGE	-.1091	.0496	-2.20	0.028
MONTHLY SAVING	.00260	.0030	0.84	0.399
LIVESTOCK	.25516	.1146	2.23	0.026

DISTANCE	-0.4203	.4513	-0.93	0.352
_cons	1.9950	2.474	0.81	0.420

Number of obs = 329
LR chi2(13) = 234.01
Prob > chi2 = 0.0000
Log likelihood = -34.667876
Pseudo R2 = 0.7714

source: Computed from the field survey data, 2009

4.4.1 Discussion on significant explanatory variables

Table: 4. 16 marginal effect after logit estimation

Variable	dy/dx	Std. Error	z	P> z
IRRCOST	.00001***	.000	4.28	0.000
SEX	.00330	.007	0.43	0.669
RIDK	.04396	.030	1.43	0.153
IRRINCOME	-.00001***	.000	-2.90	0.004
LENDING	-.07685*	.044	-1.72	0.085
REPAYMENT	-.08967*	.047	-1.90	0.057
SECONDARY	-.00911	.007	-1.26	0.208
PRIMARY	.00305	.009	0.31	0.757
WRITEREAD	.00161	.008	0.18	0.857
AGE	-.00101***	.000	-2.20	0.028
SAVING	.00002	.000	0.84	0.399
LIVESTOCK	.00237**	.001	2.23	0.026
DISTANCE	-.00391	.004	0.93	0.352

source: Computed from the field survey data, 2009.

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

Cost of irrigation technology (irrcost) was found to be an important variable in accessing formal credit use. Cost of irrigation technology positively affects access to credit. The P-value corresponding to the variable irrcost show that it is significant at 1% level. But, its effect is negligible. The increase in a birr cost of irrigation increase the probability of access to credit by 0.001 percent, but it is almost 0. The explanation is that when the cost of irrigation technology is high the farmers can't afford the price and need other financial sources. This was consistent with the prior expectation.

Income from irrigation (irrincome) was also another factor which was significantly related to the dependent variable and that it was significant at 1% level. It negatively affects access to credit. The increase in income from irrigation by one birr, decrease the probability of access to credit by 0.002 percent. This is inconsistent with the prior expectation and also its effect was negligible, this is because, most of the households who have a higher income from irrigation had small scale irrigation technology by their own finance, and the use of technology also makes their income higher.

Lending procedures such as peer group formation, project proposal and other written applications and collateral hypothesized to have a negative relationship with access to credit, because farmers don't want to put their asset on risk, the peer group formation also difficult especially for poor farmers and farmers didn't know how to prepare of project proposal. It was significant at 10% level and the result is consistent with the prior expectation. The result of the logit mode revealed that lending procedure has a negative relationship with access to credit. Households who constrained by lending procedures than households who are not constrained by lending procedures the probability of access to credit decrease by 8 percent.

This study is consistent with John et al. (2014) who empirically tested Factors Influencing Access to Credit Services by Women Entrepreneurs, found that majority of the women entrepreneurs does not access credit from financial institutions because of lack of friendliness in the lending procedures and also Lending procedures were found to be rigid and does not accommodate the needs of women entrepreneurs. The study by Francis (2015) on Small Scale Sugarcane Farmers

also indicated that the lending terms and conditions prevent Small Scale Sugarcane Farmers from seeking credit.

This study is also consistent with the study by Sisay (2008) on determinants of smallholder farmer's access to formal credit in metema woreda found that collateral or group formation was highly important in influencing access to formal credit.

Repayment period (drepayment_period) is also another variable which has a significant relationship with the dependent variable access to credit. It was affects access to credit negatively. It was hypothesized to have a negative relationship, because ACSI the repayment period for agricultural credit is short which is one year in the credit institutions and it may be in the production month (on summer), and farmers can't repay the credit during that period. It is significant at 10% and the result from the model also consistent with the prior expectation. Households who constrained by Repayment period than households who are not constrained by Repayment period the probability of access to credit decrease by 9 percent.

This study is consistent with Sunday et al. (2013) who empirically examined the Determinants of Credit Access and Demand among Poultry Farmers using Independent double hurdle model was aimed determining factors influencing credit accessibility and demand among poultry farmers. The result from the model revealed that, the amount of loan demanded by the poultry farmers was significantly influenced by the loan repayment period.

Number of livestock (number of livestock in tropical livestock unit) (livestock_population) in the rural areas constitutes accumulation of wealth, security against emergencies, and also used as a cultural privilege. It was hypothesized to have a negative relationship with the dependent variable by justifying, as the total number of animals in the household increase; the household source of income also increase. This variable is significant at 5%, the result of the logit model also revealed that the variable has a positive relationship with access to credit. Farmer with large number of animals' uses formal credit than with lesser animals. Increase in number of livestock by one increases the probability of access to credit by 0.2 percent. The result is inconsistent with the prior expectation.

The result was inconsistent with Awotide et al. (2015) studied the impact of access to credit on agricultural productivity using the Endogenous Switching Regression Model and found that Total

livestock unit is negative and statistically significant in determining the farmers' access to credit. This result was also inconsistent with Sisay (2008) which reveals that number of animals has a negative relationship, that farmer with lesser number of animals uses formal credit than with larger animals.

The positive relationship of livestock population with access to credit in the study area could be due to the livestock required as collateral to get credit, so households who had larger number of livestock or value off livestock will more likely to access credit.

Age of the farm household also another significant variable; it is significant at 5% significance level. The prior expectation was that farmers with higher age may have more access to use credit from the formal sources, but the result is inconsistent with prior expectation. Age of the farm household affects access to credit negatively. A one year increase in the age of a household decreases the probability of access to credit by 0.01 percent.

The study by Paul M. (2008) Constraints in Access to and Demand for Rural Credit in Uganda The study used the Uganda household surveys. probit, tobit and multinomial logit model estimations was applied. The result revealed that educated and the young are more likely to demand credit.

The result is inconsistent with Akudugu (2012) who estimates the determinants of credit using Logit and Tobit models. The result reveals that age have significant positive effects on credit demand. The result is also inconsistent with Ma-azu (2015) studied determinants of access to credit and its impact on household food security in karaga district of the northern region of Ghana. The study employed multivariate tobit model that estimated the determinants of credit. The study revealed that age positively affect access to credit.

4.5 constraints to access credit from formal financial institutions

This section deals with farmers' perception of the challenges or constraints of formal financial institutions. Information collected through survey interview questionnaire from small scale irrigation user farmers were presented.

4.5.1 Peer group lending (trust group)

peer group lending (trust group) 91.5% of the respondent households respond that it is a challenge to access credit from ACSI and farmers multipurpose cooperative, because the creditors require the peer group as a collateral. To get a loan members of the FMSC should make a group consists of six farmers and when one of the group members wants to take a loan the other five used as a collateral (they sign for the household) and also the amount of loan (loan size) depends on the amount of money that the peer group members saves. Especially, it is difficult to form a trust group for poor farmers and no one wants to put his property at risk. For the poor households they required to form poor of poor group. The rest 8.5 % of the respondent didn't consider peer group lending as a challenge to get credit because, they believed that collateral requirement is more challenging than peer group formation. It is also difficult to get a loan from ACSI, to get a loan farmers should form a group and This by itself is not sufficient in the study area but also guarantor is required to provide productive loans to farmers.

4.5.2 collateral

Among the sample household 92% of the farmers respond that Collateral requirement constraint them to access credit. In Ghana According to Owusu- Antwi and Antwi (2010) Large-scale farmers who possess collateral in the form of land and other assets like livestock and cocoa farms are the main beneficiaries of credit. They constitute only 20% of the farming population. Small-scale farmers are constrained in adopting improved inputs and modern technologies.

In the study area The formal institutions required livestock, land certificate, house, and trees as collateral. According to Meyer (2011) reported that in terms of both sustainable access and suitability of financial products and services are mainly; reluctance of financial institutions to lend to the agricultural sector, high risks associated with lending to the agricultural sector especially smallholder farmers who lack collateral.

4.5.3 Interest rate

Interest rate is another constraint of farmers in the study area. The interest rate charge by the Amhara Credit and Saving Institution is 18% and FMSC charges 15% interest rate. 99% of the sample households respond it is not profitable for them to get a credit in this interest rate and they can't make a profit that can cover this cost. innovation laboratory for small scale irrigation

(ILLSI) project provide credit for small scale irrigation user household in kind (pump, pull, rope and washer) Through FMSC at 7.25 interest rate. the farmers respond that this interest rate is very low compared to others. The high interest rates affect access to agricultural finance negatively with the number of borrowers reducing with reducing amounts borrowed.

Mrak (1989) found that the high interest rates in the end affect access to agricultural finance negatively with the number of borrowers reducing with reducing amounts borrowed especially from the formal financial sector.

4.5.4 Repayment period and time

Repayment period and time also constraint farmers to access credit in the study area, the repayment period in ACSI is one year and FMC is for three year (for irrigation technology in kind credit). Among The sample households 87% of the household faces this problem. According to the ACSI the households need a credit especially at the rainy season, and if they borrow at this season they should also pay next year at this season. But, in that period the farmers can't repay in the production season and price and weather conditions also affect the repayment performance of farmers.

4.5.5 Saving requirement

Farmers consider the saving requirement as a constraint. Among the total sample households 70% of the respondents respond that saving requirement is a problem or challenge. The formal institutions in this study area required saving to access a credit, that is compulsory saving. In ACSI There are also two kinds of saving; Voluntary and compulsory savings. In voluntary saving farmers can save the amount they have and they want and they can also withdraw at any time at request. In compulsory savings which is prior saving required from borrowers, in which loan clients have obligatory savings (in addition to their voluntary individual saving) to which all members contribute regularly throughout their membership with the institution.

4.5.6 loan size

The loan size (amount of credit) In the farmers multipurpose cooperatives, the loan amount delivered to members from their own sources varied among cooperatives according to the amount

of capital they had and it also depends on the amount of saving the group members (trust group) saving. The farmers can borrow six times their saving.

4.5.7 Lack of adequate finance

Lack of adequate finance that aims at benefiting irrigation user farmers. Irrigation user farmers need a credit for irrigation technology (motor pump, pully) and seed, farmers can't cover the cost of irrigation. ILLSI projet provide a credit in kind through FMSC but it only benefit 30 farmers And farmers who didn't get this types of credit uses the backward method of irrigation.

FMSC in the study area are mainly engaged in their traditional activities of disbursement of seasonal agricultural input loans (fertilizer and seed). According to the FMSC and ACSI there is no any credit scheme target on providing credit for irrigation technology.

4.3 The Importance of Revolving Fund on Irrigation

According to Yohannes (2016) Revolving Fund is that an organization or sometimes an individual has a reserve of money (the Fund) which is used to lend to one or more borrowers. Over a given period of time, the borrower is expected to repay the original sum that restocks the fund. Usually, an additional sum is charged (interest) to the borrower that acts as a fee for providing the service (administrative costs) and it helps to protect the fund from being depleted. Factors contributing to depletion can include inflation, non-payments (low rate of repayment) and the cost to the lender of getting outside finance.

Revolving Funds is often used in developing countries like Ethiopia to provide affordable access to credit for those wishing to borrow money for anything from buying food and productive inputs, to businesses and services.

There are two types of revolving fund; formal and informal revolving funds.

The main differences between an informal rotating credit scheme and a formal revolving fund, is the source of the initial fund, the scale of lending and the structure of the credit management.

Informal funds are usually those found in developing countries at the local or community level, in poor areas where access to formal bank credit is virtually impossible. Members of a group put

their savings into a commonly held fund, which is then lent to other members when they need a loan. Informal revolving funds do not usually earn any interest, unlike more formal schemes.

An important feature of such schemes is that they depend on social organization to ensure loans repayment. Peer or group pressure is a critical aspect of this kind of fund as it is used to ensure repayment, improve understanding between group members and can also be used to strengthen social networks. These types of funds are based on community savings.

A formal revolving fund usually uses seed money from an outside organization or agency. The capital fund is managed by a local organization or NGO and not the community themselves.

The seed money is used to pay for the operational structure (buildings, office equipment and vehicles for example) and also to loan money to many small borrowers. Repayments by the original borrowers over an agreed period of time, puts money back into the fund for other people to borrow. If managed well, revolving funds are an excellent means of making affordable credit available to the poor and with a small amount of capital can help benefit many people.

The concept of formal revolving funds has recently been replaced with the concept of micro-finance, which incorporates many different elements of providing small amounts of money to a large number of people.

In the study area there are non-governmental organizations providing the revolving fund, to support irrigation, animal fattening, and bee. According to the dangeshta kebele FMSC the revolving fund is distributed to the farmers through them and they have the power to control the money and recirculate the fund. More than 80% of the sample household who had access to credit is beneficiary of this revolving fund.

According to the Gumdire kebele FMSC; the non-governmental organizations provide the Revolving fund only for animal fattening and bees and there is no any special type of irrigation financing in the kebele.

According to the FMSCs, in the study area FMSCs mainly provide farm input; fertilizer and seeds and almost all farmers are member of the cooperative, because non-member farmers can't get seed, fertilizer and other benefit. So, it is easy for them to access the farmers.

The respondents who get a credit from the revolving fund benefited in different aspects; lower interest rate charge for the revolving fund, it is less than half of the interest rates charged by FMSC and ACSI, which is 7.25%.

Longer repayment period and time of the revolving fund; repayment period and time is very long and convenient for the farmer. The farmers required to repay the loan for three years, but in ACSI and FMSC credit should be repay within one year. The repayment time of the loan for this is not limited, farmers can repay at any month with in the year.

Other importance of revolving fund indicated by FMSC is it is women oriented. Non-governmental organization mainly works on women empowerment and they give special opportunity for women.

5. CONCLUSIONS AND RECOMMENDATION

5.1 Conclusion

This study was focused on the factors that affect irrigation user farmers' access to formal credit. A multi stage sampling technique was employed to select the respondents. A total of 329 respondents were selected, the data was collected using interview questionnaire. The study used logistic regression method to estimate factors affecting access to credit.

The logistic regression analysis results show that among thirteen explanatory variables, which were included in the model, only six variables were statistically significant while the remaining five were less significant in explaining the variations in the dependent variable and multipurpose cooperative membership and extension package participation excluded from the model, because two variables did not show variation among sample farm households.

The analysis shows that the probability of accessing formal credit was positively and significantly affected by cost of irrigation technology and number of livestock in TLU. Income from irrigation, repayment period, age, and lending procedures negatively affect access to credit.

based on the data from the interview questionnaire, peer group (trust group) collateral, repayment period and time, interest rate, loan size (loan amount) constraint or challenges that farmers faces in the study area.

In the study area FMSC participating on revolving fund, non-govenmental organization provide the revolving money to FMSC. According to the FMSCs it benefit the farmers, by lower interest rate, longer repayment period, and it gives special opportunity for womens.

5.2 Recommendation

To increase the importance of irrigation and technology adoption of the farm households, there should be some sort of credit access that target at irrigation or institutions should prepare a sepcial credit program for irrigation.

The repayment period of the FMSC and ACSI should be long and the repayment time should correspond to period of cash availability for the poor households.

In the study area the revolving fund supplied by the non-government organization and it is not adequate. Government plans to reduce poverty and irrigations is one means of poverty reduction. So, to achieve this plan government should also participate on revolving fund supply.

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APPENDIX

Appendix table: 7.1 Conversion Factors to estimate tropical livestock equivalent

Animal Category	TLU
Calf	0.25
Donkey (young)	0.35
Weaned Calf	0.34
Camel	1.25
Heifer	0.75
Sheep and Goat (adult)	0.13
Cow and Ox	1.00
Sheep and Goat (young)	0.06
Horse	1.10
Chicken	0.013
Donkey (adult)	0.7

Source: Storck et al. (1991)

Appendix table: 7. 1 linktest result

creditaccess	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
_hat	.9705315	.1617483	6.00	0.000	.6535106	1.287552
_hatsq	-.0414945	.0348588	-1.19	0.234	-.1098165	.0268274
_cons	.1447433	.342737	0.42	0.673	-.5270088	.8164955

Number of obs	=	329
LR chi2(2)	=	234.91
Prob > chi2	=	0.0000
Pseudo R2	=	0.7744

source: Computed from the field survey data, 2009

Appendix table: 7. 2 goodness of fit test

Group	Prob	Obs_1	Exp_1	Obs_0	Exp_0	Total
1	0.0001	0	0.0	33	33.0	33
2	0.0002	0	0.0	33	33.0	33
3	0.0005	0	0.0	33	33.0	33
4	0.0010	0	0.0	33	33.0	33
5	0.0023	0	0.1	33	32.9	33
6	0.0072	0	0.1	33	32.9	33
7	0.0293	1	0.5	32	32.5	33
8	0.2700	3	3.4	30	29.6	33
9	0.9108	22	21.2	11	11.8	33
10	1.0000	31	31.7	1	0.3	32

number of observations = 329

number of groups = 10

Hosmer-Lemeshow chi2(8) = 2.08

Prob > chi2 = 0.9783

source: Computed from the field survey data, 2009

Appendix table 7.3: multicollinearity test

Variable	VIF	1/VIF
irrcost	5.35	0.186901
irrincome	4.43	0.225569
primary	1.91	0.522608
writerread	1.83	0.547746
drisk	1.56	0.639298
secondary	1.43	0.699309
dlend	1.32	0.755434
livestock_~p	1.30	0.770750
drepayment~d	1.26	0.795851
age	1.20	0.833381
dsex	1.19	0.841121
monthly_sa~g	1.15	0.871587
distance	1.06	0.941620
multipurpo~e	1.05	0.955451
dext_package	1.03	0.966898
Mean VIF	1.80	

Survey questionnaire

HOUSEHOLD PROFILE/CHARACTERISTICS

1. Name of the kebele _____
2. Sex
 1. Male
 2. female
3. How old are you? _____
4. Marital status
 1. Married
 2. Divorced
 3. Widowed
 4. single
5. Educational attainment
 1. No formal schooling
 2. write and read
 2. Primary school (1-8)
 3. High school
 4. Degree
 5. Masters
 6. Other (specify) _____
6. Family size? _____
7. How many years in farming? _____
8. How many years in irrigation? _____
9. Which type of irrigation technology you used?
 1. Pully
 2. Motor Pump
 3. Pedal pump
 4. Other specify _____
10. How much is the cost of irrigation technology? _____
11. Total Farm size? _____
12. Farm size used for Irrigation? _____
13. How much money did you get monthly? _____
14. Income from irrigation from the last crop season?
 1. <500
 2. 500-1000
 3. 1000-2000
 4. >2000
 5. Other(specify) _____
15. Monthly saving _____
 1. < 500
 2. 500- 1,000

3. 1,001-2,000

5. other(specify)_____

4. >2000

16. Which types of house do you own?

1. Corrugated iron

2. grass roofed

17. How many class did your house has? _____

18. Made of what? _____

19. How many cow, ox, sheep, goat, calf, poultry, bee, you possess....?

Species of livestock	Number owned	Number sold during the year	Income from the sale
Ox			
Cow			
Calf			
Bull			
Heifer			
Horse			
Mules			
Donkey			
Goats			
Sheep			
Chicken			
Bee in Hive			
Others (specify)			

ACCESS TO CREDIT

1. How do you finance your irrigation activity?

1. Credit

2. by my self

If your answer is, by my-self proceed to question number 2

Source of credit	Loan amount		Rate of interest	Loan periods in months
	In cash	In kind		
Cooperatives				
NGO				
ACSI				
Banks				
Others specify				

1.1 Why you borrow this amount of money? (There could be more than one answer)

1. Interest rate
2. Repayment period
3. I need only this amount of money
4. I can only borrow this amount of money
5. Repayment time
6. Other (specify)_____

1.2 Why did you prefer this source? (There could be more than one answer)

1. Interest rate
 2. Repayment period
 3. Distance
 4. Amount of money borrowed
 5. Other
(specify)_____
2. What is the distance of the nearest credit provider in your kebele in hours?
 3. When did you really need to borrow? _____
 4. Are you aware of credit programme in your kebele?
 1. Yes
 2. No

If your answer is no, proceed to question number 6.

5. What type of credit programmes are there? _____

6. Did the Loan repayment period constrain you to take a loan?

1. yes

2. no

7. Did you have the information about the Lending procedures?

1. Yes

2. No

If your answer is no proceed to question number 8

1.1 Did the Lending procedures from formal financial sources constrain you to take a loan?

1. Yes

2. No

8. In your view, is borrowing from formal financial sources risky?

1. Yes

2. No

8.1 Did you give-up to take loans from formal lending organizations due to fear of risk in the last 12 months?

1. Yes

2. No

9 What is your view on the constraints and difficulties to access credit from the formal financial sources?

Constraints & Difficulties	ACSI	cooperatives	NGOs	If others
Group lending				
Individual collateral				
Interest rate asked from borrowers				
Time of credit availability				
Repayment time				
Repayment period				
Non-membership of farmers multipurpose cooperatives				
Lack of opportunity to take a				

second loan				
Distance from lending institutions				
Working time of the institutions				
Working ethics and efficiency of the employs of the organization				
Preparing an application letter and filling different formats				

EXTENSION CONTACT

1. Did you get extension service?
 1. Yes
 2. No
 - 1.1 If yes, for how long have you been getting the service? ____ Years
 - 1.2 How frequently were you visited by extension service provider in the last 12 months?
 1. 1day per month
 2. 2 days per month
 3. 3 days per month
2. Did you participate on household’s extension package program?
 1. Yes
 2. No
 - 2.1 If yes, what was the type of the package you used?
 1. Crop production
 2. Animal rearing
 3. Animal fattening
 4. Small-scale irrigation
 5. Others specify_____
 - 2.2 How did they provide you the technology?
 1. in cash
 2. on credit
3. Are you a Member of farmer’s multipurpose cooperatives?
 1. Yes
 2. No

KEY INFORMANTS INTERVIEW GUIDE

1. What credit service do you offer for farmers?
2. What credit service do you offer for small scale irrigation user farmers?
3. What are the requirements for obtaining a loan from the credit you association offer?

4. What is the maximum amount that the farmers can borrow?
5. What rate of interest do you charge?
6. How long do you allow borrowers to repay the loan?
7. Did your credit institution participate in the Revolving fund?
8. How you provide the revolving fund?
9. How much is the interest rate you charge for that type of loan?
10. Does the revolving fund help the irrigation credit access?