IMPACTS OF RURAL CREDIT ON HOUSEHOLD'S FOOD SECURITY AND INCOME: THE CASE OF KURFA CHELE WOREDA, EAST HARARGHE ZONE, ETHIOPIA

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DEDICATION

I dedicate this thesis manuscript to *Kurfa Chele Woreda* Rural Women whom are struggling to improve their livelihoods.

STATEMENT OF THE AUTHOR

By my signature below, I declare and affirm that this thesis is my own work. I have followed all ethical and technical principles of scholarship in the preparation, data collection, data analysis and compilation of this Thesis. Any scholarly matter that is included in the Thesis has been given recognition through citation.

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BIOGRAPHICAL SKETCH

The author, Moges Bezabih, was born in East Hararghe zone Melkabelo Woreda Harewacha Town in 1977 G.C. He completed his primary education in Harewacha Primary and Junior Secondary School. He attended his high school education in Deder Senior Secondary School. He then joined Wendo Genet Forestry Collage in 1996 and graduated with Diploma in Forestry in June 1998.

After his graduation, he worked in East Hararghe zone Kurfa Chele District Agriculture Office for three and half years as Natural Resource Management Junior Expert and as Natural Resource Management Section Team Leader. Then he transferred to Gursum District Office of Agriculture and Rural Development and worked as Natural Resource Management Section Team Leader for six months and then as Natural Resource Authority head of the District for one year.

He then Joined CARE Ethiopia East Hararghe Field Office in March,2003 and worked as Early Warning and Nutrition Data Collector, Extension Agent, Community Facilitator and Lead Community Facilitator (Supervisor) for 8 years. While he was working on supervisory position, he joined Alpha University College in 2006 and graduated with BA degree in Economics in April 2009.

In November 2011, he joined Haramaya University Continuing Education Program by self-sponsorship to pursue his postgraduate studies in Agricultural Communication and Innovation stream in the Department of Rural Development and Agricultural Extension, which this volume is the partial fulfilment. While he was under postgraduate studies he joined CARE

Ethiopia West Hararghe Field Office in April, 2012 and worked as Livelihood Project Officer and Emergency Project Team Leader for one and half years. Then he joined Save the Children in November, 2013 and worked as Livelihood and Economic Strengthening Zonal Coordinator for one year and seven months. Then he joined again his previous organization, CARE Ethiopia East Hararghe Field Office, on July 11, 2016 and still he has been working as Emergency Project Team Leader there.

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ABBREVIATIONS AND ACRONOYMS

ACSI	Amhara Credit and Saving Share Company
ADB	Asian Development Bank
AE	Adult Equivalent
ATT	Average Treatment effect on the Treated
CSA	Central Statistical Authority
DA(s)	Development Agent (s)
DD	Difference in Difference
EPRDF	Ethiopian Peoples' Revolutionary Democratic Front
FAO	Food and Agricultural Organization
GDP	Gross Domestic Product
Ha	Hectare
HoA	Horn of Africa
IV	Instrumental Variable
KWARDO	Kurfachele Woreda Agriculture and Rural Development Office
KWDPPO	Kurfachele Woreda Disaster Prevention and Preparedness Office
KWMFI	Kurfachele Woreda Micro Finance Institution
MFC	Micro Finance Credit
MFI	Microfinance Institution
MoARD	Ministry of Agriculture and Rural Development
MoFED	Ministry of Finance and Economic Development

NBE	National Bank of Ethiopia
NGO	Non-Governmental Organization
NN	Nearest Neighbor
OCSSCO	Oromia Credit and Saving Share Company
PSM	Propensity Score Matching
RDD	Regression Discontinuity Design
RoSCAs	Rotating Saving and Credit Associations

Continues…

SACCO	Saving and Credit Cooperative Organization
SFPI	Specialized Financial and Promotional Institution
SHG	Self Help Group
SPSS	Statistical Package for Social Sciences
TLU	Tropical Livestock Unit
UNDP	United Nation Development Programme
USD	United State Dollar
VIF	Variance Inflation Factor
WB	World Bank

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ABSTRACT

In Ethiopia microfinance institutions are becoming increasingly essential instruments in reducing poverty. Improving the delivery of financial services to the poor helps the poor to increase their disposable income, asset ownership, and cushion consumption during food deficit periods. Accordingly, Oromia Credit and Saving Share Company has been providing formal financial services for rural households in Oromia region for the last two decades. Large number of studies examined the impact of microcredit on self-employment activities. However, there is limited knowledge on the impact of Oromia Credit and Saving Share Company credit program to what extent farm households using the program are better off than those who do not use credit service and whether or not there exists variability in income and food security status among farmers. This research was intended to fill these gaps in the study area. The study was conducted in Kurfa Chele Woreda of East Hararghe Zone, with the objective of assessing the impact of rural credit on household's food security and income. The main research question or counterfactual statement of the study was "what happened in income and food security status to those who had participated in credit program, had not taken part in the program?" A multistage sampling method was used to select 180 (82 Credit users and the rest being non-user) sample households were interviewed. The data were

analyzed using descriptive analysis, inferential statistical tools and an econometric propensity score matching model. The result showed that, participation in the rural credit program was affected by year of education, family size in AE, voluntary saving and participation in training positively but, livestock holding and extension advice were found to affect participation in rural credit program negatively. A matched comparison of calorie intake and annual income outcomes were performed on the households who have shared similar pre-intervention characteristics except the program and participation in the program had brought a more than 59% increase in annual income and 21% increase in the calorie intake of the participant households. The sensitivity analysis also showed that all the matching estimators resulted in statistically significant effects of the program on participating households. Therefore, for effectiveness of the credit program the study finally recommended that crosslinking households with year of education to those beneficiaries that have minimal understanding of credit and saving, targeting households with greater number of family size, emphasizing on the saving behavior of the program beneficiaries and finally enhancing the effectiveness of the credit program through the management systems, ensuring that sufficient extension workers in place were viewed to enjoy expected results from the program.

***Key words**: Impact, Rural Credit, Propensity Score Matching, ATT*

1. INTRODUCTION

1.1. Background to the Study

In recent decades the Horn of Africa (HoA) has faced continuous cycles of crisis. These are the result of complex interactions between political, economic, social and environmental factors. The recent drought crisis coupled with conflict and chronic poverty in the region is estimated to have threatened the lives of thirteen million people. Designing programs to increase resilience requires bringing together a range of different skills to strengthen the ability of vulnerable populations to adapt by: 1) addressing gaps in critical livelihood assets such as cash, skills, leadership, knowledge, health, food; 2) improving access to public assets such as roads, power, water, schools, markets and health facilities; 3) strengthening the operation and capabilities of formal and informal institutions within governments, the private sector and communities; 4) supporting livelihood diversification; 5) resolving conflicts and building peace; and 6) re-building degraded ecosystems (Frankenberger *et al*., 2012).

Ethiopia is mainly an agrarian country. The agricultural sector accounts for roughly 43 percent of GDP, and 90 percent of exports. Nevertheless, food security remains a critical issue for many households, and for the country as a whole. Nearly 55 percent of all smallholder farmers operate on one hectare of land or less (MoARD, 2010). The sector also accounts for the employment 85% of the country's labor force, 70% of all exports and about 43% of the GDP of the country (MoFED, 2013). In spite of the huge agricultural potential, the growth in agricultural production has not been able to keep pace with that of the demand. One of the reasons for low production and productivity in agriculture is lack and insufficiency of Afinancial capital to invest on agricultural inputs by the poor rural households.

In Ethiopia, achieving food security is related to reducing poverty. Improving the delivery of financial services to the poor helps the poor to increase their disposable income, asset ownership, and cushion consumption during food deficit periods (Wolday, 2003). Poverty

reduction has been and still is the overriding development agenda of the government since Ethiopian Peoples' Revolutionary Democratic Front (EPRDF) assumed power in 1991.

Access to credit may lead to 'investment-led' benefits, which result in greater levels of income, consumption and wealth. There exist now a large number of studies examining the impact of microcredit on self-employment activities (McKernan, 2002; Islam and Pakrashi, 2014), the expansion of existing business enterprises (Banerjee *et al*., 2013, Dupas and Robinson, 2013) and business profits (McKernan, 2002; de Mel *et al*., 2008; Skoufias, *et al*., 2013; Crepon *et al*., 2013). Microcredit institution participation and access to microcredit prevents income from falling to such low levels that households are unable to satisfy the basic consumption needs (Sharma, 2000), by smoothing the income and consumption of poor rural households by allowing them to diversify into more profitable self-employment based activities (Gerter, Levine & Moretti, 2009; Islam and Maitra, 2012; Islam and Pakrashi, 2014) that insures them against any seasonality in consumption (Jacoby and Skoufias, 1998; Kochar, 1995; Khandker *et al.*, 2012).

The delivery of financial services has been viewed as one of the anti-poverty and food security tool of the development programs. In order to realize the need for microfinance in reducing poverty and food insecurity, the Ethiopian government issued microfinance law that supports the development of microfinance industry in 1996. Microfinance is the provision of a broad range of financial services such as deposits (saving), loans, payments, money transfers and insurance to poor and low-income households and their microenterprise (Putzeys, 2002, Remedan, 2008). Although, in Ethiopia, the establishment of microfinance institutions is relatively a recent phenomenon, within the last decade the number of microfinance institutions, the funds which have been allocated to them and the number of people who have been benefiting from the services have been rapidly growing. As indicated in the annual report of the National Bank of Ethiopia (NBE, 2008/2009), the number of MFIs have reached 28 having a total capital and assets of $ 99,697,392 (Birr 1.7 billion) and $387,060,463 (Birr 6.6 billion), respectively (Rahel, 2011). 'Ethiopia has the second largest number of microfinance users in sub-Saharan Africa' (Amha, 2000; Fekade and Alemu, 2008; Esayas, 2009).

In rural Ethiopia, most of the income of a poor household is derived from agricultural sector (MoFED, 2013), which exposes households to the seasonality in agricultural employment, poverty and consumption. Income from non-agricultural sources could safeguard households against such seasonal food insecurity, however, they may lack the necessary resources to diversify into more productive employment opportunities which could help them cope with difficult times.

1.2. Statement of the Problem

The reasons for having low savings deserve special focus in terms of further research investigations. These included, among others, poor access to financial institutions, less knowledge on finance (financial illiteracy), limited products from financial sectors (saving and loan), and macroeconomic instability (Sintayehu, 2013).

Lack and inadequacy of finance is one of the fundamental problems impending production, productivity and income of the rural and urban households (Gebrehiwot, 2006; Remedan, 2008). In Ethiopia, farmers have limited access to commercial banks for credit as their lending terms and conditions constrain smallholder farmers' access to credit. Due to the inability of the banks to meet the credit needs of smallholder farmers and to overcome the financial constraints of smallholders' agriculture, the government of Ethiopia has given due attention to alternative microfinance service providers in rural areas, including MFIs, rural SACCOs and village banks (Tesfaye, 2005b, Remedan, 2008). Microfinance institutions have established in Ethiopia after the issuance of proclamation no 40/1996. Today, the provision of credit and saving mobilization is thought of as an avenue for development. based on this line OCSSCO was established in 1997 in Oromia regional State with the objective to reduce poverty and promote economic development through the provision of credit and saving services (MEDC,1999).

In Kurfa Chele, the Oromia Credit and Saving Share Company (OCSSCO) has been engaged in providing financial credit services to smallholder farmers since 2005 (KWMFI,2015). The need and purpose for which the farmers require credit is contextual. The study district is known by recurrent drought, erratic rainfall and long dry spell which reduce the *woreda's* main crops (sorghum and maize) performance frequently but in most cases the crop failed as the

result of moisture stress occurred, while the crop are sensitive for moisture stress, at flowering and seed setting stages. To overcome the consequence of the food shortage and generate income, farmers have been engaging intensively in animal fattening by using failed crop stock, crop residue and industrial byproducts' (KWARDO, 2015). Furthermore, the study *woreda* is known for having a large livestock market in East Hararghe and favorable temperature for fattening. Therefore, the existing farmers fattening and trading experience increases their credit demand.

On the other hand, climate change acts as a multiplier of the existing threats to food security. It affects all four dimension of food security: food availability, food accessibility, food utilization and food system stability. It affects agricultural food system in all countries, including exporters and importers as well as those at subsistence level (FAO, 2008). Major determinants of poverty in Ethiopia are directly correlated to an over dependence on subsistence farming. Erratic rainfall, limited access to gainful off-farm employment and a lack of income-generating alternative activities are all issues that add to the precarious position those relaying on farming face. Heavy reliance on rain fed agriculture, during conditions of very variable rainfall and recurrent droughts, affects agriculture and, hence, has adverse effects on the economy of Ethiopia.

Similarly, it was not well known to what extent farm households using OCSSCO credit service are better off than those who do not use credit service and whether there exists variability in income and food security status among farmers, under the current situation in the area. Despite the involvement of OCSSCO, there have been very limited studies that assessed its impact on households' participation in OCSSCO programs that brings changes in income level and the constraints associated with the performance of OCSSCO. For instance, Melkamu and Mengistu, (2013) studied the impact of OCSSCO micro-credit in *Deder* and *Goro Gutu woreda*. But there is no such study made in *Kurfa Chele*. On top of this other studies like Tadesse (2008) was limited to descriptive study on the role of rural credit in reducing households' vulnerability to food insecurity in *Ganta-Afeshum woreda*. Therefore, this research is intended to fill these gaps in the study area.

1.3. Scope and Limitations of the Study

Despite the availability of a number of formal and informal source of credit, the study focused only on the role of Oromia Credit and Saving Share Company (OCSSCO) credit service rendering institute. Moreover, although the program service was being delivered in 81 *woredas* of *Oromia* regional state, the study was limited to analyze the role at household level of *Kurfachele woreda* on 180 sample households. Due to limited resource and time, the study was limited to the specific nature and socio-economic set up of the *Kurfachele* farm households. Findings from this study was linked to the area of study and therefore cannot be generalized for the whole of Ethiopia.

1.4. Significance of the Study

Microfinance institutions are important for poverty and food insecurity reduction especially in developing countries like Ethiopia. The availability of credit service alone cannot be a remedy for the whole socio-economic problems. The role of financial services should be studied to find facts whether the intended objectives of the household food security and income are being improved with expected contribution of the financial services. In the study district there has not been any empirical research conducted to identify the role of OCSSCO program in improving income and food security of smallholder farmers

The outcome of the study was expected to serve the finance institution OCSSCO as a basis to evaluate its approach of accessing credit for rural households and the impact of its services. The study also serves as information input for both policy makers and donors to revisit their policies, to learn from experience and to make improvement in their future interventions. In addition, this study was intended to serve as ground for further study for incoming researchers interested in other parts of Ethiopia where OCSSCO services are being provided.

1.5. Research Questions

1. What are the determinants of households' participation in rural credit?

2. What is the impact of OCSSCO credit service utilization on rural household food security and income?

2.6. Objectives of the Study

The overall objective of the study was to assess the impact of rural credit service in improving household's food security and income and further more identify factors affecting participation in rural credit services. The specific objectives of the study were:

1. To identify the factors affecting participation in rural credit program
2. To evaluate the impact of Micro credit on the income and food security among the households in the study area.

2. LITERATURE REVIEW

2.1. Definitions of Microfinance Institution and Concept of Credit

The concept of microfinance is not new. Its origin lies in the numerous traditional and informal systems of credit that have existed in developing economies since centuries. Many of the current microfinance practices derive from community-based mutual credit transactions that were conducted on trust, peer-based non-collateral borrowing and repayment. Microfinance is the provision of a broad range of financial services such as deposits (saving), loans, payments, money transfers and insurance to poor and low-income households and their microenterprise (Putzeys, 2002; Remedan, 2008).

Financial intermediaries include commercial banks, insurances, cooperatives, microfinance institutions, and informal financial services. Different documents defined Microfinance institutions in terms of its characteristics; targeting the poor (especially women), promoting small business, building capacity of the poor, extending small loans without collaterals, combining credit with saving and changing market rate of interest. As Wolday (2001), microfinance is the delivery of financial services (credit, saving and insurance) to the large number of productive but resource poor people in urban and rural areas, including micro, small and medium enterprise in cost effective and sustainable way.

Similarly microfinance institutions (MFIs) are defined as institutions whose major business is the provision of microfinance services (Oyunjargal and Nyamaa, 2002).Regarding the typologies of MFIs, as described by Zeller (2003) and Remedan (2008). There are five major types:

1. Cooperative model: this was the first type of microfinance developed in Europe in 19th century. Its basic principle is not profit-maximizing rather to assist the rural population to

break out of their dependence on money lenders and to improve their welfare. Focus is on members saving. It is member owned and the decision making is democratic.

2. Solidarity credit group: this offers loans to solidarity credit groups. It uses peer group as main type of guarantee for credit. Mainly focus on credit and give some attention for compulsory saving and micro insurance products.

3. **Village banks**: they are semi-formal, member-based institutions that are promoted by international NGOs. Organize a group which on average holds 30-50 members, which are relatively lower than cooperative model. Their main form of credit guarantee relies on peer pressure among the members.

4. Linkage type: this alternative retail group-based model build on pre-existing informal self-help groups (SHGs), such as Rotating Saving and Credit Associations (RoSCAs). Its major advantage is that group formation costs were already born by the members. Members of a SHG enter in to a group contract with a bank that provides saving and credit services to the group. Individual members of the SHG do not have any links with the bank. Give emphasis to saving first, which could be used as collateral.

5. Micro banks: their primary operational focus is on reaching financial sustainability. They differ from commercial banks in two aspects: firstly, they acknowledge and wish to serve the demand for financial services for micro and small scale entrepreneurs. Secondly, they use conventional collateral as well as innovative collateral substitutes. Focus on both credit and saving services.

According to Meagher (2002), microfinance is defined as 'lending small amounts of money for short periods with frequent repayments' (Kassa, 2008). However, this definition equates the concept with micro-credit, which is rather a part of microfinance service. For Maanen (2004), 'microfinance is banking the unbankables, bringing credit, savings and other essential financial services within the reach of millions of people who are too poor to be served by regular banks, in most cases because they are unable to offer sufficient collateral' (Kassa, 2008).

Credit is defined as a condition which enables a person to extend his control as distinct from ownership of resources (Padmanabhan, 1996). It means, credit can play its role by providing

the needed liquidity to farmers who do not have sufficient investment funds to make use of the opportunities available to them. Credit creates opportunities for self- employment rather than waiting for employment to be created (Latifee, 2003). It brings the poor into the income stream given the access to credit under an appropriate institutional structure and arrangement.

Micro-credit as an alternative source of credit for the poor has received wide attention in recent years. It is defined as "programmers' that provide credit for self-employment and other financial and business services (including saving and technical assistance) to the poor persons" (World Bank 1997). In many countries, micro-credit programmers' have succeeded in generating self-employment by providing access to small capital to people living in the poverty (United Nations, 1998).

2.2. Evolution of Microfinance

Microfinance was initially initiated by Dr. Mohammed Yenus, financial project researcher of Bangladish, in 1976 as a research project to test the hypothesis whether provision of small scale financial services to the poor reduce their poverty or not. From his research result, it was observed that the concept of lending has been rationalized for sustainability of both the borrowers and the lenders. The project was replicated in five districts of Bangladish during 1979-1982 in collaboration with Banks. This was evaluated and showed good performance in terms of sustainability. In 1983, the project was transferred in to Grameen Bank by the government ordinance. The evidence proved that the Grameen Bank lends to the poor people and performs reasonable degree of financial self- sufficiency and repayment rate that is significantly higher than that of conventional lending institutions. Thus, the success of Grameen Bank has been the driving force behind the rapid expansion of MFIs throughout the world (Holcombe, 1995).

2.3. Development of Microfinance in Ethiopia

Microfinance development in Ethiopia in institutionalized form is a recent phenomenon. But it has a long history in different forms. Government efforts of delivering credit to accelerate socio economic development in Ethiopia dated back to the immediate post Italian occupation

period with the establishment of the Ministry of Agriculture in 1943 and Agricultural Bank of Ethiopian in 1945.The main objective of the Bank was to assist small land holders whose farms had been devastated during the Italian occupation through loans to purchase agricultural inputs and repaired houses (Assefa *et al*., 2005).

During the Derg regime (1974-1991), a large share of credit was given to the state sector and marginalizing the private sector and the poor. Due to this, the private sector including the poor was forced to depend on self-financing and non-institutional credit. During the 1986-90 the share of domestic credit to the private sector and cooperatives averaged 4.7 and 1.1 % respectively and the rest going to the government and public sector (WB, 1991). NGOs have been delivering relief and development services like emergency food, health, education and water in Ethiopia since 1970's. NGOs delivered micro-credit service to the poor as part of their poverty alleviation programs (Wolday, 2001, Assefa *et al*., 2005 and Wolday, 2003) indicated that many NGOs were involved in the provision of microfinance services particularly in rural area. Moreover, the credit delivered by NGOs faced many problems because of bad credit culture; which includes charging interest rates that do not reflect true costs, lack of sound lending and collection policies and procedures, credit was delivered without verifying borrower integrity and skill, lending based on NGO staff needs rather than felt needs of borrowers, loan terms were not based on repayment capacity, lack of collection efforts by the staff and providing loan outside the target group (to staff friends, relatives and the like).

Following the fall of Derg regime the need to address poverty had been subject of many development programs. The delivery of financial services has been viewed as one of the anti-poverty tool of the development programs. It also provides a power to the National Bank of Ethiopia as the licensing and supervising authority. The majority of the NGOs in Ethiopia were terminated the delivery of financial services following the issuance of proclamation No. 40/1996 (Wolday, 2003). Following the issuance of the proclamation, the National Bank of Ethiopia, the licensing and supervising agency for Microfinance Institutions, issued implementation guide lines within which microfinance institutions are allowed to operate. It also issued a dead line within which different saving and credit programs operated by NGOs in the country are required to be either licensed as Microfinance Institutions or discontinue

operating their credit programs. In accordance with this, some of them were transformed to licensed Microfinance Institutions and most of them were terminated.

This legal and regulatory framework has assisted in increasing the number of microfinance institutions. These different microfinance institutions together formed an association under the name of Association of Ethiopian Microfinance Institutions (AEMFI) in 1999 to share their experiences so as to improve the services they render to their clients and provide advocacy services. AEMFI was initially registered as non-profit and 4 non-governmental organizations by the request of four MFIs such as DECSI, ACSI, OCSSCO and OMFI.

Recently, microfinance institutions are emerging rapidly in the country based on the new approach and in line with the new microfinance law. Following this legal provision, nineteen microfinance institutions have been established. the main objectives of the microfinance institutions in Ethiopia is the delivery of financial services (credit, saving, insurance, etc) to the large number of productive but resource poor people in rural and urban areas, including micro and small entrepreneurs in a cost-effective and sustainable way. According to the annual report of the National Bank of Ethiopia (NBE), 2008/2009, the number of MFIs have reached 28 having a total capital and assets of 99,697,392USD (Birr 1.7 billion) and 387,060,463USD (Birr 6.6 billion), respectively.

2.4. Definition of Food Security

Food security is a situation in which people do not live in hanger or fear of starvation. Food security exists when all people, at all times, have physical and economic access to sufficient safe and nutrition food that meets their dietary needs and food preferences for an active and healthy life (FAO, 1996). Food security, at household level, is defined in its most basic form as access by all people at all times to the food needed for a healthy life. This definition introduces four main dimensions of food security: physical availability of food, economic and physical access to food, food utilization and its stability over time.

World Bank (1986) defines food security as “access by all people at all times to enough food for an active and healthy life.” This definition encompasses many issues. It deals with

production in relation to food availability; it addresses distribution in that the produce should be accessed by all; active and healthy. The availability and accessibility of food to meet individual food needs should also be sustainable. This implies that early warning systems of food insecurity should monitor indicators related to food production, distribution, and consumption.

FAO (1992) defines food security not only in terms of access to, and availability of food, but also in terms of resource distribution to produce food and purchasing power to buy food, where it is produced. USAID (1992) defines food security as: "when all people at all times have both physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life." Here food security includes at a minimum the availability of nutritionally adequate and safe food, and assured ability to acquire acceptable foods in socially acceptable ways (*e.g.*, without resorting to emergency food supplies, scavenging, stealing, or other coping strategies).

Food security is defined by different agencies and organizations differently without much change in the basic concept. UN (1990) defines household food security as "The ability of household members to assure themselves sustained access to sufficient quantity and quality of food to live active healthy life." Food security can be described as status in which production, markets and social systems work in such a way that food consumption needs of a country and its people are always met.

Food security is defined as a situation when all people, at all time, have physical, social and economic access to sufficient, safe, and nutritious food that meet their dietary need and food preferences for active and health life (FAO, 2002). Food security depends on availability of food, access to food and utilization of food. Food security is defined in its basic form as access by all people at all times to the food needed for a healthy life (FAO, 2000). The focus in 'household' food security is on the household as the most basic social unit in a society. The distinction between food security and household food security is important because activities directed towards improving household food security may be quite different from those aimed at improving national level food security. The latter often more related to macro-level

production, marketing, distribution and acquisition of food by the population as a whole (FAO, 2003).

The assessment of food security extends to consider the health of those eating the food-the objective is a healthy and active life. Here nutritional consideration begins to come to the fore (Benson, 2004). Nutrition security is defined as the appropriate quantity and combination of inputs such as food, nutrition, health service and caretaker's time needed to ensure an active and healthy life at all times for all people (Haddada et al., 1994). The quality of food to which an individual or household has access must be considered. To enjoy a productive, healthy and active life, all people require sufficient and balanced level of carbohydrate, protein, fat, vitamin and minerals in their diets. Households or individuals facing deficiencies or imbalances in diet because they lack access to the necessary food for balanced diets are not food secure (Benson, 2004).

2.5. Studies on Food Security

A study boody Garrett and Ruel in Mozambique found that in urban and rural areas, much the same factors determine calorie availability (Garret and Ruel, 1999). Only expenditure and household size exerts significantly different effects, and even then the magnitude of difference is not large. The most important determining factors that affect calorie availability are income (proxied by expenditure), prices and demographics such as household size. Urban dwellers do seem to be slightly more sensitive to changes in income than rural dwellers. This may reflect urban residents' lack of natural resources "cushion" to absorb income or price shocks and also their need to purchase, rather than grow, their own food.

On the other hand, another food security study by FNU/MoPED (1994) in the four major towns of the country (Bahir Dar, Jimma, Awasa and Dire Dawa) shows that about 57%, 55%, 38% and 29% of the urban households were respectively unable to purchase food to meet a per caput consumption of 1700 kcal/day. The average food insecured people of these four towns were about 45 percent. However, if the nutritional requirement is raised to 2100 kcal, the food insecure people will rise to 56 percent of the urban households.

2.6. Microfinance and Food Security

When one goes through the bulk of literature on the impact of microfinance, one can find quite different results, which are generally inconclusive. In some cases, microfinance is said to have brought positive impacts on the life of the clients. A growing database of empirical studies shows that microfinance has positive impacts to boost the ability of poor people to improve the conditions in which they live. Research works indicate that the poor have taken advantage of increased earnings to improve consumption levels, send their children to school, and build assets. In some other instances, microfinance is said to play insignificant role towards mitigating the problem of the poor. But looking at the positive impacts, several studies indicate that microfinance allows poor people to increase their incomes by starting new enterprises or expanding existing ones. The argument is that through diversified sources of income, the people could be able to shield themselves against external shocks. Savings and micro insurance services could also allow poor individuals to plan for future expenses, cope with stochastic crises and cover unanticipated expenses. Studies of microfinance programs and their clients indicate the following impacts on income and food security

FAO (2013) recognize that food security in Bangladesh can be attained through increased agricultural productivity; employment and self-employment, that create income opportunities and thus allowing to buy food; social programs—including food-for-work or cash-for-work programs, other forms of productive activities within households or communities. Richard L. Meyer (2003:349-50) observe that microfinance can contribute to poverty alleviation and food security through supplying loans, providing other financial services that enhance investment, and creating employment opportunities for the participant. If microcredit is the way to achieve food security, then Mayer certainly provide some insightful arguments about the ways by which microcredit affect food security. He mentioned three pathways -first is the poverty-alleviation path, which improves income generation. The second pathway is, access to microcredit induce changes in household assets and liabilities, improves savings and insurance service, thus, stabilize consumption. The third pathway is consumption of microcredits. Through this pathway, households attempt to use loans in immediately productive ways, thus, income and food supplies increase (Meyer 2003:350). Pitt and Khandker (1998) also indicated

that microfinance has brought positive marginal impacts on consumption in Bangladesh. They showed that microfinance has become a promising strategy to shield the poor from vulnerability through consumption smoothing as well as building assets.

2.7. Food Security Measurements

The measurement of food insecurity at different levels was described by Von Braun et al (1992) as country level, household level, and at individual level. Food security is measured at national level in terms of food demand (requirement) and supply indicators. At household level, food security is best measured by direct survey of income, expenditure and consumption and compares that with the adequacy norm appropriate to the household. Based on the outcome indicators, this study made use of household level analysis as the objective is to see the impact of the rural credit utilization on household food security and Income. The recommended minimum nutritional requirement for adult person has been set at 2100 kcal per person /day is usually used as a yardstick (*Von Braun et al.,* 1992; FNU/MoPED, 1994).

At the household level, food security is best measured by direct surveys of income, expenditure and consumption and compares that with the adequacy norm appropriate to the households. Such household surveys may be costly to be carried out often and as a proxy, the level and changes in socioeconomic and demographic variables such as real wage rates, employment, price ratios, migration, etc. may be used if properly collected and analyzed at the individual level.

Comparison of methods to measure the state of food insecurity at household level in terms of costs, time requirement, skill and susceptibility to misreporting among four outcome indicators namely individual intake, household calorie requisition, dietary diversity and index of coping strategies, household caloric acquisition are found to be better measurement (Hoddinot, 2001). Hoddinot briefly outlines the four outcome measures of household food security as follows:

Individual intake: This is a measure of the amount of calories or nutrients consumed by individual in a given time period usually 24 hours. Methods of generating data with this method are that an enumerator resides in the household throughout the entire day, measuring

amount of food served to each person. The enumerator also notes the type and quantity of food consumed outside the household. The second method is recall of the previous 24-hour consumption for each household member. When implemented correctly, it produces the most accurate measures of individual caloric intake and it is possible to determine that sufficient calories are being consumed within the household. Against these advantages, it needs to be made repeatedly ideally for seven nonconsecutive days and require highly skilled enumerators who can observe and measure quantities repeatedly and quickly and in a fashion that does not cause households to alter typical level of food consumption and distribution within the households. The recall method requires interviewing carefully every household member which obviously is an extremely difficult task (Hoddinot, 2001).

Household caloric acquisition: Here the person responsible for preparing meals is asked how much food was prepared for consumption over a period of time. The most knowledgeable person in the household is asked a set of questions regarding food prepared for meals over specific period of time usually 7 or 14 days. It requires listing out food types on questionnaire and distinguishing unambiguously between the amounts of food purchased, prepared for consumption and the amount food served. This measure produces a crude estimate of number of calories available for consumption in the household. The level of skill required by enumerators is less than that needed to obtain information on individual intakes (Hoddinot, 2001).

Dietary diversity: One or more persons within the household are asked about different items they have consumed in a specified period.

Indices of household coping strategy: This is an index based on how households adapt to the presence or threat of food shortages. The person within the household who has primary responsibility of preparing and serving meal will be asked a serious of questions regarding how households are responding to food shortages (Hoddinot, 2001).

2.8. Impact Evaluation Methods

To know the effect of a program on a participating individual, we must compare the observed outcome with the outcome that would have resulted had that individual not participated in the program. However, as stated earlier two outcomes cannot be observed for the same individual. In other words, only the factual outcome can be observed. Thus, the fundamental problem in any social program evaluation is the missing data problem (Ravallion, 2005).

Estimating the impact of a program requires separating its effect from intervening factors which may be correlated with the outcomes, but not caused by the project. This task of "netting out" the effect of the program from other factors is facilitated if control groups are introduced. "Control groups" consist of a comparator group of individuals or households who did not receive the intervention, but have similar characteristics as those receiving the intervention, called the "treatment groups". Identifying these groups correctly is a key to identifying what would have occurred in the absence of the intervention (Ezemenari *et al*., 1999).

In theory, evaluators could follow three main methods in establishing control and treatment groups: randomization/pure experimental design; non-experimental design and quasi-experimental design. In practice, in the social sciences, the choice of a particular approach depends, among other things, on data availability, cost, and ethics to experiment. In what follows, brief descriptions of the main impact evaluation methods mentioned above.

2.8.1. Experimental method

In a randomized experiment, the treatment and control samples are randomly drawn from the same population. In other words, in a randomized experiment, individuals are randomly placed into two groups, namely, those that receive the program or intervention and those that do not. This allows the researcher to determine program impact by comparing means of outcome variable for the two groups According to Ezemenari *et al*. (1999), a random assignment of individuals to treatment and non-treatment groups ensures that on average any difference in outcomes of the two groups after the intervention can be attributed to the intervention. The

main advantage of a randomized experiment is its ability to avoid problem of selection bias, which arises when participation in the program by individuals is related to their unobservable or unmeasured characteristics (like motivation and confidence), which in turn determine the program outcome. Obviously, randomization must take place before the program begins.

2.8.2. Non-experimental method

A non-experimental approach is used in cases where program placement is intentionally located. For programs that are often setup intentionally, it is common to only have access to a single cross-sectional survey done after the program is introduced (Jalan and Ravallion, 2003). According to Bryson *et al*. (2002), there are two broad categories of non-experimental approach; before and after estimator and cross-sectional estimator. The essential idea of the before and after estimator of an impact evaluation approach is to compare the outcome of interest variable for a group of individuals after participating in a program with outcome of the same variable for the same group or a broadly equivalent group before participating in the program and to view the difference between the two outcomes as the estimate of average treatment effect on the treated. Cross-section estimators use non-participants to derive the counterfactual for participants in which case it becomes quasi-experimental method.

2.8.3. Quasi-experimental method

Quasi-experimental design involves matching program participants with a comparable group of individuals who did not participate in the program. This simulates randomization but need not take place prior to the intervention (Kerr *et al*., 2000). A quasi-experimental method is the only alternative when neither a baseline survey nor randomizations are feasible options (Jalan and Ravallion, 2003).

Quasi-experimental method consists of constructed (matched) control where individuals to whom the intervention is applied are matched with an “equivalent” group from whom the intervention is withheld (Ezemenari *et al*., 1999). The study used this method as there is no base line data and as the program placement is not random.

The main benefit of quasi-experimental designs is that they can draw on existing data sources and are thus often quicker and cheaper to implement, and can be performed after a program has been implemented, given sufficient existing data. The principal disadvantages of quasi-experimental techniques are that (i) the reliability of the results is often reduced as the methodology is less robust statistically; (ii) the methods can be statistically complex; and (iii) there is a problem of selection bias. When generating a comparison group rather than randomly assigning one, there are many factors which can affect the reliability of results. Statistical complexity requires considerable expertise in the design of the evaluation, and analysis and interpretation of the results. This may not always be possible, particularly in some developing country circumstances (Baker, 1999).

The most frequently used non-experimental/ quasi-experimental design methods available for evaluating development programs include propensity score matching (PSM), difference in differences(DD), regression discontinuity design(RDD), and instrumental variables (IV) (ADB, 2006).

Propensity Score Matching: Among quasi-experimental design techniques, matched comparison techniques are generally considered a second-best alternative to experimental design (Baker, 2000). Intuitively, PSM tries to create the observational analogue of an experiment in which everyone has the same probability of participation. The difference is that in PSM it is the conditional probability (P(X)) that is intended to be uniform between participants and matched comparators, while randomization assures that the participant and comparison groups are identical in terms of the distribution of all characteristics whether observed or not. Hence there are always concerns about remaining selection bias in PSM estimates (Ravallion, 2005).

Difference-In-Differences (DID): Method in which one compares a treatment and comparison group (first difference) before and after a project (second difference). Comparators should be dropped when propensity scores are used and if they have scores outside the range observed for the treatment group. In this case potential participants are identified and data are collected from them. However, only a random sub-sample of these individuals is actually

allowed to participate in the project. The identified participants who do not actually participate in the project form the counterfactual (Jalan and Ravallion, 1999; Baker, 2000).

Regression discontinuity design: a method can be used when program participation is determined by an explicitly specified exogenous rule. The method stems from the intuition that individuals around the cut-off point for eligibility are similar and uses individuals just on the other side of the cut-off point as the counterfactual. In other words, RDD compares outcomes of a group of individuals just above the cut-off point for eligibility with a group of individuals just below it. The major technical problem of the RDD method is that it assesses the marginal impact of the program only around the cut-off point for eligibility, and nothing can be said of individuals far away from it. In addition, for the RDD estimate to be valid a threshold has to be applied in practice and individuals should not be able to manipulate the selection score to become eligible (ADB, 2006).

Instrumental variables or statistical control: methods, in which one uses one or more variables which matter to participation, but not to outcomes given participation. This identifies the exogenous variation in outcomes attributable to the program – recognizing that its placement is not random but purposive. The "instrumental variables" are first used to predict program participation, and then one sees how the outcome indicator varies with the predicted values (Baker, 1999).

This study used propensity score matching (PSM) method to assess the impact of credit program on food security and income of rural households due to lack of baseline data and non-randomization of the selection of farmers into the program.

2.9. Propensity Score Matching (PSM) Method

Propensity score matching method was proposed as a way to correct for the estimation of effects of the program controlling for the existence of these confounding factors based on the idea that the bias is reduced when the comparison is performed using participants and control subjects who are similar as possible. To achieve this, the method summarizes pre-participation characteristics into a single index known as propensity score, which makes matching feasible.

Propensity score is a conditional probability estimator, and any discrete choice model such as logit or probit can be used as they yield similar results (Caliendo and Kopeinig, 2005). The matching estimators used are nearest neighbor, radius, and kernel and stratified matching methods all conditional on propensity score. The propensity score model is expressed as:

$$p(X_i) \equiv pr\{D = 1 / X_i\} = E\{D / X_i\} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where D= (0, 1) is a participating variable (in this case borrowing status) and X_i is a vector of pre-participation covariates. Propensity score ensures that matching estimation is done on subjects that are similar as possible for effective comparison. As a result, given a population of units denoted by (i), if the propensity score $p(X_i)$ is known the Average Effect of Participation (AEP) can be estimated as:

…….. (2)

Where (AEP) is the average effect of participation, Y_{1i} and Y_{0i} are the potential outcomes for the two counterfactual situations of participation and non-participation respectively, $p(X_i)$ is the propensity score, D is the participation variable, where D=1, if participated and 0 otherwise. This model works under two assumptions; the balancing assumption and conditional independence assumption. The balancing assumption postulates that participation is shaped by pre-articipation characteristics. Conditional independence assumption postulates that all the covariates must be independent of participation.

However, households participating in the program cannot be simultaneously observed in two states. A household can either be in the program or outside the program. Thus, the fundamenta l problem of such an impact evaluation is a missing data problem. In other words, we are interested in answering the research question “what would have been the food security outcome of participating households be if rural credit is not in place?” Hence, this study applies a propensity score matching technique, which is a widely applied impact evaluation instrument in the absence of baseline survey data for impact evaluation.

Rosenbaum and Rubin (1983) were the first to develop the PSM statistical tool. The technique has attracted attention of social program evaluators since the last fifteen years (see for *e.g.,* Jalan and Ravallion, 2003). The present study also used a PSM technique to address its main objectives which is impact of rural credit on household food security and income in the study area. The PSM technique enables us to extract from the sample of non-participating households a set of matching households that look like the participating households in all relevant pre-participation characteristics. In other words, PSM matches each participant household with a non-participant household that has almost the same likelihood of participating into the rural credit.

PSM is preferred to the traditional regression method in several ways. Among others, PSM compares outcome for observations, who share similar observable characteristics. Moreover, PSM only compares households lay in the common support and excluded others from the analysis. In this research "treatment" implies participation in the rural credit utilization and "impact" is meant for the change of food security using calorie intake and income as an outcome indicator. On the other hand, "control" stands for non-participant/non-treated households will be used for comparison. According to Caliendo and Kopeinig (2005), there are steps in implementing PSM. These are estimation of the propensity scores, choosing a matching algorism, checking on common support condition and testing the matching quality.

2.9.1. Procedures of propensity score estimation

The first step in PSM method is to estimate the propensity scores. As described by Rosenbaum and Rubin (1983), matching can be performed conditioning on P(X) alone rather than on X, where P(X) = Prob(D=1|X) is the probability of participating in the program conditional on X. If outcomes without the intervention are independent of participation given X, then they are also independent of participation given P(X). This reduces a multidimensional matching problem to a single dimensional problem.

A logit model is used to estimate propensity scores using a composite of pre-participation characteristics of the sampled households (Rosenbaum and Robin, 1983) and matching is then performed using propensity scores of each observation. According to matching theory

(Rosenbaum and Robin, 1983; Bryson et al., 2002; Jalan and Ravallion, 2003), the logit model via which the propensity score is generated should include predictor variables that influence the selection procedure or participation in the program and the outcome of interest. Several factors guide selection of predictor variables. In the present study, explanatory variables of the logit model will be identified using findings of previous empirical studies on food security, and own field observation. Many explanatory variables will be included as possible to minimize the problem of unobservable characteristics in our evaluation of the impact of the rural credit. One should also exclude those non-participants for whom the probability of participating is zero.

2.9.2. Matching estimators

After estimation of the propensity scores, seeking an appropriate matching estimator is the major task of a program evaluator. There are different matching estimators in theory. Below, only the most commonly applied matching estimators are described. These are:

Nearest Neighbour (NN) Matching: it is the most straight forward matching estimator. In NN matching, an individual from a comparison group is chosen as a matching partner for a treated individual that is closest in terms of propensity score (Caliendo and Kopeinig, 2005). NN matching can be done with or without replacement options. In the case of the NN matching with replacement, a comparison (non-participant) individual can be matched to more than one treatment individuals, which would result in increased quality of matches and decreased precision of estimates. On the other hand, in the case of NN matching without replacement, a comparison individual can be used only once. Matching without replacement increases bias but it could improve the precision of the estimates. In cases where the treatment and comparison units are very different, finding a satisfactory match by matching without replacement can be very problematic (Dehejia and Wahba, 2002). It means that by matching without replacement, when there are few comparison units similar to the treated units, we may be forced to match treated units to comparison units that are quite different in terms of the estimated propensity score.

Caliper Matching: The above discussion tells that NN matching faces the risk of bad matches, if the closest neighbour is far away. To overcome this problem researchers, use the second

alternative matching algorism called caliper matching. Caliper matching means that an individual from the comparison (non-participant) group is chosen as a matching partner for a treated individual that lies within a given caliper (propensity score range) and is closest in terms of propensity score Caliendo and Kopeinig, 2005). If the dimension of the neighborhood is set to be very small, it is possible that some treated units are not matched because the neighborhood does not contain a control unit. On the other hand, the smaller the size of the neighborhood the better is the quality of the matches (Becker and Ichino, 2002). One problem in caliper matching is that it is difficult to know a priori what choice for the tolerance level is reasonable.

Kernel Matching: this is another matching method whereby all treated units are matched with a weighted average of all controls with weights which are inversely proportional to the distance between the propensity scores of treated and controls (Becker and Ichino 2002; Venetoklis, 2004). Kernel weights the contribution of each comparison (non-participant) group member so that more importance is attached to those comparators providing a better match. The difference from caliper matching, however, is that those who are included are weighted according to their proximity with respect to the propensity score. The most common approach is to use the normal distribution (with a mean of zero) as a kernel, where the weight attached to a particular comparator is proportional to the frequency of the distribution for the difference in scores observed (Bryson *et al*., 2002).

According to Caliendo and Kopeinig (2005) a drawback of this method is that possibly bad matches are used as the estimator includes comparator observations for all treatment observation. Hence, the proper imposition of the common support condition is of major importance for kernel matching method. A practical objection to its use is that it will often not be obvious how to set the tolerance. However, according to Mendola (2007) kernel matching with 0.25 band width is most commonly used. The question remains on how and which method to select. Clearly, there is no single answer to this question. The choice of a given matching estimator depends on the nature of the available data set (Bryson et al., 2002). In other words,

it should be clear that there is no `winner' for all situations and that the choice of a matching estimator crucially depends on the situation at hand.

The choice of a specific method depends on the data in question, and in particular on the degree of overlap between the treatment and comparison groups in terms of the propensity score. When there is substantial overlap in the distribution of the propensity score between the comparison and treatment groups, most of the matching algorithms will yield similar results (Dehejia and Wahba, 2002). To give an example, if there are only a few control observations, it makes no sense to match without replacement. On the other hand, if there are a lot of comparable untreated individuals it might be worth using more than one nearest neighbor to gain more precision in estimates (Caliendo and Kopeinig, 2005).

2.9.3. Region of common support condition

Imposing a common support condition ensures that any combination of characteristics observed in the treatment group can also be observed among the control group (Bryson et al., 2002). The common support region is the area which contains the minimum and maximum propensity scores of treatment and control group households, respectively. It requires deleting of all observations whose propensity scores is smaller than the minimum and larger than the maximum of treatment and control, respectively (Caliendo and Kopeinig, 2005).

2.10. Empirical Studies on Impact of Microfinance in Ethiopia

Determining the impact of a microfinance intervention is particularly important when it is desired to improve the quality of life of the clients. In Ethiopia, since the operation of MFI is a recent phenomenon, limited studies have been undertaken regarding impact assessment (Kebede, 2003). Hence, some of the studies undertaken on impact assessment are discussed below.

The econometric analysis on determinant of income by Remedan (2008) shows that average amount of credit received, access to irrigation and use of chemical fertilizer/improved seed significantly influenced the total household income. This suggests that the supply of credit is

crucial for farmers to use modern technologies and procure agricultural input. Participation in off farm/ non-farm activities positively influenced total household income. In addition, male farmers had higher chance to increase their income. Similarly, allocation of farm for production of *khat* has significantly contributed for the improvement of household income.

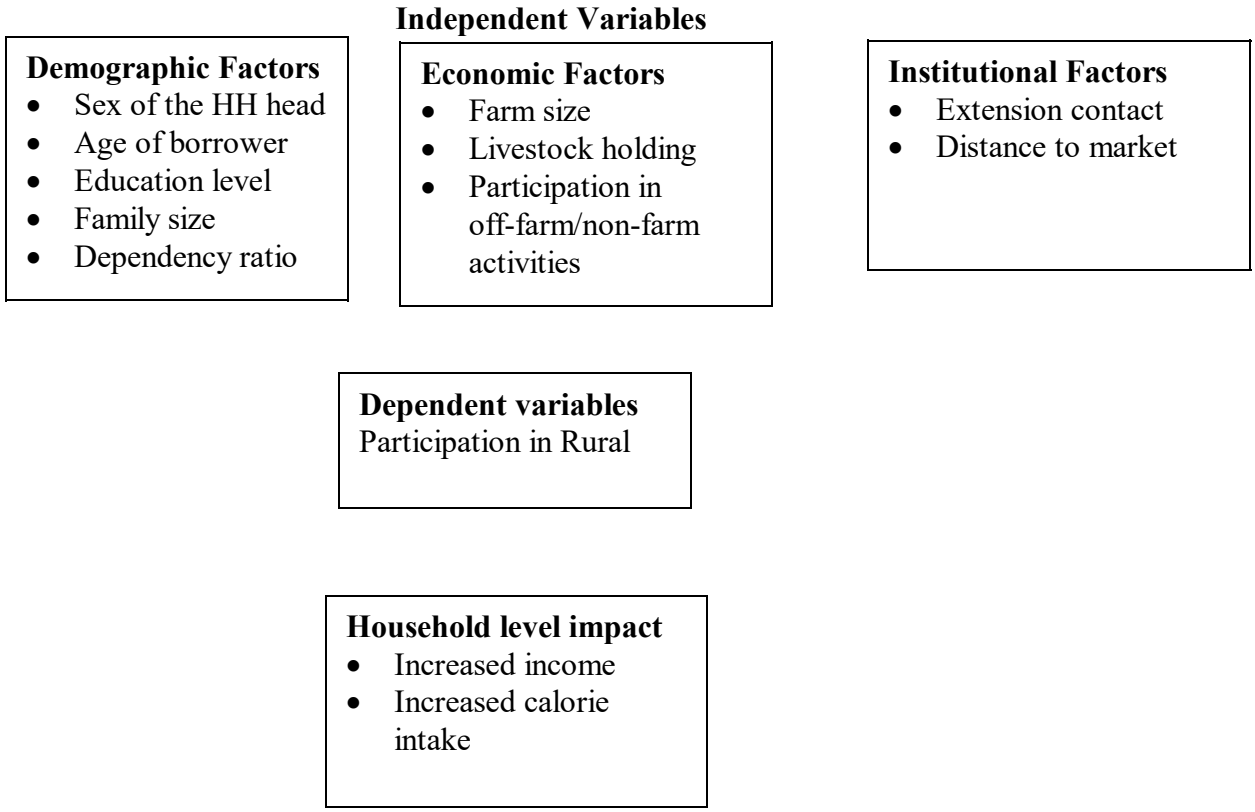
Padma and Getachew (2005) conducted a study on women economic empowerment and microfinance by reviewing Awassa women clients. The finding revealed that 83% of respondents, who constitute the majority, reported that credit was a very supporting tool to their business. These clients built up some additional rooms for the purpose of living and business. They have better asset ownership, better educational expense and participation in decision-making. There is a positive influence of microfinance in asset formation, increasing income and employment generation, in business improvements, and increasing decision-making process (Abebe, 2006)

The detailed study of Garber *et al.* (2006) assessed the individual, household, enterprise and community level impact of Amhara Credit and Saving Share Company (ACSI) in Amhara Region. They used 685 (345 mature and 339 incoming clients) for impact survey. According to the qualitative study, the majority of the sample clients reported that their participation in the ACSI program has been a life changing event. They feel much better about themselves and their small successes (Kassa, 2008).

A study by Abebe (2006), on the impact of microfinance on poverty reduction on Specialized Financial and Promotional Institution (SFPI) in Ethiopia, found out that SFPI intervention has improved households' living conditions. The findings revealed that the average monthly income of most households rose after they took loans from SFPI. Similarly more than 65 % of households confirmed that the overall household income increased due to SFPI program. However, the impact is more pronounced in rural households than urban households. Furthermore, households made improvements in their houses after they joined SFPI program. SFPI program has also raised the households' asset ownership. Ownership of assets in all interviewed clients has increased after the program. Even poor households purchased television, sofa and refrigerator after taking loans from SFPI signing heard.

A Study by Tadesse (2008), focusing on the role of rural credit in reducing households' vulnerability to food insecurity in Ganta-Afeshum woreda, Eastern Tigray, Ethiopia, studied on the income diversity of credit clients in comparison to non-clients. As a result the sample credit clients diversified their income sources and larger value of mean income diversity index. Larger proportions of the credit clients also participated in more remunerative activities like high value crop production (mainly pulses), livestock production (mainly sheep and goat production/fattening) and petty trade. This implies that clients have more diversified income sources than non-clients. However, with respect to the share of non-agricultural income in the annual income of households, there is no significant difference between the two groups.

2.11.Conceptual Framework



Source: - adapted from Hulme (2000) and modified by researcher

3. METHODOLOGY

3.1. Description of the Study Area

Kurfa Chele woreda is one of the twenty two woredas of East *Hararghe* zonal administrations in *Oromia* Regional State. It is located at a distance of 55 km from zonal town, *Harar* and 540 km from Addis Ababa. The *woreda* is bordered with *Kersa* woreda in the north, *Haromaya* and *Fedis* woredas in the east, *Grawa* and *Bedeno* woredas in the west and *Grawa* woreda in the south.

The altitude of the *woreda* ranges from 1400 to 3400 meters above sea level (CSA, 2010). The same source indicated that the *woreda* falls in to high land, midland, and low land agro climatic zones. Total area of the *woreda* is 30,177 ha (KWARDO, 2015) or 259.69 square kilometer (CSA, 2010). Of its total area, 36 % is high land, 13 % is mid land and the remaining 51% is lowland. From the total coverage 11,894.84-hectar is used for agricultural production, 6,746 hectare is covered by forest, 3817 hectare is used for grazing land, 2,905 hectare is arable land, and 4814.16 hectare is used for other purpose. Its annual average temperature varies between a maximum of $31c^0$ and a minimum of $10c^0$ with the annual rain fall ranges from 700mm to 2000mm.

The *woreda* has a total population of 58,712 in 2007, and it is projected to be 75,939 in 2016 given a 2.9% annual growth rate of *Oromia* Region. From this population 37,557 are females and 38,382 are males, 90.2% of the total population lives in the rural parts of the *woreda* and the remaining 9.8% of the population are urban dwellers (CSA, 2007). More than 98% of the *woreda* population makes their livelihood on agricultural activities (KWARDO, 2015). The main crop items of the *woreda* are cereals mainly sorghum and maize, in small areas wheat and barley, cash crops *khat* and coffee in low land, Irish potato in high land and green pepper in some small low land areas but size of farm land used for cash crop production is limited and their production system is rain fall dependent (KWARDO, 2015). Livestock keeping is also considered as subsidiary to the crop production activities. The same source indicated that,

Kurfa Chele has twenty *kebele* administrative. Out of these two of them are small urban *kebeles* while the remaining eighteen are rural *kebeles*. In each *kebele* Agricultural extension workers and Health extension workers were assigned by the *woreda* Agricultural and Health offices respectively. According to the information obtained from the *woreda* Rural Road Authority, 10 rural and 2 urban *kebeles* were accessible for all weather roads while the remaining 8 rural *kebeles* were accessible only for dry season road.

In the study area, agricultural production is largely rain-fed in the face of erratic rainfall and frequent drought. The mean land holding per farm household is 0.5 Ha in general and even less for high land and irrigable low land areas (KWARDO, 2015). Although there were no disaggregated figures for the study *Woreda*, most households encountered food shortage for four to six months. As a result, *Kurfa Chele woreda* was one of the most food insecure *woredas* of Oromia regional state in Eastern Ethiopia (KWDPPO, 2015). Oromia Credit and Saving Share Company (OCSSCO) has provided saving and credit services for the *woreda* community in general, particularly for rural households in order to improve agricultural production and productivity, to participate in off-farm income generating activities and for consumption smoothing at the time of food gap instead of depleting household assets. OCSSCO provide financial service to individuals and households that are excluded from conventional financial institutions by using group lending method. Groups were formed according to predetermined criteria such as homogeneity of interest, knowing each other, capacity to lend or save with the institution, and with group responsibilities. As of September, 2015, a total of 2602 individual clients were borrowed 3,871,311.00 birr from the woreda microfinance institution. Of these borrower 805 and 1797 were female and male clients and borrowed 2,643,165.00 and 1,228,146.00 birr respectively (KWMFI, 2016).

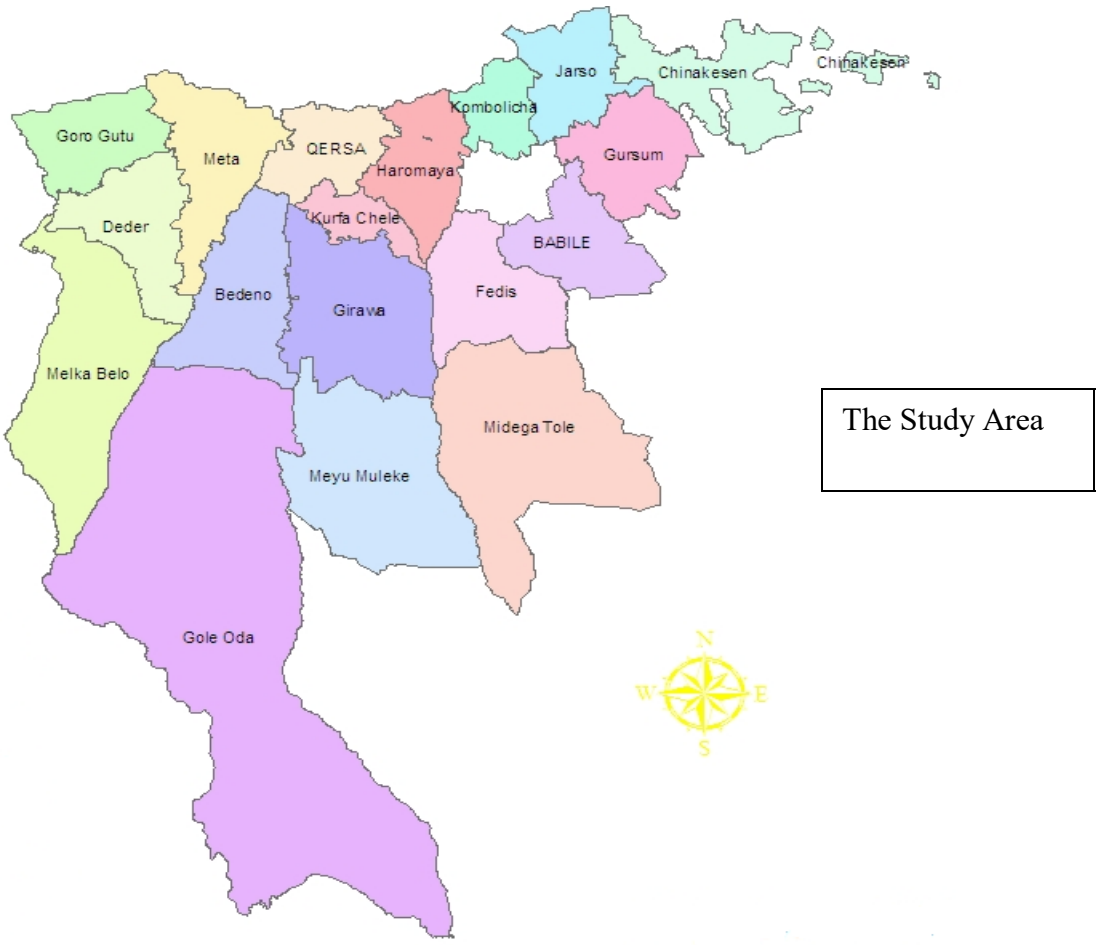


Figure 1. East Hararghe Zone Map

3.2. Sources and Methods of Data Collection

For this study, both qualitative and quantitative data were important. The study relied on both primary and secondary data sources of information. The qualitative data were collected through individual interview using checklists, focus group discussions in each sample *kebele,* key informant interview and personal observations were made. Four FGDs that contains 8-10 members were conducted in the sampled kebeles. The program credit users and non-users households were participated on FGDs. Advantages and disadvantages of credit, credit service utilization practice, sources of credit, livelihood and food security condition of the community

were among the questions we used for FGDs. The quantitative data were collected through survey using interview schedule. Characteristics' of households, resource endowments including land and livestock, productive and non-productive assets ownership and the estimated value of the assets, amount of income and income sources, household's consumptions and expenditures, availability of alternative source of credit and household's participation in the credit program were quantitative data collected through household survey using interview schedule. Moreover, written documents from *kebele* and *woreda* offices were consulted to find out the relevant information which helps in triangulating validity of the information collected from different sources with written documents. Four enumerators who were familiar with the local language, the culture of the community and practical experience were selected and given training about the purpose of the study, method of data collection and interview technique for two days. Then the interview schedule was pre-tested on a total of eight target and non-target households selected randomly in one of non-sampled but nearest *kebele* to insure the reliability and validity of survey instruments. Finally, necessary modifications were made on the data collection instruments based on the result of the pre-test.

3.1. Sample Size and Method of Sampling

The study employed a multistage sampling procedure. In the first stage *Kurfa Chele woreda* was selected as the study area purposively because first *Kurfa Chele* was one of the drought affected, chronically food insecure *woreda* in East *Hararghe* zone of *Oromia* region. Secondly due to the researcher's knowledge about the area since the commencement of OCSSCO in offering the services. Thirdly the *woreda* has become to be known for its animal fattening (oxen and goat) and trading activities. Fourthly large number of households had receiving credit for trading purpose. Out of 20 *kebeles* found in the *woreda* four of them were removed from the sampling frame because 2 of them were urban and the others 2 were non services *Kebeles*. The remaining 16 *kebeles* were stratified based on agro-climatic zones; type of crop production, altitude, temperature and annual rain fall amount. Stratification was necessary to have a better representation of respondents from each agro-climatic zones. Because in the district high land areas are assumed more productive than low land moisture stress areas. After stratification, 4 *kebeles* were selected purposefully by considering distance from the *woreda*

town and accessibility of the road. This was made to verify the impact of distance from the service providing institutions for accessing credit, capacity building information, and marketing facility. Once the *kebeles* were identified, the sample households were selected from each *kebele* by using the simple random sampling with the probability proportional to size.

There are several approaches to determine the sample size. These include using a census for small populations, imitating a sample size of similar studies, using published tables, and applying formulas to calculate a sample size. This study used a simplified formula provided by Yamane, 1967 to determine the required sample size at 95% confidence level, degree of variability=0.5 and level of precision= 9% (0.09)

…….. (3)

Where n is the sample size, N is the population size (total household heads size), and e is the level of precision. The above formula requires a minimum of 123 responses but this study was conducted on 180 respondents considering similar studies sample size.

The sample units in the first sample group were those households who had accessed financial credit service from Oromia Credit and Saving S.C at least once and their loan was matured. The second sample group were households who were eligible but did not received loan from OCSSCO and from other Governmental and non-Governmental organizations because of different reasons except agricultural inputs (seed and fertilizer). The size of the first and the second sample group was 180 households. Eighty two (82) sample OCSSCO client households and ninety eight (98) sample non OCSSCO client households were selected randomly from each sample *kebele* considering population proportional to size technique.

The list of loan borrower was found from *woreda* OCSSCO financial service providing institution, and list of other sample groups were found from the *woreda* office of agricultural or from respective *kebele* development agents' office.

Table 1. Distribution of sampled respondents by sample kebeles

Kabele	Sampling Frame		Total Sample households		Credit Users		Non-Users	
	Credit Users	Non-Users	Freq	Percent	Freq	Percent	Freq	Percent
Gudina Mulata	250	250	64	35.6	32	50	32	50
Arele Guda	205	265	60	33.3	26	43.3	34	56.7
Goro Gerbi	63	87	19	10.6	8	42.1	11	57.9
Hula Jeneta	125	165	37	20.6	16	43.2	21	56.8
Total	643	767	180	100	82	45.6	98	54.4

Source: KWMFI, 2016

3.2. Data Analysis Method

The qualitative data were summarized through interpretation and conceptual generalization for that specific *woreda*. This helps in describing the different socioeconomic activities that determines the participation of the rural household in the credit program. The quantitative data obtained through different data collection methods were analyzed using descriptive and econometric models and interpretation for analysis. For the quantitative data, both descriptive and econometric models were used to analyze the relationship between the dependent and explanatory variables. Descriptive statistics such as mean, frequency, standard deviation and percentage and correlation model were statistical tools. Moreover, statistical tests such as t-test, F-test, and chi-square test were used to test the significance of the variables under consideration.

3.2.1. Descriptive analysis

Descriptive method of data analysis refers to the use of ratios, percentages, means, variances and standard deviations and it was employed in the process of identifying, describing and summarizing the services from the microfinance institute, the proxy indicators of food security,

amount of annual income generated and the respective independent variables under consideration.

3.2.2. Econometric models

Econometric analysis for factor affecting participation in rural credit

The logit and probit are the two most commonly used models for assessing the effects of various factors that affect the probability of adoption of a given technology. These models can also provide the predicted probability of adoption. Both models usually yield similar results. However, the logit model is simpler in estimation than probit model (Aldrich and Nelson, 1984).

Hence, the logit model was used in this study to analyze the determinants of participating in rural credit. Following Liao (1994), Gujarati (2003) and Aldrich and Nelson (1984) the logistic distribution function for the participation in rural credit is specified as:

(4)

Where, Pi = is the probability of participating in the credit program for the i^{th} farmer and it ranges from 0 to 1.

e^{Zi} = stands for the irrational number e to the power of Z_i.

Z_i = a function of n-explanatory variables which is also expressed as:

$$Z_i = \beta_0+\beta_1X_1+\beta_2X_2+\ldots+\beta_nX_n \quad (5)$$

Where, X_1, $X_2 \ldots X_n$ are explanatory variables.

β_0- is the intercept, β_1, β_2 … β_n are the logit parameters (slopes) of the equation in the model.

The slopes tell how the log-odds ratio in favor of using the rural credit changes as an independent variable changes. The unobservable stimulus index Zi assumes any values and is actually a linear function of factors influencing decision of using rural credit. It is easy to verify

that Z_i ranges from -∞ to ∞, Pi ranges between 0 and 1 and that Pi is non-linear related to the explanatory variables, thus satisfying two requirements:

- As X_i increases P_i increases but never steps outside the 0 and 1 interval; and
- The relationship between P_i and X_i is non-linear, *i.e.*, one which approaches zero at slower and slower rates as X_i gets small and approaches one at slower and slower rate as X_i gets very large. But it seems that in satisfying these requirements, an estimation problem has been created because P_i is not only non-linear in X_i but also in the β's, as well as can be seen clearly below.

$$P_i = \frac{1}{1 + e^{-(\beta_0+\beta_1 X1+\beta 2X2+\ldots+\beta nXn)}} \quad (6)$$

This means the familiar OLS procedure cannot be used to estimate the parameters. But this problem is more apparent than real because this equation is intrinsically linear. If P_i is the probability of using rural credit then (1-Pi), the probability of not using, can be written as:

(7)

Therefore, the odds ratio can be written as:

(8)

Now equation (8) is simply the odds ratio in favor of using rural credit. It is the ratio of the probability that the household will use rural credit to the probability that it would not use it.

Finally, taking the natural log of equation 8, the log of odds ratio can be written as:

(9)

Where, Li is log of the odds ratio in favor of rural credit utilization, which is not only linear in X_i, but also linear in the parameters. Thus, if the stochastic disturbance term,

(U_i), is introduced, the logit model becomes:

(10)

This model can be estimated using the iterative maximum likelihood (ML) estimation procedure.

Impact analysis method

The impact of rural credit utilization on food security and income is the difference in households' mean calorie intake with the participation and non-participation in the credit program. For this study propensity score matching is selected to evaluate the impacts of rural credit utilization on household income and food security. The propensity scores themselves serve only as devices to balance the observed distribution of covariates between the treated and comparison groups. The success of propensity score estimation is therefore assessed by the resultant balance rather than by the fit of the models used to create the estimated propensity scores (Lee, 2006). Using predicted probabilities of participation in the rural (OCSSCO) credit program (*i.e.* propensity score) match pairs are constructed using alternative methods of matching estimators. Then the impact estimation is the difference between simple mean of outcome variable of interest for participant and non-participant households. In our case of food security, the mean stands for household calorie intake for one week preceding the survey. The mean impact of the credit utilization on food consumption is given by:

Δ (11)

Where, Y_{ij1} is the post intervention food consumption of household *j,* Y_{ijo} is the food consumption of the i^{th} non-participant in credit utilization matched to the j^{th} participant, *P* is the total number of participants, *NP* is the total number of non-participants in credit and *C* is food consumption in calorie.

Similarly, the impact of rural credit utilization on household income was analyzed in the same way as that of impact of rural credit on food consumption. We have a propensity score for every sampled participant and non-participant. To evaluate impact of rural credit utilization on household income, the income model is given by:

(12)

Where Y_{ij1} is income of credit user household *j*, Y_{ij0} is the income of the i^{th} credit non-user household was matched to the j^{th} credit user household, *P* is the total number of user of credit and *NP* is the total number of non-user.

3.3. Hypothesis and Operational Definitions of Variables

After reviewing related literature, the explanatory variables that are expected to determine households' Food Security and Income are discussed as follows.

3.3.1. Dependent variable

Participation in rural credit program is dummy variable that takes value 1 if a household member participates in OCSSCO credit program and 0 otherwise to analyze factor affecting rural credit program participation and impact evaluation.

3.3.2. Outcome variable

Annual Income: is a continuous variable measured in *Birr.* It refers to the total income of the household that is obtained by summing up income from the sale of crop produce, animal sale, animal products sale, and income from non-farm and off-farm activities.

Calorie Intake: is a continuous variable measured in Kcal/AE/Day of the total consumption of the household. If the food consumption or calorie intake per adult equivalent per day for a

person is greater than or equal to 2,200 Kcal, then food secured otherwise food insecure (MoFED, 2012).

3.3.3. Independent variables

The independent variables of the study are those variables which were hypothesized to have associations with the household's annual income and calorie intake. Therefore, the following explanatory variables were hypothesized as factors influencing the household's choice of participation in rural credit program and the outcome variables.

Age of the respondent (years): In peasantry farming system; the types of crops grown, the technology used, the allocation of resources among enterprises, *etc*. are largely determined by the decisions of farm household. Age, as one of the developmental characteristics of human being, considerably influences the decision making process. This all influences the use of available resource in the best way to contribute for household asset improvement. Though not significant age of the household head has a negative relation with micro-credit utilization (Melkamu and Mengistu, 2013). Therefore, as age advances household heads become much reluctant to accept new production styles and thus, age was hypothesized to affect the household food security and participation in micro-credit program negatively.

Sex of the household head: Refers to the role played by the male or female household heads in generating income from different sources. The sex of the household head is determinant for wage employment access (Rees, 2002). Female headed households are less likely to generate income due to cultural barriers and household chores. Therefore, it was hypothesized that male headed households are more likely demand credit to participate in income generating activities than their counterparts–female headed households. This is dummy variables which takes a value of 1 if the borrowers are male and 0, otherwise.

Family size in AE: is a continuous variable measured by the number of household members taken in the standardized unit of adult equivalent. The larger the number of family members, ceteris paribus, the more the labor force available for production purpose. Large family size needs more production for consumption so that they demand more credit. Families with larger

family size can earn additional income by sending a family member to work in families with scarce labor. Another important demographic variable that can affect a households' welfare is household size (Sefiager, 2013). Therefore, the variable was hypothesized to influence the participation decision on credit program and the outcome variables in positively.

Education of the respondent: It is a continuous variable defined as the level of grades or years of schooling completed by the respondents. Education equips individuals with the necessary knowledge of how to make living. Moreover, education enhances farmers' ability to perceive, interpret and respond to new events. Education helps the individual to utilize microfinance credit service, because the capacity created would help the individual to analyze and interpret and make use of it than less educated individuals (Endalew *et al*, 2013. Education thus, was hypothesized to positively affect the use of modern technology and hence expected to increase the household participation in credit program.

Agricultural land holding: is a continuous variable which refers to the total area of farm land that a farmer owns (whether cultivated or rented out) in hectare since it reflects the ownership of an important asset. The theory of substitutability of factors of production implies that, land substitutes the other input, which is purchased from credit. Hence, farmers who have relatively large size of agricultural holding may fulfill their financial problem by rented out some size of his/her land so that less demand for credit. In other hand, the larger the cultivated land size, the more the labor required that demands additional capital that might be obtained through credit (Sisay, 2008). Hence, this variable was hypothesized either positively or negatively influence participation of households in credit giving microfinance institutions.

Total livestock holding: This refers to the total number of animals possessed by the household measured in tropical livestock unit (TLU). Livestock is considered as another asset which is liquid and a security against crop failure. Farmers owning more livestock can settle their debts and they even neutralize crop failure by selling out their animals and animal products. Moreover, households who have large number livestock might cover their expense by selling livestock instead of looking for credit. Livestock holding was found to affect participation in micro-credit and farm productivity negatively (Melkamu and Mengistu, 2013).

Therefore, the variable was hypothesized to influence the households' decision to participate in credit borrowing microfinance program negatively.

Extension contact: This refers to the number of contacts with extension agents that the household made in the year. Farmers who have a frequent contact with extension agents would be expected to have more information that would influence farm household's demand for credit from the formal sources (Sisay, 2008). Therefore, it was hypothesized that extension contact positively influences households' participation in credit borrowing microfinance program and outcome variables.

Dependency ratio: The number of the non-productive age groups, individuals whose ages are less than 15 years and greater than 64 years, in relation to the number of productive age groups in the household. The higher the dependency ratio, the lower the probability of the household participating in credit borrowing microfinance program. This may be due to the fact that in higher dependency ratio of household, demand for working capital might be less because large part of the household members are dependent so as to carry out farm/non-farm activities independently. In contrast, in lower dependency ratio of household, demand for working capital might be higher in order to involve in different farm/non-farm activities by each household members independently. Even though, not significant dependency ratio was found to positively influence participation in micro-credit (Melkamu and Mengistu, 2013). But, this research hypothesized that dependency ratio had negative relationship with participation in credit borrowing microfinance program.

Participation in Off-farm/non-farm Activities: this represents whether the farm household participate in any off-farm/non-farm income generating activities besides main agricultural activities. Agricultural production may not be the rural household's only source, or even their most important source of income. The multiple livelihood strategies enhance household asset building. Engaging in non-farm activities has dual effects on households' productivity and welfare. It is a means of diversifying income sources and earning of higher levels of income by

investing in high risk high return activities. Besides, income generated from non-farm activities can be plowed back to agriculture with an effect of increasing agricultural productivity (Sefiager, 2013). But, this research hypothesized that participation in off-farm/non-farm activity would be positively associated with household participation in rural microfinance credit program.

Distance to the market center: proximity to market centers creates access to additional income by providing non-farm employment opportunities, and easy access to inputs and transportation of farm outputs. It will measured by the number of kilometers covered by the respondents to access the market…It is, therefore, expected that households nearer to market center have better chance to improve household income than others. Location further away from the market significantly reduced the marginal probability of participating (Owuor, 2009). Proximity to market centers was expected to have positive relationship with household income.

Summary of Variables

Table 2. List of Variables

Dependent Variable	Variable Type	Level of Measurement	Hypothesized Relationship
Participation in OCSSCO credit program	Dummy	1 for Credit user, 0 otherwise	
Outcome Variables			
Total Annual Income	Continuous	Income of the household	
Calorie intake /AE/Day	Continuous	Total calorie intake of the household per AE per Day.	

Independent (Explanatory) Variables			
Age of the Household Head	Continuous	Age of the Household Head	(-)
Sex of the household head	Dummy	Gender of the Household Head	(+)
Educational Status of the Household Head	Discrete	Years of formal Schooling	(+)
Family size in AE	Continuous	family members taken in AE	(+)
Dependency ratio in AE	Continuous	Ratio of Dependents in AE to independents in AE	(-)
Agricultural land holding	Continuous	Hectare of land holding	(+/-)
Total livestock holding	Continuous	Livestock holding in TLU	(-)
Distance to market center	Continuous	Distance measured in kilometers from household to the nearest market center	(+)
Extension contact	Discrete	The number of visits by DA	(+)
Participation in Off-farm/non-farm Activities	Dummy	1 if participated in off/non-farm activities and 0 otherwise	(+)

4. RESULT AND DISCUSSION

The results of the study are presented and discussed in this chapter. The first section presents result of the descriptive and inferential statistical analysis. The second section deals with the discussion of the propensity score matching (PSM) model outputs.

4.1. Descriptive Statistics

Different descriptive statistics were applied on the socioeconomic and demographic data of the households to inform the subsequent empirical data analysis. In Table 1, the number of sampled household's distribution in the different peasant associations were presented. Then in Table 2, the frequency and percentage of the sample household characteristics and comparison of the two groups in terms of the characteristics are presented. In addition, in Table 3, the means and standard deviations of sample household characteristics and comparison of the two groups in terms of these characteristics are presented. The descriptive results also show that there were statistically significant differences between credit users and non-user households in some of the characteristics.

As already discussed in the previous chapter a total of 180 households were selected for the survey, from which 82 (45.6%) credit user households belong to the four rural *Kebeles* and the remaining were non-user households belong to the same rural *Kebeles* of *Kurfa Chele Woreda* (Table 1).

4.1.1. Descriptive Statistics of categorical variables

The survey result showed that out of the total sampled households, 90.6% were male headed and the remaining were female headed households (Table 3). With regard to the sex composition across the treatment and control groups 90.0% and 91.0% of the Credit users (treatment) and non-users (control) groups respectively were male headed households. The result of the chi-squared test for the sex composition across the treatment and control groups was statistically insignificant (χ^2= 0.041). This clearly implies there was similar sex distribution among the two comparison groups.

As can be observed in Table 3, from the total sampled respondents 75.6% of them did not participate in off-farm activities to generate some income for the household but the rest 24.4% of the respondents reported that they participated in off-farm activities to earn some money. Moreover, out of the 82 credit users (treatment) and 98 non-users (control) groups 78.05%

and 73.5% of them did not participate in off-farm activities respectively. However, the remaining treatment and control groups responded that they participated in off-farm activities. In relation to the extension contact between the sample respondents and the development agents, majority of the sampled respondents 94.4% of them reported they had extension advice, but the remaining 5.6% respondents reported they had no extension advice in association with either credit or any other agricultural activities. As can be observed in Table 3, of the treatment group 92.7% and from the control groups 95.9% had the extension advice whereas, 7.3% of the credit users and 4.1% of non-user households didn't get extension advice. There was also statistically insignificant difference between the treatment and control groups with regard to extension advice from the development agents (χ^2= 0.139). The result obtained hear seems there was no difference in extension advice provision among the treated and control groups in the study *woreda*.

It is evident from Table 4, on the five point likert scale majority of the respondents 71.7% reported they benefited from the extension advice forwarded by the Development Agent (DA) in their locality. Additionally, 22.2% of the respondents strongly agreed on the usefulness of the extension advice related to credit and saving, farming practice and marketing activities (Table 4). This result showed intensified activities should be done in areas of training and workshops targeted to credit and saving, income generating activities and making advisory coupled with follow-ups of more remunerative activities.

Table 3. Socioeconomic and demographic categorical variables

Categorical Variables	Total households N= 180		Credit Users N= 82		Non-Users N= 98		χ^2-test
	Freq	Percent	Freq	Percent	Freq	Percent	
Sex of household head							
Female	17	9.4	8	10	9	9	0.041
Male	163	90.6	72	90	91	91	
Participation in Off-farm activities							
Yes	44	24.4	18	21.95	26	26.5	0.279
No	136	75.6	64	78.05	72	73.5	
Extension Contact							
Yes	170	94.4	76	92.7	94	95.9	0.139
No	10	5.6	6	7.3	4	4.1	
Voluntary saving							
Yes	53	29.4	52	63.4	1	1.02	51.85***
No	127	70.6	30	36.6	97	98.98	

Source: own survey result, 2017.

*** means significant at 1% probability levels.

While looking at the issue of voluntary saving from the responses summarized in Table 3, majority of the sampled respondents 70.6% reported that they do not have voluntary saving, out of which 36.6% are credit users and 98.98% are non-user households. Contrary to this, 29.4% of the total households have voluntary savings, this figure was comprised of 63.4% Credit users (treatment) and 1.02% of non-users (control) groups. It is also evident that the chi-square test proved there is a statistical significant difference in voluntarily saving habits between the two (treatment and control) groups at 1% significance level (χ^2= 51.85). The result indicate that the program has contribution for voluntary saving practice.

In support of this on the five point likert scale made to measure the perception of respondents in association to different trainings, majority of the respondents 40.6% were found to agree that trainings given on general and specific issues of credit and saving was helpful. Additionally, other 35% of the respondents strongly agreed on the importance of training and support in taking credit, how it can be used, and the benefits of saving and related issues (Table 4).

Table 4. Communities' perception related to training and advisory support

Perception Indicators of Trainings	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Do you think extension advice will be helpful	0.6%	1.1%	4.4%	71.7%	22.2%
Do you think training on credit and saving will be helpful	-	1.1%	23.3%	40.6%	35.0%

Source: own survey result, 2017.

4.1.2. Descriptive Statistics of Continuous Variables

The respondents in the study area, as summarized in Table 5, reported that the average age of the total respondent household heads was 38.53 years with a standard deviation of 9.43, that is, the credit user (treatment) households average age was 40.5 years having a standard deviation of 9.97 and the non-user (control) households was 36.88 years with a standard deviation of 8.66. It was also proved from the t-test that there was a statistically significant difference in the average age between the two groups (t = -2.61) at 5% significance level. This clearly indicates that elder household heads participated better than younger household heads. This means the result shows age have direct relationship with participation in a program.

The mean educational level of the total respondent households was 2.62 years having a standard deviation of 3.69 (Table 5). With this regard the average educational level in years of schooling for the treatment group (Credit users) was found to be 2.11 years of education with a standard deviation of 3.22 and this figure was found to be 3.04 years on average with a standard deviation of 4.01 respectively for the control groups (Non-user) households. The statistical t-test for the existence of the difference in the average educational level between the two groups was proved to be statistically significant in the average educational in the two groups (1.69) at 5% significance level. As observed, the average educational level of the credit users appears lower than those of the non-users since there are more educated household heads in the non-user group.

The average family size in Adult Equivalent (AE) of the total respondents was 4.33 AE having a standard deviation of 1.49 (Table 5). With respect to comparing the family size between the

treatment and control groups the average family size of the Credit user and non-users was found to be 4.65 and 4.06 AE with standard deviations of 1.62 and 1.33 respectively. The t-test confirmed a statistical significant mean difference in the average family size between the two groups (t = -2.64) at 1% significance level. This clearly indicates the households with greater number of family size in units of AE belong to the credit user group and this is evidence that participating in credit program is affected by family size.

The average value of the dependency ratio of the total respondents was be 2.66 dependents in AE having a 2.09 standard deviation. For the credit user (treatment) group this figure was found to be 2.81 dependents in AE with a standard deviation of 2.31. Similarly, for the non-users (control) groups the average dependency ratio was 2.52 dependents in AE with a standard deviation of 1.90. While testing for the existence of mean difference in dependency ratio, the t-test (t = -0.92) confirmed there was no statistically significant mean difference in dependency ratio measured in terms of AE (Table 5). As can be observed the average dependency ratio of the credit user group appears higher than the non-users, even though not significant, meaning there are more child and old age dependents to the working age within the household.

The land holding was measured in Hectare (Ha) for the total respondent households was found to be 0.39 Ha on average with a standard deviation of 0.23. However, for credit users (treatment) group the average land holding was 0.45 Ha with a standard deviation of 0.28 and for the non-users (control) group the mean land holding was 0.35 Ha with standard deviation of 0.17. While comparing the mean land holding across the treatment and control groups, it was confirmed out from the t-test (t= -3.13) that a statistically significant mean difference exists in the average land holdings at 1% significance level. This clearly indicates the significantly higher land holding of the credit-user households can be used for cropping, grazing or other purposes that in turn affects the household economy than the non-user groups.

Average farming experience of the total sampled household was found to be 18.53 years with a standard deviation of 9.60. The mean farming experience was 19.62 years for credit user households and 17.62 years for non-user households having standard deviations of 10.61and

8.61 respectively. The statistical test for measuring the existence of mean difference in farming experience t-test (t = -1.40) also confirmed a statistically insignificant mean difference in the farming experiences between the two groups (Table 5). A higher average years of farming experience in credit users group was observed than the non-user households. This affects the decision whether to participate or not in a credit program, how to allocate the credit obtained and which areas are more remunerative.

The livestock holding of the total respondent households, reflects the livestock owned by the sampled respondents measured in the standardized measurement unit called Tropical Livestock Unit (TLU) it was found to be 2.33 TLU with standard deviation of 1.62. The number of livestock owned by the treatment (credit user) households was found to be 2.51 TLU on average having standard deviation of 1.75 while this figure was 2.19 TLU with the standard deviation of 1.51 for non- users. There was also an insignificant statistical mean difference on the average livestock holding between the treatment and control groups as can be observed from the t-test value (t = -1.32) (Table 5). The higher average livestock holding of the credit users than the non-users might be attributed to the credit program.

The annual income in this study computed to be the sum of income from crop sell, animal sell, animal products sell and non/off farm activities of the respondent households in the production year was found to be 7321.5 Birr on average having a standard deviation of 6091.8 for the total households. But the mean annual income of the credit users and non-user for the households was found to be 8856.7 Birr and 6037.1 Birr with standard deviations of 7546.1 and 4156.0 respectively. The statistical t-test (t = -3.17) also confirmed that there was a significant mean difference in the annual income between the two (treatment and control) group households (Table 5). This result was found to be in-line with the expectation of the study that, the credit user households had a significantly greater average annual income than the non-users and this might be attributed to the participation in the credit program.

Table 5. Socioeconomic and demographic continuous variables

Continuous variables	Total households N= 180		Credit Users N= 82		Non-Users N= 98		
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	T-test
Age (Yrs)	38.53	9.43	40.50	9.97	36.88	8.66	-2.61**
Year of education	2.62	3.69	2.11	3.22	3.04	4.01	1.69**
Family Size (AE)	4.33	1.49	4.65	1.62	4.06	1.33	-2.64**
Dependency Ratio (AE)	2.66	2.09	2.81	2.31	2.52	1.90	-0.92
Land Holding (Ha)	0.39	0.23	0.45	0.28	0.35	0.17	-3.13***
Farming Experience (Yrs)	18.53	9.60	19.62	10.61	17.62	8.61	-1.40
Livestock Holding (TLU)	2.33	1.62	2.51	1.75	2.19	1.51	-1.32
Annual Income (Birr)	7321.5	6091.8	8856.7	7546.1	6037.1	4156.0	-3.17***
Distance from Market (Km)	5.26	2.05	5.42	2.03	5.13	2.07	-0.94
Calorie Intake/AE/Day	2188.7	1163.7	2197.2	1158.3	2181.6	1174.1	-0.09

Source: own survey result, 2017.

***, and ** means significant at 1%, and 5% probability levels respectively.

The distance of the nearest market center from the respondents' household, was a key factor for generating income from different activities, in buying and selling of goods and services including consumption was also computed to be 5.26 Km on average with standard deviation of 2.05. This figure was found to be 5.42 Km and 5.13 Km among the credit users and non-user households having standard deviations of 2.03 and 2.07 respectively. Even though credit users were found to be closer to the market center. It was observed from the statistical t-test value (t = -0.93) as there was no statistically significant mean difference between the treatment and control groups on the average distance of the household's from the nearest market center (Table 5). This insignificant mean difference in the average market distance

might be because both the credit users and non-user households were selected from the same locality.

The calorie intake of the respondents was calculated by taking into account of the total calories of the food consumed by the household divided to the household size in adult equivalent per each day. Therefore, the mean calorie intake per AE per Day was found to be 2188.7 Kcal per adult equivalent per day having a standard deviation of 1163.7. Whereas, the mean calorie intake for the treatment group was found to be 2197.2 Kcal/AE/Day with standard deviation of 1158.3 but it was found to be 2181.6 Kcal/AE/Day for the control group having standard deviation of 1174.1. Meanwhile, the t-test value confirmed that there was no statistically significant mean difference on the average calorie intake in Kcal/AE/ Day between the treatment (credit users) group and control (non-users) group as it was reported to be (t = -0.09) Table 5. This shows that households in the program were found were very slightly better off in calorie intake. Similar result was also obtained by (Temesgen, 2014). The national level total calorie intake per AE per day was 2200 Kcal as obtained from the survey result (MoFED, 2012) and calorie intake per person per day for Afar, Somali, Gambela, SNNPR, Oromiya, Harari, DireDawa and Benshangul-Gumuz is above the average calorie intake at country level, whereas Tigray and Amhara regional sates average consumption is below the country level average.

4.2. Econometric Model Results

4.2.1. Specification tests

Prior to running PSM different specification tests were conducted. Variance inflation factor (VIF) was applied to test for the presence of strong multicollinearity problem among the explanatory variables (Appendix 4). Multicollinearity problem arises when at least one of the independent variables is a linear combination of the others. There was no explanatory variable dropped off from the estimation model since no serious problem of multicollinearity was detected from the VIF results. As mentioned earlier, the variables included in the model were assumed to affect not only the household's participation in the credit program but also the

outcome of the program, which was households' annual income. Thus, a measure of multicollinearity associated with variance of inflation factor is defined as:

$$VIF\ (X_i) = (1\text{-}R_i^2)^{-1}$$

Where R_i^2 is the multiple correlation coefficients between explanatory variables. The larger the value of R_i^2, the higher the value of VIF (X_i), which causes multicollinearity among the variables (X_i).

The values of VIF for variables were found to be small (*i.e.* VIF values less than 10). Based on the VIF result (ranges between 3.16 and 1.10), it can be concluded that the data set had no serious problem of multicollinearity. As a result, all the explanatory variables were retained and moved to the analysis.

4.2.2. Propensity Score Matching (PSM) estimation results

As already discussed in the previous sections, the aim of using this PSM model was to provide an answer for the counterfactual question "What would have happened to those who had participated in credit program, had they not participated?" which requires observing outcomes of a household with-and-without participation in the Credit program. This section describes the whole process to arrive at the impact of the credit program. It explains the estimation of propensity score matching methods, common support region, balancing test and sensitivity analysis. It also explains the treatment effect of the credit program on the participating households.

4.2.3. Logit model results

This section presents the results of the logistic regression model which was used to estimate propensity scores for matching credit user households with non-user households. As indicated earlier, the dependent variable in this model is a binary variable which refers to whether the household participated in the credit program or not.

The data was first cleared and coded into an SPSS version 20 statistical software and then the model was estimated using STATA version 11.1 computing software using the propensity score matching algorithm. In the estimation procedure, data from the two groups: namely, Credit user and non-user households were pooled in such a way that the dependent variable (Participation in Credit program) takes a value 1 if the household had participated in the program and 0 otherwise.

Table 6 shows the estimation results of the logit model output. The estimated model appears to perform well for our intended matching exercise. The pseudo-R^2 value is 0.067. Low pseudo-R^2 value shows that the allocation of the program has been de facto random (Pradhan and Rawlings, 2002). In other words, a low pseudo-R^2 value means that program households do not have much distinct characteristics overall and as such finding a good match between the program and non-program households becomes easier. The pseudo-R^2 indicates how well the regressors explain the participation probability. After matching there should be no systematic differences in the distribution of covariates between both groups and therefore, the pseudo- R^2 should be fairly low (Caliendo and Kopeinig, 2005).

Table 6. Logit model output

Variables	Coef.	Std. Err.	Z	P>z	Marginal effect
Age of Household Head	-0.014	0.056	-0.24	0.811	-0.003
Sex of Household Head	-0.291	1.224	-0.24	0.812	-0.073
Educational Status	0.062*	0.107	2.58	0.064	0.016
Family Size in AE	0.473*	0.244	1.94	0.053	0.118
Dependency Ratio in AE	-0.172	0.200	-0.86	0.389	-0.043
Voluntary Saving	4.084***	1.418	2.88	0.004	0.715
Land Holding	1.954	1.451	1.35	0.178	0.489
Farming Experience	-0.008	0.047	-0.17	0.867	-0.002
Livestock Holding	-0.075*	0.261	-2.29	0.075	-0.019
Total Income	0.029	0.052	0.68	0.494	0.003
Extension Advice	-2.028**	1.391	-1.76	0.045	-0.398
Participation in Training	5.165***	1.008	5.13	0.001	0.853
Participation in off-farm activities	0.526	0.750	0.70	0.483	0.130

Distance from market Center	0.283	0.174	1.62	0.105	0.071
Calorie Intake/AE/Day	0.020	0.180	0.29	0.773	0.001
_cons	-5.609	2.884	-1.94	0.052	

Dependent Variable = Participation in Credit program

Logistic regression Number of obs = 180

LR chi^2(15) = 167.94 Prob > chi^2 = 0.0000

Log likelihood = -40.084426 Pseudo R^2 = 0.0676

Source: own survey result, 2017.

***, ** and* means significant at 1%, 5% and 10% probability levels, respectively.

Looking into the estimated coefficients, the results indicate that the probability of participating in the credit program is significantly influenced by six explanatory variables. Educational Status, Family Size in AE, Voluntary Saving, Livestock Holding, Extension Advice and Participation in Training were found to have significant relationship with household probability of participation in the program.

Years of education: It was hypothesized that participation in credit program would be affected positively by the educational status of the household head. What was found from the logit model output was that an increase in educational status of the household head by 1 year increases the probability of participating in credit program by a factor of 0.016 positively at 10% significance level. This is because educated people in the study area had benefited the credit program by utilizing the credit to more remunerative activities (Table 6).

Family Size: It was hypothesized that family size of the household would affect participation in credit program positively. It was found out that an increase in the size of the family by 1 Adult Equivalent affected the probability of participation in the credit program positively by a factor of 0.118 at 10% significance level. This can be justified in many ways, probably, it was because the head used the credit for running small business income generating activities, since there was plenty of labor force, or used up the credit to smoothen the family's consumption (Table 6).

Voluntary saving: an increase in voluntary saving of the household by 1 birr increases the probability of participating in rural credit program positively and significantly by a factor of

0.715 at 1% significance level. This was found to be in-line with the universal objective of rural credit and saving program, to promote saving (Table 6).

Livestock holding: It was hypothesized that the livestock holding would affect participation in credit program negatively. What can be observed from the research finding was in line with the hypothesis. That is, an increase in livestock holding by 1 TLU decreases the probability of participating in rural credit program by a factor of 0.019 negatively and significantly at 10% significance level. This was because households with more number of livestock ownership have got greater liquid asset as a result there was no need to participate in rural credit program, probably that household with greater livestock holding may even be illegible to the program because of having greater asset holding (Table 6).

Extension advice: It was hypothesized that extension advice measured interms of the number of contacts with the development agent would positively influence households' decision to participating in microfinance credit program and outcome variables. But what was obtained from the logit model result was the extension advice was negatively influencing the probability of participating in rural credit program. That is an increase in number of advice contacts b/n the development agent and the farmer household by 1 contact decreases the probability of participation in credit program by a factor of 0.398 negatively and significantly at 5% significance level. This could be justified as the extension advice was dominated by other issues other than credit and saving importance like farm inputs, loan repayment, post-harvesting and related agendas (Table 6).

Participation in training: It was hypothesized that participation in trainings associated with credit and saving positively affect participation in rural microfinance credit program. The research finding obtained from the logit model output was also the same. The result of this study also suggested that being participant in training would increase the probability of participating in rural credit program positively by a factor of 0.853 at 1% significance level. This shows that it is always of immense importance to deploy awareness creation trainings, follow ups and supports in association to credit and saving (Table 6).

4.2.4. Propensity scores

As stated before, three main tasks should be accomplished, before one launches the matching task itself. First, predicted values of program participation (propensity scores) should be estimated for all households in the program and outside the program. Second, a common support condition should be imposed on the propensity score distributions of household with and without the program. Third, observations whose predicted propensity scores fall outside the range of the common support region are discarded.

As shown in Table 7, the estimated propensity scores vary between 0.0415 and 0.9997 (mean=0.8425) for Credit or treated households and between 0.0014 and 0.9526 (mean=0.1318) for non-user or control households. The common support region would then lie between 0.03 and 0.97. In other words, households whose estimated propensity scores are less than 0.0415 and larger than 0.9526 not considered for the matching exercise.

Table 7. Distribution of estimated propensity scores

Group	Obs	Mean	Std. Dev.	Min	Max
Total households	180	0.4556	0.4243	0.0014	0.9997
Credit Users	82	0.8425	0.2460	0.0415	0.9997
Non-Users	98	0.1318	0.2218	0.0014	0.9526

Source: own survey result, 2017.

4.2.5. Matching estimators of the model

Alternative matching estimators were tried in matching the program treated and control households in the common support region. The final choice of a matching estimator was guided by different criteria such as equal means test referred to as the balancing test (Dehejia and Wahba, 2002), pseudo-R^2 and matched sample size. Specifically, a matching estimator which balances all explanatory variables (*i.e.*, results in insignificant mean differences between the two groups), bears a low pseudo-R^2 value and also results in large matched sample size is preferable.

Table 8. Performance of matching estimators

Matching Estimator	Performance criteria		
	No. of variables with insignificant mean difference	Pseudo-R 2	Matched sample size
Nearest Neighbor Matching			
Without replacement	10	0.038	115
With replacement	9	0.035	125
Radius caliper Matching			
Caliper (0.01)	10	0.157	109
Caliper (0.25)	10	0.047	128
Kernel Matching			
Band width(0.5)	8	0.07	128
Band width(0.25)	**10**	**0.026**	**128**
Band width(0.1)	10	0.034	128
Band width (0.05)	10	0.07	128

Source: own survey result, 2017.

Table 8 presents the estimated results of tests of matching quality based on the above mentioned performance criteria. First, equal means test (referred to as the balancing test) which suggests that a matching estimator which balances all explanatory variables (*i.e.*, results in insignificant mean differences between the two groups) after matching is preferred. Second, looking into pseudo-R^2 value, the smallest value is preferable. Third, a matching estimator that results in the largest number of matched sample size is preferred. After looking into the results, it was found that Kernel matching with a band width of 0.25 is the best estimator for the data we have. As such, in what follows estimation results and discussion are the direct outcomes of the kernel matching algorithm based on a band width of 0.25, because it satisfied all the three matching performance criteria.

Table 9 below shows the balancing test of covariates, before and after the matching. As the result on the Table shows, program and non-program households were **significantly different in terms of certain characteristics.** However, these differences were removed after matching was conducted.

Table 9. Balancing tests of covariates

Variables	Sample before matching (180)			Sample after matching (180)		
	Treated 82	Control 98	t-test	Treated 82	Control 98	t-test
Age of Household Head	40.5	36.65	3.13***	39.03	38.03	0.44
Sex of Household Head	0.9	0.98	-1.97*	0.87	0.93	-0.81
Educational Status	2.11	0.3	4.55***	1.63	2.14	-0.61
Family Size in AE	4.65	3.88	3.92***	4.39	4.29	0.25
Dependency Ratio in AE	2.81	3.9	-3.89***	3.60	3.61	-0.01
Voluntary saving	0.63	0.65	-0.16	0.03	0.06	-0.44
Land Holding	0.45	0.28	5.35***	0.44	0.35	1.36
Farming Experience	19.62	13.35	4.44***	18.87	17.41	0.53
Livestock Holding	2.51	2.41	0.44	2.20	2.14	0.16
Extension Advice	0.93	0.98	-1.45	0.90	0.91	-0.14
Participation in Training	0.96	1.00	-1.75*	0.90	0.85	0.62
Participation in off-farm activities	0.22	0.05	3.29***	0.23	0.26	-0.25
Distance from market Center	5.42	2.85	8.55***	4.68	4.48	0.33

Source: own survey result 2017.

*** and * means significant at 1% and 10% probability levels, respectively.

4.2.6. The plausibility of the overlap and unconfoundedness assumption

Figures 2 and 3 portray the distribution of estimated propensity scores, with and without the imposition of the common support condition, for Credit User and non-user households, respectively. Most of the program (treatment) households have propensity score around 0.9 whereas a significant number of the non-program (control) households have propensity score less than 0.1.

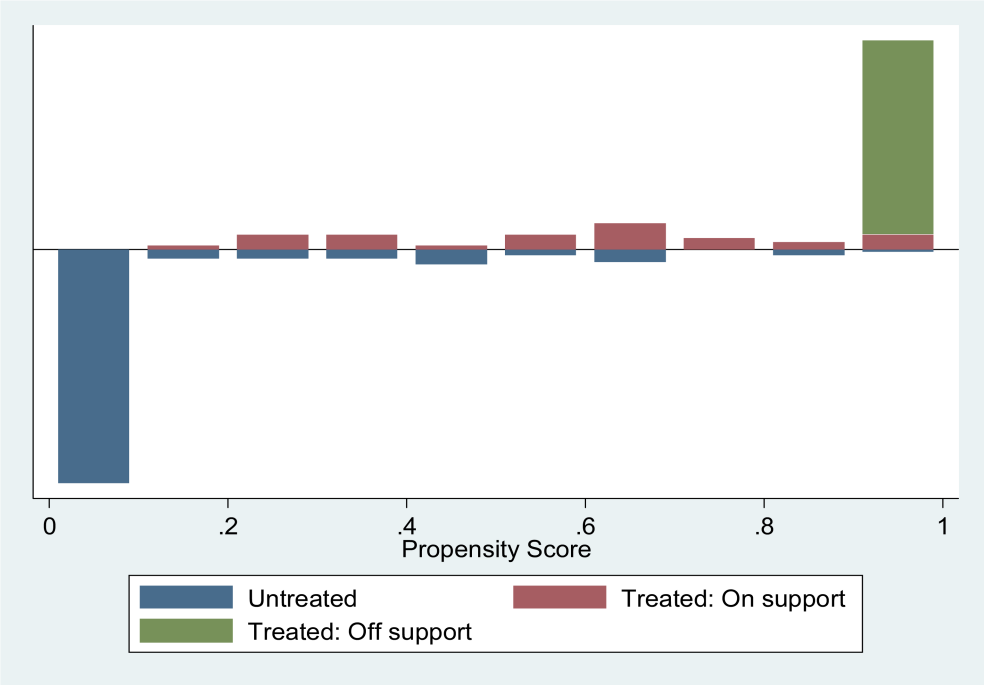


Figure 2. Distribution of propensity scores of beneficiary and non-beneficiary households before common support

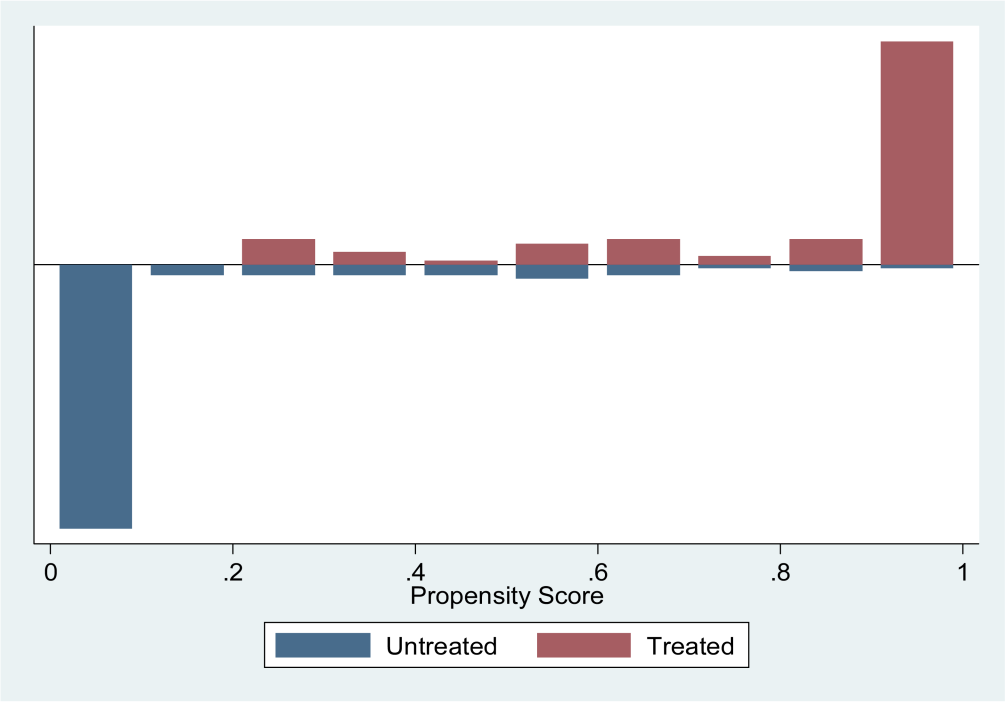


Figure 3. Distribution of propensity scores of treated and untreated households after common support

4.2.7. Treatment effect on the treated

In this sub-section, the study provides evidence as to whether rural credit program has brought significant changes in the annual income and calorie intake/AE/Day of the sampled households. The estimation result presented in Table 10 provides a supportive evidence of statistically significant effects of the program on the household annual income and calorie intake.

After controlling for pre-intervention differences in the characteristics of the Credit User (treatment) and non-User (control) households, it has been found that, participation in the rural credit program has increased the annual income, on average, by 3294.4 Birr. That means, the program has increased the annual income of the participating households by 59.23% what they would have earned in the absence of the program. This mean difference in the average effect of the treatment on the treated between the matched treatment and control groups was also found

to be significant as can be confirmed from t-test value (t = 2.51) at 5% significance level (Table 10). In support of this, Owuor (2009), evaluate the impact of micro-finance credit (MFC) on borrower's productive performance in Kenya and the findings revealed that participation in MFC improved household productive income significantly. At the household level, microfinance services have impacts on household income, income diversification, household assets, education, health, nutrition and copying strategies which are mainly the indirect impacts of increased in household income generated by the microenterprises (Barr,2005; Chames,1992)

Similarly, it was found that, participation in the rural credit program has increased the calorie intake, on average, by 384.8 Kcal/AE/Day. That means, the program has increased the calorie intake of the participating households by more about 21.2% from what they would have consumed in the absence of the program. In line to this, Temesgen (2014) reported that participation in PSNP program has increased physical food consumption of the participating households than the counterpart non-participants at significant level. Study by (Ghaliba, Malki, and Imai 2014), emphases that Pakistani microfinance has positive impact on poverty alleviation which was manifested in household income and expenditure especially in clothing and health. It is possible to infer that the role of OCSSCO in improving food security and income is ballad, this is justified by the focus group discussion made along with clients and the district OCSSCO workers. Therefore, OCSSCO has playing significant role in improving income and food security situation of rural households living in the study area.

Table 10. Average Treatment Effect on the Treated (ATT)

Outcome Variable	Sample	Treated	Controls	ATT	T-stat
Annual Income	Unmatched	8856.7	6037.1	2819.6	3.17***
	Matched	8856.7	5562.2	3294.5	2.51**
Calorie Intake	Unmatched	2197.2	2181.6	15.6	0.09
	Matched	2197.2	1812.5	384.8	3.53***

Source: own survey result 2017.

*** and ** means significant at 1%, and 5% probability levels, respectively.

4.2.8. Testing sensitivity to the specification of the propensity Score

Recently, checking the sensitivity of the estimated results becomes an increasingly important topic in the applied evaluation literatures (Caliendo and Kopeining, 2008). In a non-randomized study, the results could reflect the effects of unknown or unmeasured confounders. Hidden biases must be addressed by other means such as sensitivity analysis. A sensitivity analysis determines the magnitude of a potential unmeasured confounder that could erase the observed association or would need to be present to materially alter the conclusions of a study.

Sensitivity analysis was carried out on the estimated average treatment effect using alternative matching estimators, as shown in Table 11. All the matching estimators resulted in statistically significant effects of the program on calorie intake and total annual income for the participating households. Thus, we can conclude that **our impact estimates** (ATT) were insensitive to the unobserved selection bias.

Table 11. Sensitivity analysis

Variable	Matching Method	Treated	Controls	ATT	t-value
Annual Income	NN	8763.56	5465.58	3297.9	3.16***
	Caliper	7994.7	5187.3	2807.4	2.94***
	Kernel	8856.7	5562.2	3294.5	2.51***
Calorie Intake	NN	2041.5	1675.4	366.1	1.54*

Caliper	2182.0	1767.4	414.6	2.36***
Kernel	2197.2	1812.5	384.8	3.53***

Source: own survey result, 2017.

*** and* means significant at 1% and 10% probability levels, respectively.

5. SUMMARY, CONCLUSION AND RECOMMENDATION

5.1. Summary and Conclusion

The study was conducted in Kurfa Chele *Woreda* of East Hararghe Zone, Oromia Regional State to assess impacts of rural credit on household's food security and income. The main research question of the study was "what would have happened to those who had participated in Credit program, had they not been participated in the program?" Answering this question requires observing outcomes with-and-without the program for the same household. However, it is impossible to observe the same object in two states simultaneously. In other words, the fundamental problem in any social program evaluation is the missing data problem. While the program evaluator observes the factual for an object, it is impossible to observe the counterfactual for the same object. Therefore, this study has used propensity score matching method to address the main research question of this study.

A multistage sampling method was used to select sample households to be interviewed. In the first stage Kurfa Chele *woreda* was selected as the study area purposively because first Kurfa Chele was one of the drought affected, chronically food insecure *woreda* in East Hararghe zone of Oromia region. Secondly due to the researcher knowledge about the area since OCSSCO had started providing the service. Thirdly the *woreda* has become known by animal fattening (oxen and goat) and trading activities. Fourthly large number of the program clients borrowed loan for trading purpose. Out of 20 *kebeles* found in the *woreda* 16 *kebeles* were stratified and after stratification, 4 *kebeles* were selected purposefully. Once the *kebeles* were identified, sample households were selected from each *kebele*. That is, after having the total number of households in sampled *Kebeles*, only 180 households (82 Credit users, beneficiary or treatment households and 98 non-credit user or control households) were selected randomly based on probability proportional to their size. The interviews were conducted with the household members of the sampled households. This study used both primary and secondary data. The primary data were collected mainly from the selected sample households by using

interview schedule, visiting the areas. Secondary data were obtained from different actors like *Woreda* OCSSCO office, *Woreda* agriculture office and NGOs.

The data were analyzed using descriptive analysis, inferential statistical tools and an econometric PSM (Propensity Score Matching) model were also employed.

As expected, participation in the rural credit program was affected by multiple factors. The probability of households participating in the program is significantly influenced by six explanatory variables. Educational Status, Family Size in AE, Voluntary Saving and Participation in Training were having positive and significant relationship with household probability of participation in the program. Whereas, Livestock Holding and Extension Advice were found to have negative and significant relationship with household probability of participation in the program.

Finding a reliable estimate of the program impact necessitates controlling for all other pre-intervention factors adequately. In doing so, propensity score matching has resulted in 82 program households to be matched with 98 non-program households. In other words, a matched comparison of calorie intake and annual income outcomes were performed on these households who have shared similar pre-intervention characteristics except the program. The resulting matches passed a variety of matching quality tests and were found fit to answer the study's main objectives.

After controlling for other characteristics, program participation has brought significant positive impact on participating households: annual income was raised by more than 59% and the calorie intake was also increased by more than 21%.

The sensitivity analysis was carried out on the estimated average treatment effect using alternative matching estimators. All the matching estimators resulted in statistically significant effects of the program on participating households. Therefore, it can be concluded that the impact estimates ATT are insensitive to unobserved selection bias.

5.2. Recommendations

Based on the empirical findings of this study, the following recommendations were forwarded:

As participation into the program was positively influenced by educational status of the household head, it would be good to crosslink households with higher educational status with those beneficiaries that have minimal understanding of credit and saving. This would improve the group performance in all financial activities like raising their income, allocating the credit on a more remunerative activity and pay it back on due date.

Since the family size in AE had significant and positive impact on the probability of participating in rural credit program, it would be better to select households with greater number of working age. This guarantees having greater task-force for participating in diversified income generating activities and financial performance. This is justified by participants FGDs. The program participants stated that although OCSSCO credit was given for a household member, more than one family members were using the credit for petty trading activities in the program participants' household. Similarly, In-depth interview participant (Fatuma), said she has doing petty trade with her daughter by the loan she borrowed from OCSSCO. This indicates how the program credit uses for household family members.

Greater emphasis should also be given to the saving behavior of the program beneficiaries in subsequent credit and saving activities. This is because voluntary saving has significant and positive effect on probability of participating in the program. Since this is one of the greatest program objectives, emphasizing on saving behavior of program participants is logical.

In the selection criteria of participating households, it should be wise to consider the main reason for taking the credit for those households with greater number of livestock, this is because of the significant negative influence in the probability of participating in the credit program. This shows clearly the need for better consultation and follow-ups with credit user

households with greater number of livestock. Investing the credit on predetermined business may mitigate households from selling their livestock for loan repayment purpose.

Enhancing the effectiveness of this credit program through the management systems, staffing, human resource development, and equipment in addition to

Existence of knowledgeable and skillful development workers are very crucial to enjoy expected results from the program. Development workers must have the skills and knowledge to carry out their tasks efficiently. They also need access to work in an environment that enables them to carry out their jobs. For Development workers to be effective their responsibilities and areas of accountability must be well articulated and their performance routinely monitored against the work he/she has done.

Since development workers are experts that make things happen in the field, and since they are very close to the rural households, special attention, incentives and benefits should be provided in order to motivate them on the course of filed activities. The development workers need to be up-to-date with the recent developments and approaches in the credit program. Regular training also ensure that experts have the knowledge and skills to carry out their work.

It was found out a series of trainings must be given to raise the awareness and how to perform in this credit and saving program, how to utilize the credit taken and different advices is also crucial for credit users. That is, the credit giver should arrange and facilitate trainings to development workers to improve their knowledge and communication skills for better program performance.

Finally, from the results of the ATT, the program brought up a significant and positive impact on the treatment or credit-users total annual income and also on the participant's household calorie intake per AE per day. Therefore, it is recommended that the credit program should expand its outreach and incorporate additional components to credit and saving service like availing entrepreneurs and financial management trainings. It's also possible to arrange marketing activities in association with other cooperatives.

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7. APPENDICES

Appendix 1. Conversion factor of livestock number into Tropical Livestock Unit (TLU)

Animal	Conversion Factor used for	
	Young	Adult
Cow	0.34	1
Ox	0.75	1
Camel		1.25
Sheep	0.06	0.13
Goats	0.06	0.13
Donkey	0.35	0.7
Horse	0.8	1.1
Mule	0.8	1.1
Poultry		0.013

Source: ILCA, 1993 in Freedman *et al.*, 1996

Appendix 2. Conversion factor for adult equivalent (AE)

Age group	Male	Female
< 10	0.6	0.6

10-13	0.9	0.8
>13	1	0.75

Source: Storck *et al*., 1991

Appendix 3. Conversion factor for computing calorie intake

Food item	Unit	Calorie	Food item	Unit	Calorie
Wheat	Kg	3574	Beef	Kg	1148
Teff	Kg	3589	Milk	Litter	737
Barely	Kg	3723	Butter	Kg	7363
Lentil	Kg	3522	Egg	No	61
Horse bean	Kg	3514	Honey	Kg	3605
Sorghum	Kg	3805	Pepper	Kg	933
Peas	Kg	3553	Maize	Kg	3560
Vetch	Kg	3470	Millet	Kg	3260
Linseed	Kg	5109	Check pea	Kg	3630
Sugar	Kg	3850	Garlic	Kg	118
Coffee	Kg	1103	Edible Oil	Litter	8964

Source: EHNRI, 2000

Appendix 4. Variance Inflation Factor (VIF) of explanatory variables

Variables	VIF	1/VIF
Age of Household Head	3.16	0.316
Farming Experience	2.73	0.367
Voluntary Saving	1.90	0.525
Participation in Training	1.83	0.547
Calorie Intake/AE/Day	1.75	0.571
Dependency Ratio in AE	1.73	0.579
Total Income	1.71	0.584
Distance from market Center	1.61	0.621
Livestock Holding	1.56	0.640
Educational Status	1.56	0.640
Family Size in AE	1.52	0.659
Sex of Household Head	1.20	0.837
Land Holding	1.17	0.856
Extension Advice	1.13	0.888
Participation IN off farm activities	1.10	0.907
Mean VIF	1.71	

Source: own survey result 2017.

Robust standard errors were estimated to tackle heteroscedasticity problem in the data.

Appendix 5. SAMPLE INTERVIEW SCHEDULE

Date of interview_____

Identification Number (code) _____

Name of the enumerator_____

Name of Peasant Association _____

I. Demographic Information

1. Name of HH Head _____ **2.** Age _____

3. Sex 1. Male 2. Female

4. Marital status of household head?

1. Single 2. Married 3. Divorced 4. Widowed

5. What is the level of formal education completed by the household head?

Grade level attained_____

6. Family members

No	Name of household member	Relation with the household head	Sex: Male or Female	Age in Years
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				

II. Access to Credit Services

1. Do you participate in Oromia Credit and Saving Share Company (OCSSC) Credit program?

(Have you taken credit) 1=Yes 0= No

2. If No to Q1, what was the reason? 1) No access 2) No collateral 3) Problem of the eligibility criterion 4) No need for credit 5) Others, specify _____

(if your answer to Q1. is Yes, answer Q3-7)

3. What was/were the other credit source/s from which you usually borrow money?

1) Cooperatives 2) Micro Finance Institutions 3) Banks 4) Merchants

5) Friends and relatives 6) Money lenders 7) Others, specify _____

4. How many times you borrowed from OCSSC? _____

Please indicate the size of loan you borrowed, for what purpose utilized, the amount of loan utilized for the particular purpose?

First: Size of loan Birr _____ Purpose _____Utilized Birr_____

Second: Size of loan Birr _____ Purpose _____Utilized Birr_____

Third: Size of loan Birr _____ Purpose _____Utilized Birr_____

Fourth: Size of loan Birr _____ Purpose _____Utilized Birr_____

Fifth: Size of loan Birr _____ Purpose _____Utilized Birr_____

5. For what other purposes did you use the credit?

1) Petty trade 2) To buy fertilizer 3) To buy seed 4) To buy oxen 5) To purchase irrigation facilities 6) Livestock raising 7) Consumption 8) Others, specify _____

6. With how much interest rate you have taken the credit? _____

7. Have you paid back your loan on due date? 1= Yes 0= No

8. If No to Q7, why did you not pay full?

1) Due to insufficient return 2) Lenders do not collect on time

3) Others specify _____

9. How long is the lone repayment period? _____

10. Is the lone repayment period enough for you to payback the credit? Yes= 1; No= 0

11. Do you have voluntary savings in OCSSC? Yes= 1; No= 0

12. How much money you saved _____

13. If yes to Q9, what are the attractive features of OCSSC saving facilities? (One or more answers are possible)_____

1. Interest rate is good 3. Convenient to make deposit and withdrawal since it's near by
2. Offers a safe way of holding savings 4. Others (specify) _____

14. If you have no voluntary savings with OCSSC what is/ are the reason/s? _____

1. Unable to save 2. Interest rate too low
3. Prefer to save in saving and credit cooperatives etc. 4. Prefer to save in bank
5. Prefer to save in kind (livestock, etc.) 6. Difficult to withdraw savings from OCSSC
7. My savings with OCSSC may be used for settling the group's loan
8. OCSSC does not give enough encouragement to save
9. Don't trust OCSSC with my savings (not sure about the safety of deposits in OCSSC)
10. Other, (please specify) _____

15. Do you have any personal cash savings other than with OCSSC? (Yes =1; No= 0)___

16. If yes, please tell us with which one the following

1. Relatives/ friends 4 At home
2. In a bank 5. Other(Specify)_____
3. Other development programs *e.g.* cooperatives

III. Farm Size and Farming Practice

1. Total farm size of the household: _____ kindi (1/8 ha)

1.1. Total cultivated land: _____Kindi

1.1.1. Annuals crops: _____ kindi

1.1.2. Perennials crops: _____ Kindi

1.2. Grazing land: _____ Kindi 1.3. Fallow land: _____ kindi

1.4. Forest land: _____Kindi 1.5. Other, specify: _____kindi

2. Which type of crop you have been producing dominantly? 1= Cash crops 0 = Non cash crops

3. Which crops you have been producing?

1) Chat 2) Coffee 3) Sorghum 4) Maize 5)Vegetable 6) Others (specify)_____

4. How long have you been in farming in years? _____

5. Did you have labor shortage for crop and livestock farming in 2008 E.C? 1= Yes 0= No

6. If Yes to Q5, how did you solve the shortage? 1) Hiring 2) Support (friends and relatives)

4) Communal labor 5) Other (specify)_____

7. Did you get labor to be hired when you are on demand? 1= Yes 0= No

8. Household's livestock ownership

No	Types of live stock	Number of livestock		Total
		Young	Adult	
1	Cow			
2	Ox			
3	Camel			
4	Sheep			
5	Goats			
6	Donkey			
7	Horse			
8	Mule			
9	Poultry			
10	Other			

IV. Income Source

1. Income gained from sales of livestock and livestock products during 2008 E.C

Item	No. of Animals sold	Total income
Oxen		
Cows		
Heifer		
Calf		
Sheep		
Goats		
Donkey		
Camel		
Chicken and egg		
Milk and milk products		
Others (specify)		
Subtotal- 1		

2. Income gained from annual crop sales during 2008 E. C

Crop	Quantity sold	Total income

Maize		
Sorghum		
Vegetables		
Pepper		
Groundnut		
Sweet potato		
Other (specify)		
Subtotal-2		

3. Income gained from sales of perennial crop during 2008 E.C

Type	**Quantity sold**	**Total income**
Chat		
Coffee		
Banana		
Mango		
Other (specify)		
Subtotal-3		

4. Income gained from nonfarm activity in 2008 E.C

Type of non-farm activity	**Have you ever participated in activity 1=Yes 0= No**	**If yes, Income from each activity in the year 2008**
Petty trade		
Handicraft		
Carpenter		
Weaving		
Remittance		
Others, specify		
Subtotal-4		

5. Income gained from off-farm activity in the year 2008

Type of off farm activity	**Have you ever participated in activity 1=Yes 0= No**	**If yes, Income from each activity in the year 2008**
Daily labor		
Sale of charcoal		
Sale of fire wood		
Sale of grass		
Rent of land & pack animal		
Others, specify		
Subtotal-5		

6. The estimated amount of **yearly total income** of the household last year in birr was: _____

V. Access to Extension Services and Training

1. Have you ever been visited by Development Agent in 2008? _____ 1= Yes 0= No

2. If Yes to Q1, how frequently do you usually discussed with the extension agent?

1) Weekly 2) Monthly 3) Quarterly 4) Semi-annually 5) Annually

6) Arranged on discussion 7) Other time (specify) _____

3. Do you think extension advice will be helpful for you?

1. Strongly disagree 2) Disagree 3) Neutral 4) Agree 5) Strongly agree

4. What was the extension advice?

1) Credit & Saving in OCSSC 2) On income generating activities 3) Farming practices

4) Money allocation 5) Post harvesting 6) Irrigated farming 7) Others (specify)_____

5. Did you get training on credit and saving? _____ 1= Yes 0= No

6. If yes which organization gave you the training?

1) OCSSC 2) Credit and Saving Cooperatives 3) Banks 4) NGO's

5) Others (specify)_____

7. Do you think training on Credit and saving will be helpful for you?

1. Strongly disagree 2) Disagree 3) Neutral 4) Agree 5) Strongly agree

VI. Access to Market

1. How faraway is the nearest market center from your home? _____ Km.

2. How much time do you take to travel the nearest market to sell your agricultural products and buy the necessary items? _____hrs

VII. Income and Consumption

1. From where do you get food for your family?

1. Own produce 2. Purchase 3. Borrow from relatives/neighbors

4. Food aid 5. Gift /share from relatives/ clans 6. Others(specify)_____

2. What type of food item is your family mostly used to eat (staple food)?

1. Sorghum 2. Maize 3. Teff 4. Milk

5. Wheat 6. Barely 7. Others(specify)_____

3. How many meals per day did your household eat in the last two weeks?

1. Once 2. Twice 3. Three times

4. As obtained 5. More than 3 times

4. Do you tell us the food consumption in your family of the last two weeks?

Food items consumed for the last two weeks	Unit	Quantity	Unit market price (ETB)	Total value (Birr)	1. Own 2. Gift 3. Aid 4. Loan 5. Purchased
Teff					
Maize					
Sorghum					
Wheat					
Barely					
Peas					
Beans					
Chickpea					
Millet					
Lentils					
Milk					

Butter					
Beef					
Egg					
Coffee					
Honey					
Sugar					
Oil					
Pepper					

5. Do you tell us the non-food consumption items in your family for the last two weeks?

Non-Food items consumed for the last two weeks	**Unit**	**Unit market price**	**Quantity**	**Total value (Birr)**
Clothes for the HH members				
Kitchen equipment				
Furniture				
Charcoal				
Fuel wood				
Kerosene				
Sop/omo				
Building materials				
Ceremonial expenses				
Social obligation like *Afosha*				
Donation to religious inst.				
Taxes				
Water fee				
Medical expenses				
School fee				
Transport expenses				
Drinks				
Rents				
Farm implements				
Farm oxen				
Animal feed, veterinary service, labor cost etc				
Chat				
Labor for any farm operation				
Others				

6. Household Change in Living Condition, Food Security Indicators and Coping with Difficulties/Shocks

Over the past five years: please answer 'A' to 'M' using the following codes.

(1= decreased greatly; 2= decreased; 3= stayed the same; 4= increased, 5= increased greatly)

A. Has living standard /livelihood of the household changed? _____

B. Has the total income of the household changed? _____

C. Have productive assets (farm implement) of the household changed? _____

D. Have the household durable assets (capital goods, bed, etc.) of the household changed? _____

E. Has quality of food (nutritious food) consumption of the household changed? _____

F. Has quantity of food consumption of the household changed? _____

G. Has consumption of basic non-food item of the household changed? _____

H. Has the clothing of the household changed? _____

I. Has the health of the household members changed? _____

J. Has housing condition (major repair, corrugated iron roof, additional room construction) changed? _____

K. Has household's participation in community development programs changed? _____

L. Has the household's access to drinking water changed? _____

M. Has the involvement of female members in income generating activities changed? _____

7. What are the reasons for **positive changes** in the living conditions; if the answer for **6 - A** is 4 or 5? (One or more answers are possible, do not read answers, probe) __

1. Credit from OCSSC
2. Credit other than OCSSC (NGO, government, relatives)
3. Credit from private moneylenders
4. Additional employment in wage work and increase in wage rate
5. Engaged in new income generating self-employment
6. More involvement in livestock activities such as dairy, shoats, poultry and apiculture
7. More involvement in vegetable and fruit production
8. Additional investment in agriculture (purchase of oxen, farm implement)
9. Use of improved agricultural practices (fertilizer, improved seeds, pesticides, irrigation, extension advice, etc.)

10. Access to more land (renting, share cropping, inherited)
11. More labor power in the household
12. Food for work and other relief aid
13. Remittances
14. Inheritance other than land
15. Credit from merchants either in kind or cash
16. Good agriculture season
17. Sold in new markets
18. Increase in demand/ sales
19. Others (specify) _____

8. What are the reasons for **decrease/negative change** in living condition; if the answer to **6 - A** is 1or 2? (One or more answers are possible do not read answers, probe) ____

1. Indebted because of OCSSC credit
2. I have been sick
3. Natural disaster (drought, flood, hailstorm)
4. Poor agricultural season
5. Poor sales
6. Could not get credit
7. Less land
8. I do not have land
9. House members being sick
10. Others (specify) _____

Appendix 6. Sample Focus Group Discussion checklist

Name of Peasant Association: _____

FGD members: _____Male:_____ Female: _____

Date: _____

1. What do you think is/are the advantages and disadvantages in credit and saving service?
2. What is/are the success stories do you know from credit user clients in your area?
3. What is/are the challenging rules and regulations practiced on credit and saving by OCSSC?
4. What kind of training do you need in association with credit and saving?
5. What do you think is best way for credit and saving service utilization?

6. What do you do with the credit you have received from OCSSC?
7. What is/are the reasons for taking or not taking credit from OCSSC?
8. What are the reasons for saving or not saving in OCSSC?
9. What kind of businesses do clients run with the credit they obtained from OCSSC?
10. Do you think there is problem of food security and how do you tackle it with the credit you obtained?

Appendix 7. Sample Key Informant interview Checklist

Name of organization: _____
Name of interviewee: _____
Position: _____

1. Can you give me a brief overview how you give credit for clients?
2. Are there specific areas on which OCSSC finances with credit?
3. How many households have accessed credit from your OCSSC branch?
4. Do you have eligibility criterion on how to access credit from the OCSSC?

5. What strength and weaknesses does the eligibility criterion have?
6. Do you promote credit and saving service rendered by OCSSC for households?
7. Have you (OCSSC) given training for clients in credit and saving?
8. Please tell me the maximum and minimum amount of credit accessed and also the maximum and minimum savings clients have in 2008 E.C.
9. Please tell me the most frequent and the maximum number of times OCSSC clients have accessed credit?
10. Do you think accessing credit is easy and paying back period is convenient for OCSSC clients?
11. Can you tell me the capacity of OCSSC for how many households it can give credit?
12. How regularly does OCSSC staff monitor client's credit utilization?
13. How do the clients perform in paying back the credit they have taken from OCSSC?
14. What is/are the potential challenges in credit and saving service in OCSSC?
15. What success stories do the clients have with the credit they have accessed from the organization?
16. What weaknesses have you recorded for lessons to be learned for the future?