Determinants of Credit Repayment and Fertilizer Use By Cooperative Members in Ada District, East Shoa Zone, Oromia Region

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Abebe Mijena

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As Thesis research advisor, I hereby certify that I have read and evaluated this Thesis prepared under my guidance by **Abebe Mijena**, Entitled: **Determinants of Credit Repayment and Fertilizer Use by Cooperative Members in Ada District, East Shoa Zone, Oromia Region.** I recommend that it be submitted as fulfilling the Thesis requirement.

Major Advisor	Signature	Date

As members of the Board Examiners of the Final M.Sc Thesis Open Defense Examination, we certify that we have read and evaluated the thesis prepared by **Abebe Mijena** and examined the candidate. We recommend that the thesis be accepted as fulfilling the Thesis requirement for the degree of Master of Science in Agricultural Economics.

Chairperson	Signature	Date
Internal Examiner	Signature	Date
External Examiner	Signature	Date

DEDICATION

This thesis manuscript is dedicated to my father, Mijena Kabeta (may Lord put his soul in peace), my mother Ayantu Ararsa and my brother Miressa Mijena, who had great contribution for the success of my life.

STATEMENT OF AUTHOR

I hereby declare that this thesis is my bonafide work and that all sources of materials used for this thesis have been duly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for an advanced M.Sc degree at the Haramaya University and is deposited at the University Library to be made available to borrowers under the rules of the library. I solemnly declare that this thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma, or certificate.

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LISTS OF ABBREVIATIONS

ADARDO	Ada District Agricultural and Rural Development Office
ADCPO	Ada District Cooperative Promotion Office
AE	Adult Equivalent
CBE	Commercial Bank of Ethiopia
CSA	Central Statistics Authority
DBE	Development Bank of Ethiopia
ESZARDO	East Shoa Zone Agricultural and Rural Development Office
FAO	Food and Agriculture Organization
FCU	Farmers Cooperative Union
FCPC	Federal Cooperative Promotion Commission
FPC	Farmers Primary Cooperative
GDP	Gross Domestic Product
IFDC	International Fertilizer Development Center
Kg	Kilogram
LPM	Linear Probability Model
MOA	Ministry of Agriculture
MPC	Multi Purpose Cooperative
NBE	National Bank of Ethiopia
NGO	Non-Government Organization
OARDB	Oromia Agricultural and Rural Development Bureau
OCPC	Oromia Cooperative Promotion Commission
OFCPB	Oromia Farmers Cooperative Promotion Bureau
OLS	Ordinary Least Squares
Qt	Quintal
ROSCA	Rotating and non-Rotating Savings and Credit Association
SPSS	Statistical Package for Social Sciences
SSA	Sub-Saharan Africa
TLU	Tropical Livestock Unit
VIF	Variance Inflation Factor

BIOGRAPHY

The author was born in west Shewa of Oromia region in 1975. He completed his primary and junior secondary education in Tikur Enchini Primary and Junior Secondary School. He attended his secondary school education at Ambo Comprehensive Secondary School (1990-1993). After passing the Ethiopian School Leaving Certificate Examination (ESLCE), he joined the former Alemaya University of Agriculture in September 1994 and graduated with B.Sc degree in the field of Plant Science in July 1997.

Starting from January 1998 up to December 1998 he served in Amhara Regional State of Oromia Zone in Disaster Prevention and Preparedness office as Junior Agronomist. From January 1999 to 2004 he was transferred to Oromia Regional State, East Shewa Zone Agricultural and Rural Development Office at Woreda and Zonal levels as Junior and Senior Agronomist respectively. From 2005 until he joined Haramaya University for his postgraduate study in 2007 he served as Extension Team Leader at Zonal level. This time he joined Agricultural Economics department by taking preparatory Agricultural Economics courses in addition to the post graduate studies.

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ABSTRACT

The major aim of this study is to empirically examine factors influencing timely credit repayment and input use (especially fertilizer) by smallholder farmers in Ada district of East Shoa zone. Data for this study were collected both from primary and secondary sources during 2009. A two-stage random sampling procedure was adopted to select five agricultural cooperatives and a total of 130 sample respondents from the district. Descriptive and inferential statistics were used to describe socio-economic and institutional characteristics of the respondents which revealed that there is significant mean difference regarding Age, family size, cultivated land size, number of livestock owned, on-farm income, amount of fertilizer used and saving habits. Tobit model was employed to identify factors influencing loan repayment performance of the households. The result of the model showed that family size, livestock ownership, on-farm income, non-farm income and saving habit were the statistically significant factors influencing timely loan repayment performance positively. On the other hand, multiple linear regression model was used to identify the variables that contributed to the amount of fertilizer use among respondents. From a total of 12 explanatory variables included in the model, education level, number of draught oxen owned, cultivated land size, family size and saving habit of the respondents were found to be the most significant variables contributing to the amount of fertilizer use positively, while age of the household head influences it significantly and negatively. Therefore, the study suggests that improving the livestock sector, educating households and their family member, giving attention in promoting non-farm activities in rural areas and promoting saving habit are some of the important priority areas for the success of future intervention strategies aimed at the promotion of production increasing technologies and sustainable credit facilities.

1. INTRODUCTION

1.1. Background

Agriculture is the mainstay of Oromia Regional State from which about 89% of the population earns their livelihood. The largest proportion of the regional GDP is accounted for by agriculture (65%), followed by service (23%), manufacturing (5%) and others (7%). Wheat, maize, teff, barely, sorghum, millet and pulses are the principal crops that are grown under rain-fed agricultural system (OARDB, 2008).

Population is growing at an alarming rate though the scope for expansion of the cultivable land is limited. However, there is a significant room for yield improvement through intensification. Use of appropriate improved technologies by agricultural producers is an essential prerequisite for economic prosperity in less developed countries.

According to IFDC (2005), African countries consume the lower level of input use which is manifested with the 22 kg of fertilizer per ha of arable land in contrast to 89 kg/ha in Latin America and Caribbean and 148 kg/ha in South Asia and Pacific. Sub-Saharan Africa (SSA) countries excluding South Africa, consume only 9 kg/ha. Africa's fertilizer is not only characterized by low level of use by global standards but also by sharp variations between and with in countries. In 2002, fertilizer consumption ranged from 0.31 kg/ha for Central Africa Republic to 437 kg/ha for Egypt (Camara and Heinemann, 2006). The same source reported intensity of fertilizer consumption for Ethiopia as 15.10 kg/ha in 2002.

The average level of fertilizer use in Oromia was 13.5 kg/ha of arable land in 1995, whereas it amounted to 17 kg/ha in 2000. Currently it is pushed to a level of about 24.5 kg/ha, while that of improved seeds is still very low (1.7 kg/ha). Generally, only 45% and 3.7% of the total land under cultivation in the region was covered by chemical fertilizers and improved seeds respectively implying low level of input use, contributing to low productivity.

According to OARDB (2008) in Oromia 7,142,253 hectares of land was covered by different annual crops and 132,031,320 quintals was harvested. This data shows that the yield per hectare has remained extremely low and growth in production is sluggish with an average yield of 18.49 quintals per hectare.

Improvement in the production and productivity of the agricultural sector must be given due weightage in the region and agriculture should be organized on business lines and crop should be grown to maximize farmers' nutritional status and profit. This study gives more emphasis for chemical fertilizers, which is becoming important limiting factors for crop production. Most developed countries have improved their agricultural and economic wellbeing significantly through increased use of modern technology, including improved seeds and application of chemical fertilizers. Dr. Norman Borlang " The Father of the Green Revolution", has called improved seeds "catalysts that ignited the Green Revolution'', and fertilizer the "fuel'' that powers it (Alemayehu *et al.*, 2008).

The participation of the private sector in input marketing (especially fertilizer) has increased since 1991. However, due to different factors, the private sector could not effectively supply the input to all corners of the country and this again call back the government to play a leading role in input provision particularly to make the on-going development program successful (OESPO, 1999). The participation of the government was reflected through the attention given to the establishment of cooperatives so that they participate in input-output markets and serve the rural community at large.

In Oromia there are 3055 multipurpose agricultural cooperatives with members of 1,217,478 of which 1,117,648 are male and 99,830 are female. These agricultural cooperatives have a total capital of 128,253,440 Birr (OCPC, 2008). These multipurpose agricultural cooperatives involve in different activities including input supply, output marketing and provision of credit. These primary cooperatives are grouped and formed cooperative unions which are involved in activities that are not easily accommodated by primary cooperatives both technically and professionally. They are involved in fertilizer importing, supplying of farm machineries such as tractors and combine harvesters which demands huge capital.

The main channels for agricultural input marketing in the region are Farmers Primary Cooperatives (FPC) and their respective Farmers Cooperative Unions (FCU). The primary cooperatives collect and consolidate the demand of their members and submit to their respective Farmers Cooperative Unions. The sources of inputs are identified by OARDB and make the Unions to know, except for fertilizer that is imported from abroad by representative Union. Depending on the request from primary cooperatives, the respective Unions provide the type and amount of input for their member primary cooperatives.

Agricultural input credit is disbursed to farmers through primary cooperatives. Commercial bank against regional government collateral is the main source of fund for the input credit administered by cooperatives. The main reason for the government intervention in the input credit market and the diversion of valuable time of extension workers to credit repayment is due to the lack of good performance of primary cooperatives.

Therefore, a thorough investigation of various aspects of loan defaulters and agricultural input use are of great importance for sustainable input utilization, credit repayment and policy interventions.

1.2. Statement of the Problem

One of the reasons for the persisting food insecurity in the region is the low level and inappropriate use of improved technologies, which acts as a principal barrier to increase farm productivity. Growth in agricultural production in the past was achieved through horizontal expansion. Today, there is little scope for horizontal expansion because of high population density in the region. According to Wolday (2003), with the rapidly expanding population, the average farm size has continuously declined over the years in Ethiopia. The average cultivated area per household declined to less than one hectare in the late 1990s, compared to about two hectares some three decades ago. Future increase in agricultural production could be achieved by intensifying agricultural improved technologies. According to Getahun *et al.* (2000), small-scale farmers manage 96 percent of total cropped land and 90 percent total outputs. Most of these

farmers practice non-improved input intensive and rain fed farming that does not result in high yield.

The total cultivated land in Ada district is 77,932 hectares. The total fertilizer used in Ada district is 31,885 qt. DAP and 22,352.5 qt. Urea in the year 2009, which is by far below the potential of the district (with blank recommendation one quintal DAP and one quintal urea should be used for an hectare of land). Moreover, shortage and late delivery of these inputs, increase in input price, weak credit and extension services, low efficiency of the role of cooperatives in distribution and marketing of inputs and absence of timely input credit repayment could be mentioned as the major constraining factors (ADARDO, 2009).

Thus, improving the marketing and use of inputs from its current low level have to be a priority task to enhance agricultural production and productivity; and enhancement of the role of cooperatives in these activities to make the system sustainable. Most of the multipurpose cooperatives (MPC) established in Oromia region were found to be the single supplier of improved agricultural inputs to their respective members. Starting from demand identification, credit arrangement, transporting, storing, distribution, selling and recovery of credit were made by primary cooperatives. The right quality and quantity of input supply at the right time with right distribution and fair cost supply are decisive factors so that such problems have to be tackled in order to increase farmers' productivity and boost the benefits they gained from their cooperatives.

The seasonal nature of agricultural inputs, its bulkiness, being an imported commodity that require huge amount of hard currency coupled with cooperatives service motive nature, makes input marketing activity the one that needs great management. At the same time, securing credit from financial institutions for purchasing inputs and recovering the extended loans timely from members were posing a great challenge for many of primary cooperatives. In most cases, it becomes beyond the capacity of cooperatives themselves and seeking the assistance of the government offices including the administrative body.

According to OCPC (2008), an amount of birr 1,654,692,221.79 was disbursed for input purchase in the past five years (2003/4 _ 2007/8) and birr 227,337,749.81 remain uncollected. According to this report, Ada district of East Shoa zone has also a significant share from the region.

Therefore, this study aimed at assessing the socio-economic, human capital and institutional factors affecting credit repayment of borrowers and input use that are marketed through primary cooperatives.

1.3. Objectives of the Study

The general objective of the study has to assess the agricultural input credit repayment performance and fertilizer use that was marketed through Primary Farmers Cooperatives in Ada district.

The specific objectives of the study are:

- To identify factors affecting timely input credit repayment performance of borrowers nd
- To identify factors influencing farmer's fertilizer use marketed through primary cooperatives.

1.4. Research Questions

To answer the objectives, the following research questions are taken as key instruments.

- What are the factors that determine agricultural input utilization among farm households?
- What are the benefits gained by members as a result of input provision and credit facilitation through cooperatives?
- What are the major challenges of input provision and credit facilitation through cooperatives?
- What are the factors that are responsible for farmers to defaulting input credit?

1.5. Significance of the Study

The information generated from this study would be useful in the formulation of appropriate policies in the area of credit services and input marketing activities through cooperatives to promote farm households' input utilization and credit repayment thereby shaping the development of smallholder's agriculture. Furthermore, the analysis and identification of factors affecting utilization of inputs is vital in the process of promoting improved input use and enhancing food production as well as food security in the region. This study also provides base line information for further research work and development activities that will benefit the smallholder farmers in the study area.

Agricultural cooperatives have been organized in order to render economic benefits to farmers. They are supposed to increase efficiency of the marketing system and promote agricultural development in the rural sector of the country's economy. Hence, analyzing the benefits and challenges of improved input supply through cooperatives will help policy makers to know which factors to target to improve the livelihood of poor farmers.

1.6. Organization of the Thesis

This thesis constitutes five chapters. In the first and introductory chapter subtopics that are discussed includes, background, statement of the problem, objectives of the study, research question and significance of the study. The second chapter elaborates a review of some theoretical and practical concepts related to agricultural improved inputs use and credit repayment performance marketed through cooperatives. A brief description of the study area and a thorough explanation of the methodologies used for the study are presented in chapter three. The findings of the study are presented in the results and discussions part in chapter four. Finally chapter five deals with the summary and conclusions that are drawn from the study.

2. REVIEW OF LITERATURE

2.1. Credit

2.1.1. Definition

Beckman and Foster (1969) defined credit as the power or ability to obtain goods or services in exchange for a promise to pay for them later. In other words, it is the power or ability to obtain money, through the borrowing process, in return for a promise to repay the obligation in the future. According to these authors, credit represents the actual or prospective debtor's power or ability to affect an exchange by offering his promise for future payment. Credit is necessary in a dynamic economy because of the time that elapses between the production of a good and its ultimate sale and consumption. The risk in extending credit is the probability that future payment by the borrower will not be made. Futurity is thus a basic characteristic of credit and risk is necessarily associated with the time element.

Regarding financial institutions, there are private and governmental organizations, which serve the purpose of accumulating funds from savers and channeling them to individuals, households and businesses, needing credit. Financial institutions are composed of deposit-type institutions-bank and non-bank-contractual saving institutions, personal and business financial companies, government and quasi-government agencies, and miscellaneous lenders. Formal financial institutions can be defined as institutions that are regulated by central bank's supervisory authorities for licensing and credit policy implementation. Formal loans are those disbursed by financial institutions that are set up legally and engaged in the provision of credit and mobilization of savings. In the Ethiopian context, these institutions are regulated and controlled by the National Bank of Ethiopia (NBE). On the contrary, informal loans are those provided by individuals, organizations and institutions that operate outside the legal banking system and control of the National Bank.

According to Bekele (1995), informal credit sources are categorized as commercial (those who lend money on short-term basis to obtain profit) and non-commercial (lenders that generally include friends, relatives and neighbors). Mutual help associations include Iddir, Iqqub, modern cooperatives, NGOs, etc. Informal finance is the one that comprises of all lawful but unregulated activities, such as rotating and non-rotating savings and credit associations (ROSCAs), moneylenders and money collectors and other providers of retail financial services. Default is defined as failure to pay a debt or a loan at the right time. On the contrary, non-default is defined as payment of a debt or a loan at the right time. Hulme (1996) defined credit worthy (synonymous to non-defaulter) borrowers as those who satisfy the entire loan contract conditions and repay their loans without ever going into arrears. Non-credit worthy (defaulters), as opposed to non-defaulters, is those who breach their loan contracts and have repayment problems.

2.1.2. The need for credit

Credit is the key input in every development program; this is particularly true for rural development because so long as sufficient credit is not provided to the development programs of poor sections of the society, the goal of development cannot be achieved. Access to capital in the form of either accumulated savings or a capital market is necessary in financing the adoption of many new agricultural technologies.

Several authors Adams and Graham (1981), FAO (1996), Gonzalez-Vega (1977) and Pischke (1980) have underlined the importance of credit facilities to smallholders of less developed countries. Governments of less developed countries and aid agencies have extended a large amount of money in the form of agricultural loans. The motivation has been the belief that loans are an essential part of various input packages that are prescribed as part of agricultural investment projects designed to introduce modern technologies and thus stimulate change and growth in agriculture.

Kumar *et al.* (1987) indicated that the need for credit in the case of majority of cultivators arises from inadequate savings to finance various activities on their farm. Moreover, while their income

accrues during limited period of the year, their expenses are spread throughout the year. This implies that expenditure on inputs have to be incurred much in advance of the income from resulting outputs. Producers meet these expenditures out of their past savings; and when these savings fall short of the requirement, they borrow. Studies undertaken in Ethiopia show that credit provision to small farmers increases their productivity and improves their standard of living. For instance, Assefa (1987) reported the need for the expansion of rural credit to all areas of the country. Likewise, Berhanu (1993) and Getachew (1993) pointed out the need for agricultural credit to increase productivity and accelerate adoption rates.

Because of high population pressure in rural areas of developing countries like Ethiopia, bringing of additional productive land under cultivation is difficult, implying the need for improving farm level productivity through intensification. This involves the use of improved farm inputs such as fertilizers and selected seeds besides improved tillage and husbandry practices. These inputs are not available on the farm and some farmers are not able to purchase them due to their meager resources. Moreover, most of the commercial inputs are expensive and hence smallholder farmers cannot afford to buy them from their own cash earnings. It is, therefore, generally acknowledged that rural credit can improve smallholder's farm productivity through use of purchased farm inputs.

Generally, credit removes a financial constraint and helps accelerate the use of new technologies, increases productivity, and improves national and personal incomes. In addition, it constitutes an integral part of the process of commercialization of the rural economy and a convenient means of redressing rural poverty (MOA, 1995).

2.1.3. Importance of cooperatives for agricultural input credit delivery

Kelly (2005) explained the importance of farmers' association for an effective delivery of vital services in rural areas. Accordingly, the demand for fertilizer in Sub Saharan Africa as collective action has the capacity to reduce farm-level transaction costs for potential input suppliers and output buyers.

Belay (1998) expressed about financial institutions like Development Bank of Ethiopia (DBE) and Commercial Bank of Ethiopia (CBE) that need collateral and legal group formation for loan processing could reduce administration cost with existence of cooperatives. Given the Bank's existing working conditions, it is much difficult and almost impossible to reach the numerous geographically dispersed farm households individually, thereby he recommended the demand for credit should be accompanied with volunteer group formation so that loan application, processing, acquisition and repayment can be simple and effective. The same author suggested that, in order to qualify for credit service, farmers' cooperatives should be registered under cooperatives law. Capable management, adequate record keeping, reliable market for farm products and efficiency in lending and collection performances are some of the areas of consideration for measuring the viability of cooperatives.

2.2. Fertilizer

2.2.1. Definition and Perception

Any substance that is added to soil to supply one or more plant nutrients and intended to increase plant growth is fertilizer (Cooke, 1972). Fertilizers are substances, which are added to the soil to supplement the soil with those elements required in the nutrition of plants. That means, any material organic or inorganic, natural or synthetic, that furnishes to plants one or more of the chemical elements necessary for normal growth is fertilizer (Berhanu, 2000).

Inorganic fertilizers are usually simple chemical compounds made in a factory or obtained by mining, which supply plant nutrients and are not residues of plant or animal life (Cooke, 1972). Broadly speaking, any chemical compound used for supplying one or more of the essential plant-food elements are chemical fertilizer (Mcvickar, 1970). All fertilizer materials that might be present on the fertilizer market and that are sold within the same trade are called commercial fertilizers (Collings, 1955). In general, chemical fertilizers are inorganic or synthetic materials of a concentrated nature. They contain one or more plant nutrients in easily soluble and quickly available forms (Berhanu, 2000).

2.2.2. Economic Importance and Demand for Fertilizer

One of the major problems that have constrained the development of an economically successful agriculture in developing countries is the poor soil fertility for crop production (Fertilizer Research, 1995). Agricultural production can, of course, be boosted by increasing inputs and/or by introducing modern agricultural technology. That means agricultural growth based on continuous increase in yield requires technological changes. If there are soil fertility constraints, it is difficult to introduce and sustain such technological changes on millions of hectares of cultivated land without growing application of plant nutrients, chemical fertilizers are but one source of plant nutrients (Desai, 1991). However, most of the growth in agricultural production in less developed countries over the last forty years has been due to area expansion and not to yield increase. Consequently, grazing land and considerable forestland have been put under cultivation and has resulted in environmental degradation.

Promotion of fertilizer usage, including the use of governmental subsidies, can be expected to have multiple benefits: growth in agricultural output, increased national food security, increased income in the rural sector, maintenance of soil fertility and structure and the limitation of soil erosion and deforestation as the pressure to utilize more fragile ecosystems is reduced (Mohammed et al., 1994).

Similarly, fertilizer use increases land productivity through yield increase and eases the nutrient constraint to multiple cropping and land development programs. As a result, it relaxes the land constraint. Since the yield increase is proportionately more than the corresponding incremental labour applied, fertilizer use increases labour productivity. As fertilizer production, distribution and consumption increase, backward and forward linkages create additional employment, which is extremely important in labour surplus countries (Mudahar, 1978).

In general, agricultural output can be increased through the expansion of cultivable area or through improving the productivity of available land. With the gradual closing of the land frontier, however, future increase in agricultural output has to depend on increasing the

productivity of land only. One of the crucial inputs to increase the productivity of land is fertilizer (Subramaniyan and Nirmala, 1991).

In the same way, the potential to increase farm production and agricultural growth is achievable, at least in short run, through land use intensification with the help of modern yield-increasing technologies. These technologies include, among other innovations, improved seeds and chemical fertilizers (Teressa and Heidhues, 1998). With the introduction of high yielding varieties of various crops the possibilities of increasing farm yield and profit with intensive use of fertilizers has become financially feasible (Sirohi and Goel, 1972). That means fertilizer is one of the most critical inputs in farming. It can bring about a rapid increase in agricultural production even in the short-run, which is the dire need of a developing country (Dhillon and Sankhayan, 1977).

Therefore, the provision of fertilizer is one of the essential factors, which play a great role in improving agricultural productivity. Agricultural revolution that has occurred in developed countries has led to a great increase in productivity, particularly due to the use of fertilizers (Gashu, 1985). In line with this, the use of inorganic fertilizer has also a significant effect even on local crop varieties in which responses are generally believed to be low (Teressa and Heidhues, 1998).

The wise usage of fertilizer is one of the best investments a farmer can make. That means, with efficient use of fertilizer, the farmer expects a higher return on each unit of money spent on fertilizer (McVickar, 1970). Though, all of the improved farm technologies must be applied together, it is generally true that proper use of fertilizer and high yielding variety seed offer the greatest opportunity for greater and rapid improvement in farm production especially for those small farmers suffering from shortage of capital and seasonal income fluctuations. Thus, investing on fertilizer and high yielding variety seed is more attractive than on fixed assets (Berhanu, 1993).

Profit from fertilizer use generally results from greater yield. For some crops, improvement in quality can make the use of more fertilizer profitable, but generally the pay-off comes from

increased production per ha. The nature of this greater yield, known as the yield response is governed by the well-known principle of diminishing returns. But the knowledge of the maximum physical production range is needed to determine the most profitable use of fertilizer (Nelson, 1968). However, the continuous use of fertilizer depend mainly on its profitability and physical availability at the right time (Dhillon and Sankhayan 1977).

It is a mere fact that fertilizer plays a pivotal role in augmenting crop production. Its importance cannot be over emphasized, especially in a country like Ethiopia, where the plant nutrients are mined for a century and crop production is stagnated as the result. With this fact, the demand for the input is expected to increase from year to year. To obtain the outcome expected from fertilizer use, genuine fertilizer at the required time, place and kind should reach the farmer (Bekele, 2000)

A producer's input demand is derived from the underlying demand for the commodity, which he produces within the given production. Thus the demand for fertilizer can be derived from a given aggregate production function for the agricultural commodities (Dholakia and Majumdar, 1995). Demand for fertilizer is a derived demand, which is influenced, among other things, by (a) the yield response of fertilizer, (b) fertilizer prices and (c) price of the agricultural products. Changes in any one of the above three would affect the demand for fertilizer (Sah and Shah, 1995). In general, fertilizer demand is dependent on various factors like weather condition, supply of the product, credit availability, input price, output price, knowledge and experience of the users (OFCPB, 2000).

2.2.3. Fertilizer Supply

Inputs such as fertilizer, improved seeds and crop protection chemicals are believed to be the most important production boosting factors to attain food self-sufficiency and thereby augment the income of farming households. In view of this, many efforts were made by the government to improve supply and use of fertilizer and other agricultural inputs. As a result, agricultural inputs and extension services have rapidly been expanded in a closely related manner.

Despite the fact that the extension services on the use of improved inputs have started long ago, the level of utilization of this technology by the farmers is still very low. The average fertilizer use during the reference (this study year) period was below 25 kg per hectare (compared to a standard of 100 kg/ha which is the lowest in the world. Generally, only 45% of the total land under cultivation in the region was covered by fertilizer implying low level of input use, contributing to low productivity among other factors. The situation is further aggravated by insufficient supply of other agricultural technologies such as chemicals and farm implements. Therefore, it is extremely important to further promote the use of fertilizer and other inputs to augment production and productivity (OARDB, 2008).

Inputs that are mainly marketed are fertilizers (DAP and Urea). Both of them are imported since they are not produced locally. Therefore, planning of a season's supply must start at least six months in advance if the imports are to be in the country in the right time for distribution and sales. Regarding seasonal consumption as evidenced by annual sales volume, only 15-20 percent of the fertilizer is consumed in the short rainy season (Belg) starting from February through March, while 80 to 85 percent of the average annual sale is consumed during the main season (Meher) starting from June to September.

2.2.4. Fertilizer Consumption Trend in Oromia

Even though fertilizer application in Oromia dated back to the late 1960's and early 1970's, the total fertilizer consumption was limited to an annual average of 1,300,000 quintals of DAP and Urea combined. Fertilizer distribution, both in terms of quantity and agricultural areas covered has been growing at a gradual pace through the region (Furgassa, 1996). Fertilizer consumption has been kept increasing in Oromia since the liberalization of market. It has shown increasing trend from 1991 to 1995. This trend exhibits inconsistency after 1995. The average fertilizer consumption of Oromia from 1991 to 1999 was estimated at about 1,061,520 quintals per annum, which can be considered as long-term period. The 1999 fertilizer consumption is below the previous nine years average, which was 921,800 quintals (OFCPB, 2000).

Currently fertilizer supply reaches all the seventeen zones in the region with 252 districts. However, the quantities differ considerably from one area to another. In terms of area, the bulk of fertilizer consumption in Oromia from 1995 to 1999 was restricted or concentrated to West Shewa, Arsi and East Shewa zones. The quantity being consumed by these zones in 1999 was 202,300 quintals, 171,300 quintals and 159,300 quintals, respectively. The least consumers were Borena and West Hararghe zones (OFCPB, 2000).

2.3. Major Benefits of Cooperatives

The theory of cooperative organization provides several reasons why farmers join the cooperatives. According to Schroeder (1992), cooperatives provide quality supplies and services to the farmers at a reasonable cost. By purchasing supplies as a group, farmers offset the market power advantage of other private firms providing those supplies. The farmer can gain access to volume discounts and negotiate from a position of greater strength for better delivery terms, credit terms, and other arrangements. Suppliers will also be more willing to discuss customizing products and services to meet farmers' specifications if the cooperative provides them sufficient volume to justify the extra time and expense. Increased farmers bargaining power in the market places is the other advantage of the cooperative. Marketing on a cooperative basis permits farmers to combine their strength and gain more income. Farmers can lower their distribution costs, conduct joint product promotion, and develop the ability to deliver their products in the amounts and types that will attract better offers from purchasers.

According to Parliament *et al.* (1990), a cooperative gives farmers a means to organize for effective political action. Farmers can meet to develop priorities and strategies. They can send representatives to meet with legislators and regulators. These persons will have more influence because they will be speaking for many, not just for themselves. According to Folsom (2002) having a businesses owned and controlled on a cooperative basis helps farmers' entire community. Cooperatives generate jobs and business earnings for local residents. They pay taxes that help finance schools, hospitals, and other community services.

2.4. Farmers' Attitude on the Performance of Cooperatives

The cooperative is usually one alternative form of business organization that can offer good/ service to the farmers. If the other business organizations are regarded as dishonest, inefficient or exploitive, farmers will be predisposed to use the cooperative (Chukwu, 1990). On the other hand if the other business organizations are offering good/ service efficiently, honestly and at fair price, the farmers more likely to be less interested in the cooperative.

According to Klein *et al.* (1997), the performance of the cooperative will also affect the possibilities of having more farmers as member. If the cooperative is seen as inefficient, its functionaries corrupt and not prepared to listen to its members, the prospective members (farmers) will not have a good attitude towards the cooperative. Cooperatives cannot be free of risks as they undertake speculative business activities (Chukwu, 1990). For example, in Ethiopia in addition to input marketing, agricultural cooperatives purchase teff, coffee and other farm produces from the farmers in the harvesting season speculating that the price rises in the latter seasons. These risks are usually high for the average cooperative farmers who in most cases belong to the lower economic class of the society. Furthermore, decision making in the agricultural cooperative is known to be traditionally relatively low, whereas speculative business activities require flexible and speedy action. If there is repeated loss in the cooperative, farmers will be disappointed with performance and be less interested in the cooperative.

2.5. Empirical Studies on Credit Repayment Performance and Input Use

2.5.1. Empirical studies on the credit repayment performance

Bekele (1995) associated loan default problems to three major factors in Ethiopian context. These are: the inability of borrowers to repay the loan as a result of crop failure for various reasons, the unwillingness of borrowers to repay the loan as a grant or political patronage, and institutional and policy problems. He further argued that the dissolution and malfunctioning of producers' cooperatives contributed a lot to increase loan default. Apart from the dissolution of

cooperatives, borrowers were reported to develop wrong attitudes of expecting debt rescheduling or write-off and of regarding loans as government grants.

The study by Mulat *et al.* (1997) emphasized that administrative measures that were applied to enforce repayment can also be harsh and ignored farmers' circumstances. For instance, collection of payments that begin immediately after harvest is not convenient to all farmers in all areas. This is associated to the fact that most farmers are forced to bring their produce to the market at the same time (in order to pay their fertilizer debts, taxes, etc.), and as a result, supply exceeds demand, and prices fall sharply. The system does not accommodate the interest of farmers who are willing to incur additional interest costs by delaying crop sales as price rise later in the year.

According to a study made by Bekele *et al.* (2005), the socio-economic factors influencing repayment of agricultural input loan in Ethiopia using the logistic method of analysis were the amount of loan taken by households, total livestock holding, timeliness of input supply, off-farm income by member of the household, yield loss and grain production were became significant variables.

Belay (1998) in a case study at Alemegena District (Ethiopia) found out a significant positive relation ship of livestock ownership and loan repayment performance of farmers. Accordingly, animal production was found to be important source of cash income during sharp fall of crop prices. Also, Bekele (1995) in his Ethiopian case study using logit model revealed that value of total livestock holding has positive impact on loan repayment performance of smallholder farmers. According to the study, farmers who owned more livestock were able to repay their loans even when their crops failed due to natural disaster.

The study undertaken by Zemen (2005) revealed that there were four important factors which affect the borrowers' timely repayment of their debts in Amhara region by using Linear Descriminant Analysis. According to his findings, the variables that differentiated the sample borrowers into non-defaulters and defaulters were the size of cultivated land, the loan diversion behaviour, membership condition and the amount of other credit borrowed during the study period.

2.5.2. Empirical studies on fertilizer use

Berhanu (1993) has analyzed factors influencing fertilizer consumption in Ada wereda (East Shewa, Ethiopia) using multiple regression model. The study concluded that, number of oxen owned, land fertility, off-farm income, gross farm income, farm size, timely distribution of fertilizer, area under improved variety of seeds and education have significantly influenced fertilizer consumption. Out of these variables, land fertility and farm size were inversely related to the level of fertilizer consumption.

Teferi (2003) used Tobit model for identifying the determinants of fertilizer use. His results showed that health of the respondent, education level, credit access, extension contact, labor, availability, livestock holding, age, distance from the road and use of improved seed were found to determine the use of fertilizer. Getahun (2004) used Tobit model to assess factors affecting adoption of wheat technology. His results showed that fertilizer use, income and credit influenced the probability of adoption and intensity of improved wheat varieties. Another study conducted by Asmerom *et al.* (1994) in central Ethiopia has shown that cattle and land possession significantly affect fertilizer use.

Itana (1985) in his study of adoption of improved varieties and fertilizer in two extension areas of Western Shewa, Dilalla and Ollankomi by using tobit model showed that in Ollankomi, extension contact of farmers, level of education, farm size and the adequacy of rain fall (as a proxy of risk) were found to affect fertilizer and improved variety adoption and in Dilalla, the above factors did not affect fertilizer and improved variety adoption. Instead, extension area, farmer's asset position, non-farm income and price of farm out-put positively affect the adoption of the new technologies.

Akililu (1975) in Bako and Jimma area, using discriminant analysis, concluded that fertilizer use was influenced by profitability in Jimma area and extension contact in Bako area. Farm size and labour availability also positively affected the level of fertilizer adoption in both areas.

Tesfaye (1975) in CADU using probit model showed that the probability of adoption of improved varieties and fertilizer increase with farm size, availability of cash for down payment, membership in local association and literacy.

Lelisa (1998) used Probit and Tobit models to identify the determinants of adoption and intensity of fertilizer use in Ejere District, West Shewa, Ethiopia. He included eighteen explanatory variables in the model to identify determinants of fertilizer adoption and reported that age of the farmer, use of animal dung, and renting out land have negative and significant influence, while access to credit, and oxen ownership have a positive and significant influence. He also reported that use of animal dung, and distance from fertilizer marketing centers have negative and significant influence on the intensity of fertilizer use, while access to credit, level of education, extension service, oxen ownership, value cost ratio and family size have a positive and significant influence.

3. METHODOLOGY

3.1. General Description of the Study Area

3.1.1. An overview of Oromia Regional State

Oromia is one of the nine national regional states of Ethiopia with 353,690 square kilometers of land area (32%) of the country, and covering a wide range of agro-climatic zones. Oromia has a total population of 27,158,471, of which 13,676,159 are male and 13,482,312 female. Urban inhabitants number 3,370,040 or 11.3% of the population. The annual population growth rate in the region is estimated at 2.9 % (CSA, 2008).

Administratively, Oromia is divided into 17 zones, 245 weredas, and 36 town administrations with 6500 kebele subdivisions which have 5,590,530 households (4,724,236 rural and 866,294 urban). The Regional State extends from the western end to the eastern parts of eastern Hararge from 34°E latitude to 43°E. Its south north expanse runs from 4⅔° north to 10⅔° North latitude.

Oromia has an average annual rain-fall ranging from 400mm in parts of Borena (Southern Oromia) to over 2400mm in parts of Illuabbabor zone or over its Western highlands. The altitude of the region ranges from less than 500 meters to high level of mountain Batu which is 4607 meters above sea level.

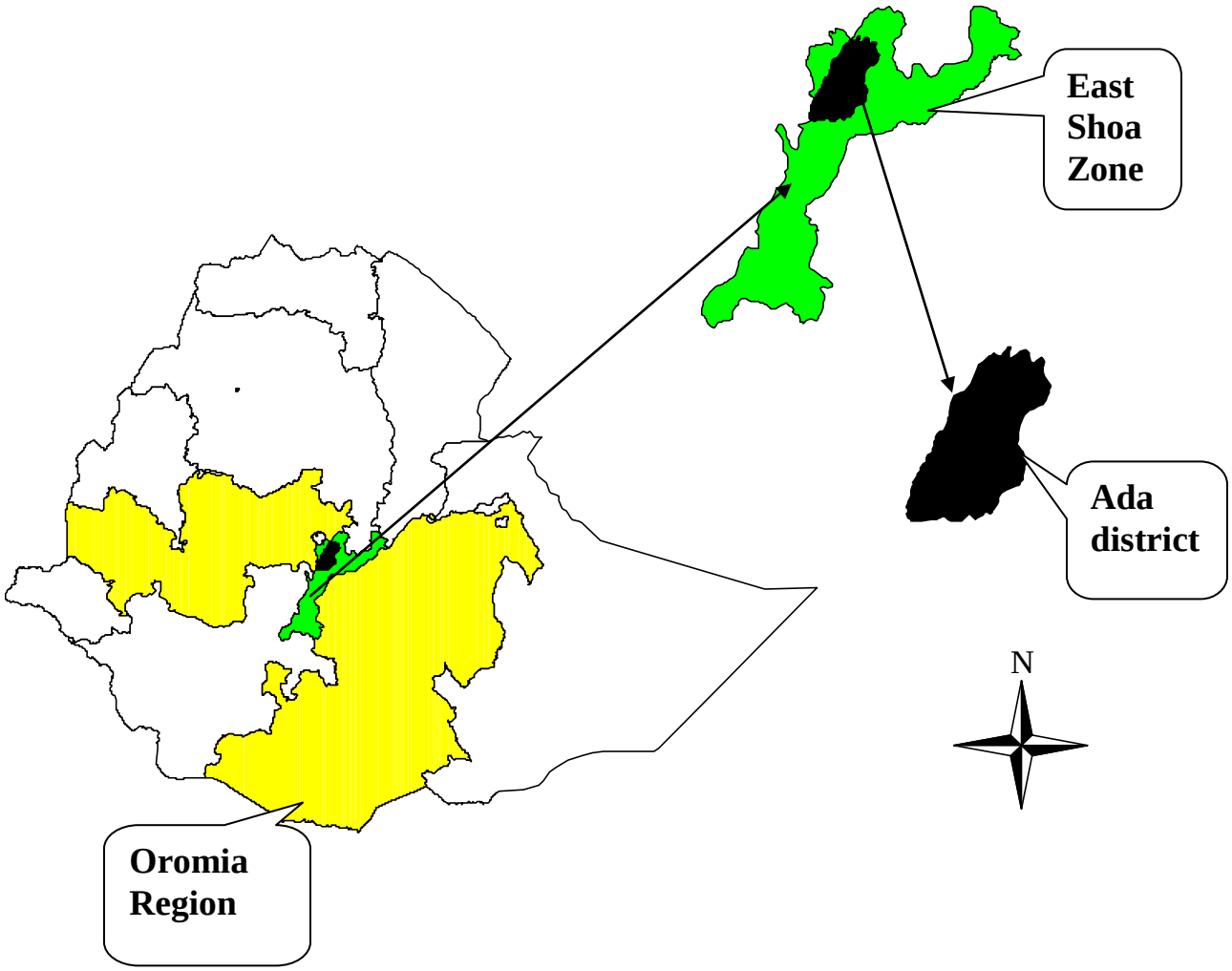

Figure 1. Map of Ada district

3.1.2. An overview of the East Shoa Zone

East Shoa zone is divided into 10 districts and has an area of 14,050 km^2 from which 4,289.25 km^2 is cultivable land. The total population of the zone, according to CSA (2008) is about 1,357,522 of which 696891 are male and 660631 female. The zone has an estimated livestock population of about 5.3 million and arable land of about 44.0% of the total area. Teff, wheat, maize, barley, sorghum, haricot bean, chickpea, lentils, bean, pea, fruits and vegetables are some of the widely cultivated crops in the zone. Cattle, sheep, goat, horse, donkey, camel and chickens are the common livestock found in the zone (ESZARDO, 2008).

3.1.3. Ada district

Ada district is one of the 10 districts in East Shoa Zone, Oromia Regional State, located about 45 km East of the capital, Addis Ababa (Finfinnee). It is the largest district in the zone with an area of 962.12 km^2 and cultivable land of 779.32 km^2 (81%). Livestock population is 606,037 including poultry. Bishoftu is the capital of the district. Currently, the district is divided into 27 Peasant Associations. The elevation of the district ranges between 1500–2300 m.a.s.l. The largest portion (95%) of the district has mid highland agro-climate and the remaining portion (5%) has highland agro-climate. The annual temperature of the district is 15-20 ^{0}C (ADARDO, 2008). The total rural population of Ada district is 131,273 of which 68,381 are male and 62892 are female. The total households in the district are 23,868 with an average family size of 5.6 persons (CSA, 2008).

Ada district is one of the most known agriculturally rich districts of the zone and it is the most popular in farming activities. Its agro-climatic conditions are sub-tropical and the major soil is vertisol which made it suitable for the production of cereals and pulses. The farming calendar of the district is from April to January. Rain-fed agriculture is its main crop production system. The agro-climatic conditions of the district are conducive for the production of various types of crops. The major crops that are produced in the district are cereals, pulses and oil seeds. Teff occupied the largest cultivated area out of the crops grown in the district.

In Ada district, there were 21 multi-purpose agricultural cooperatives. Moreover, they had 20,579 members (17,589 male and 2990 female) in 2008. The total capital of the cooperatives was birr 4,741,509.48. The cooperatives provide fertilizer, improved seeds and other farm inputs to farmers. One of the fascinating attributes of agricultural cooperatives is extending input in credit. They also market farm produces especially teff and wheat. Some of the cooperatives render tractor and grain mill service (ADCPO, 2008).

3.2. Sample Size and Method of Sampling

A two-stage random sampling method was used to select the sample respondents. In the first stage, from 21 primary cooperatives found in the district (having 20,579 farmer members) five cooperatives were selected randomly from the sampling frame obtained from District Cooperative Promotion Office (ADCPO). In the second stage out of five primary cooperatives 130 sample farmers were selected randomly from the lists of respective cooperatives taking input in credit in 2009 cropping calendar using probability proportional to size.

Table1. Sample primary cooperatives and number of sampled households

No	Name of Cooperatives	Input Borrowers			Total Sample		
		ND	D	Total	ND	D	Total
1	Denkaka	349	88	437	22	4	23
2	Dire	532	133	665	31	6	35
3	Dukem	487	122	609	28	8	32
4	Godino	305	76	381	17	2	20
5	Lugo	304	76	380	19	6	20
	Total	1977	495	2472	104	26	130

Source: Own survey result, 2010

ND= Non-Defaulter

D= Defaulter

3.3. Data Sources and Techniques of Data Collection

Data for this study were collected both from secondary and primary sources. Secondary data were collected from published and unpublished documents, reports, maps, statistical data, bulletin and audit reports. Secondary data were also collected from different governmental and non-governmental offices found in the district, zonal, and regional offices.

A structured questionnaire was employed to collect primary data for the cropping season of 2008/09 from the sample respondents. Before conducting the actual interview, the questionnaire was pre-tested. The pre-test was administered on member farmers in the cooperatives who were not included in the sample respondents. Considering the pre-test information, some amendments were made on the questionnaire before it has been administered. Enumerators were recruited and trained on the details of the interviewing techniques and the contents of the questionnaire. Five enumerators, four of which were diploma holders in general agriculture and with a degree in cooperative science having experience in data collection were recruited and trained. Continuous supervision was made to reduce error during data collection and to correct possible errors right on the spot.

3.4. Methods of Data Analysis

3.4.1. Descriptive statistics

Descriptive statistics such as mean, standard deviations and percentages were computed to analyze the collected data. Moreover, differences between defaulters and non-defaulters with respect to the selected variables are tested using t-test and χ^2- test.

3.4.2. Econometric model

The Tobit model

There are several occasions where the variable to be modeled is limited in its range. Because of the restrictions put on the values taken by the regressand, such models can be called limited dependent variable regression models. When information on the regressand is available for some observations, using OLS may result in a biased and inconsistent parameter estimates even asymptotically. The bias arises from the fact that if we consider only the observable or n_l observations (i.e. only observations for which the values of the dependent variable are observed) and omit the others, there is no guarantee that the expected value of the error terms, E (u_i), will be necessarily zero. And without E (u_i) =0 we cannot guarantee that the OLS estimates will be unbiased. It is intuitively clear that if we estimate a regression line based on the n_1 observations only; the resulting intercept and slope coefficients are bound to be different than if all the (n_1 +n_2) observations were taken into account (Greene, 2000).

There are three types of regression models under the limited dependent variables models. These are Censored or Tobit regression, Truncated regression and sample selected regression models. Inferring the characteristics of a population from a sample drawn from a restricted part of the population is known as truncation. A truncated distribution is the part of untruncated distribution that is above or below some specified value (Greene, 2000). Whereas a sample in which information on the regressand is available only for some observation is known as censored sample.

The use of Tobit models to study censored and limited dependent variables has become increasingly common in applied social science research for the past two decades (Smith and Brame, 2003). Tobit is an extension of the Probit model and it is one approach to dealing with the problem of censored data (Johnston and Dinardo, 1997).

Most of the studies conducted in modeling the determinants of loan repayment used dichotomous discrete choice models (Logit and Probit) where the dependent variable is a dummy that takes a value of zero or one depending on whether or not a farmer has defaulted. However, Lynne *et al.*

(1988) pointed out possible loss of information if a binary variable is used as the dependent variable. In addition, binomial models, explain only the probability that an individual made a certain choice (defaulted or has not defaulted) and they fail to take into account the degree of loan recovery.

In this study the value of the dependent variable is repayment ratio that has been computed as the ratio of amount of loan repaid to the total amount borrowed from formal sources of credit. Thus, the value of the dependent variable ranges between 0 and 1 and a two-limit Tobit model has been chosen as a more appropriate econometric model.

Specification of two-limit Tobit model

The two-limit Tobit was originally presented by Rossett and Nelson (1975) and discussed in detail by Maddala (1992) and Long (1997). The model derives from an underlying classical normal linear regression and can be represented as:

$Y^* = \beta' x_i + \varepsilon_i$, (1)

$\varepsilon \sim N [0,\sigma^2]$.

Denoting Yi as the observed dependent (censored) variable

$$Y_i = \begin{cases} L & if\ Y^* \le L \\ Y^* = X\beta + \varepsilon_i & if\ L < Y^* < U \\ U & if\ Y^* \ge U \end{cases} \quad (2)$$

Where,

Y_i = the observed dependent variable, in our case repayment ratio (ratio of amount repaid to the amount borrowed)

Y_i^* = the latent variable (unobserved for values smaller than 0 and greater than 1).

X_i = is a vector of independent variables (factors affecting loan repayment and intensity of loan recovery)

β_i = Vector of unknown parameters

ε_i = Residuals that are independently and identically normally distributed with mean zero and a common variance σ^2 , and

i= 1,2,…n (n is the number of observations).

L = lower limit

U = upper limit

By using the two-limit Tobit model, the ratio of repayment was regressed on the various factors hypothesized to influence loan repayment performance of smallholder farmers in the study area.

The log likelihood function for the general two-limit Tobit model can be given as follow:

$$Log = -\frac{1}{2}\sum_{j\varepsilon c} W_j\left[\left(\frac{y_i - x\beta}{\sigma}\right)^2 + \log 2\pi\sigma^2\right] + \sum_{j\varepsilon L} W_j \log\Phi\left(\frac{y_{Lj} - x\beta}{\sigma}\right) + \sum_{j\varepsilon R} W_j \log\left[1 - \Phi\left(\frac{y_{Rj} - x\beta}{\sigma}\right)\right] + \sum_{j\varepsilon I} W_j \log\left[\Phi\left(\frac{y_{2j} - x\beta}{\sigma}\right) - \Phi\left(\frac{y_{1j} - x\beta}{\sigma}\right)\right] \quad (3)$$

Where C's are point observations, L's are left censored observations, R's are right-censored observations, and I's are intervals. And Φ is the standard cumulative normal distribution, and the w_j is the normalized weight of the j^{th} observation.

The Tobit coefficients do not directly give the marginal effects of the associated independent variables on the dependent variable. But their signs show the direction of change in probability of being non-defaulter and marginal intensity of loan recovery as the respective explanatory variable change (Amemiya, 1984; Goodwin, 1992; Maddala, 1992).

The Tobit model has an advantage in that its coefficients can be further disaggregated to determine the effect of a change in the i^{th} variable on changes in the probability of being non-defaulter (Mc Donaled and Moffit, 1980) as follows:

1. The change in the probability of repaying the loan as an independent variable Xi changes is:

$$\frac{\partial\Phi(\delta)}{\partial X_i} = \phi(\delta)\frac{\beta_i}{\sigma} \quad (4)$$

2. The change in intensity of loan recovery with respect to a change in an explanatory variable among non-complete defaulters is:

$$\frac{\partial E(Y_i / U > Y_i > L, X)}{\partial X_i} = \beta_i \left(1 + \frac{\delta_L \phi(\delta_L) - \delta_U \phi(\delta_U)}{\Phi(\delta_U) - \Phi(\delta_L)} - \left[\frac{\phi(\delta_L) - \phi(\delta_U)}{\Phi(\delta_U) - \Phi(\delta_L)} \right]^2 \right) \quad (5)$$

3. The marginal effect of an explanatory variable on the expected value of the dependent Variable is:

$$\frac{\partial E(Y / X_i)}{\partial X} = \beta_i (\Phi(\delta_u) - \Phi(\delta_L)) \quad (6)$$

Where,

X_i = explanatory variables,

$\Phi(\delta)$ = the cumulative normal distribution

$\delta = \frac{\beta_i X_i}{\sigma}$ = the Z-score for the area under normal curve

β_i = a vector of Tobit maximum likelihood estimates

σ = the standard error of the error term.

$$\delta_L = \frac{L - X_i \beta}{\sigma}$$

$$\delta_U = \frac{U - X_i \beta}{\sigma}$$

L and U are threshold values (L =0 and U =1)

ϕ and Φ are probability density and cumulative density functions of the standard normal distribution, respectively.

Hypothesis and definition of variables for credit repayment

Based on the literature reviewed and discussion held with stakeholders, the explanatory variables selected for this study were broadly categorized under socioeconomic, institutional and household factors. In what follows, a brief explanation of the explanatory variables selected for this study and their likely influence on loan repayment performance are presented below.

Dependent variable (CREDITREP): The dependent variable of the Tobit model for this study is the proportion of loan repaid during the specified repayment period. This was calculated as the ratio of the total amount of credit repaid to the total amount of due. Its value ranges between 0

and 1. Those borrower farmers that did not repay any amount of money they borrowed are considered as complete defaulters (i.e., the value the repayment ratio in this case is zero). On the other hand, those farmers that repaid the money they borrowed with in the stated time are considered as non-defaulters.

Independent variables

Age of the household head (AGE): It is defined as the number of years the respondent household since birth until the survey was conducted. It is a continuous variable measured by years. Through time household heads acquire experience in the farming business and/or credit use. Moreover, older borrowers may accumulate more wealth than younger ones. Therefore, this variable is hypothesized to have positive impact on loan repayment performance of respondents. However, if they have insufficient labor within their households, older household heads in rural areas are at a disadvantaged position economically in undertaking the heavy physical labor required in agriculture. Each additional unit increase in age after some point would thus add less to household income leading to low credit repayment performance. Therefore, the expected effect of age on loan repayment could be positive or negative.

Marital status (MARSTA): It is represented by 1 if the respondent is married, 2 if the household is single, 3 if the household is divorce and 4 if widow. It is assumed that married households can handle and manage their overall livelihood (social duties and farm activities) better than households who divorce, widowed, or single, that enabled them to produce more and generate more income. Therefore, married households repay their loan more actively than divorce, widow and single households.

Education level of the household head (EDUCLVL): This is a continuous variable measured by level of educational attainment. Education may enable farmers to be more aware of the importance of formal loan and hence may reduce willful default. Therefore, ceteris paribus, education is expected to reduce the rate of loan default.

Family size (FAMSIZE): The number of family members residing with the respondent. The larger the family members, the more the labor force available for production purpose. Therefore,

there is a possibility to have more alternative sources of income to overcome credit risks (Schereiner and Nagarajan, 1997). Based on this, families with sufficient labor-force would be expected to low probability of defaulting. On the contrary, since food requirements increase with the number of adult equivalent in the family, most of produce is used for consumption as number of family members relatively increase. It is expected that family size decrease loan repayment performance of farmers (Zemen, 2005). Therefore, the coefficient of this variable may appear with negative or positive effect on credit repayment performance of household.

Non-farm income (NONFARM): This is defined as the amount of income generated from activities other than crop and livestock productions. These include: petty trading, casual work, home made drinks, handicraft (weaving, blacksmith, tannery) etc. These additional sources of income would back the farmers up to settle debt even during bad harvesting seasons and when repayment period and agricultural prices are inversely related. Most probably, repayment starts immediately after a peak harvesting time when prices of agricultural products fall sharply. During this time, farmers who practice non-farm activities can easily repay their loan on time than those who don't involved in non-farm income. Therefore, non-farm income is a very important source of cash for farm households especially to purchase inputs and repay their credits (Reardon *et al.*, 1999). It is assumed that the variable has a positive impact on credit repayment.

On-farm income (ONFARM): Was defined as the total income generated from crops and livestock activities measured in Birr during a particular year. The higher the on-farm income, the greater the repayment capacity of the farmers and the higher the probability to be non-defaulter and vice versa. Therefore, the coefficient of this variable is expected to appear with positive sign.

Cultivated land (CULTLAND): It refers to the total cultivated land holding of the household. It is argued that farmers with large farm size have better chance of earning more income which in turn enables him/ her to use inputs and repay credits. This variable is hypothesized to have positive impact on credit repayment.

Amount of fertilizer used (AMFERT): It refers to the amount of chemical fertilizer used by respondents during the cropping season. It is argued that households who used chemical fertilizer as per the recommendation rate produce more and generate more income which enables them to repay their credit on time. Thus it was hypothesized to be positively related to the credit repayment performance.

Number of livestock owned (LIVSTNO): This variable is defined in terms of Tropical Livestock Unit (TLU) and may serve as a proxy for the capacity to bear risks of using credit. Livestock may also serve as a proxy for oxen ownership, which is important for farm operations. It is expected that this variable have a positive influence on loan repayment performance.

Access to extension service (EXTSER): This is a dummy variable, which takes a value 1 if the household receives extension service and 0 otherwise. It is hypothesized that this variable positively influences credit repayment.

Status in the cooperative (COOPSTA): This is a dummy variable which takes a value of 1 if the respondent is an elected committee and 0 otherwise. It is assumed that farmers who worked as an elected committee member have better repayment status than other members.

Saving habit (SAVING): This is a dummy variable that is represented by 1 if the respondent has saving and 0 otherwise. Farmers usually save from their proceeds for consumption smoothing purposes through out the year, accumulation of wealth, and for contingency purposes in case of bad harvest or accident. Saving enables farmers to easily fulfill the contract entered when prices of agricultural products are not conducive. The more the amount of savings, the greater the capacity to repay input credit. Therefore, it is hypothesized that this variable positively influences credit repayment.

Multiple linear regression model

Most of the economic and business problem analysis is based upon the cause and effect relationship and one of the major objectives of analyzing data in economic and business research

is to describe the functional relationship between variables. This objective is generally achieved by fitting the regression model. It is much wider application to determine the extent, strength and direction of the relationship between the dependent and independent variables in linear as well as non-linear form.

According to Maddala (1992), multiple linear regression is important model to analyze data when the dependent variable is continuous. Moreover, this model is effective to bring out the effect of some variables on the dependent variable.

In addition to its wider application, multiple linear regression analysis is a general technique, which can be fitted to all kind of variables. For instance, Berhanu (1993) used linear multiple regression to describe the functional relationship between fertilizer consumption, fertilizer credit and factors influencing both of them.

Multiple Linear Regression model can be specified as follows:

$$Y_i = \beta_o + \sum \beta_i X_i + u_i \quad , \qquad i = 1, 2\ldots, 14 \tag{7}$$

Y_i = dependent variables which is continuous

β_o = an intercept

β_i = coefficients of i^{th} independent variable

X_i = independent variable and can be either dummy or continuous, and i runs from 1-14

u_i = unobserved disturbance term

In this study multiple linear regression model is used to analyze factors influencing input (fertilizer) use among sampled farm households.

Hypothesis and definition of variables for fertilizer use

Based on the literature reviewed and discussion held with stakeholders, the explanatory variables selected for this study were broadly categorized under socioeconomic, institutional and

household factors. A brief explanation of the explanatory variables selected for this study and their influence on fertilizer use were presented below.

Dependent variable (FERTIUSE): This represents a continuous dependent variable, which is measured in the amount of quintals of fertilizer input used in the cropping year 2009.

Independent variables

Age of the household head (AGE): It is defined as the number of years the respondent household since birth until the survey was conducted. It is a continuous variable measured by years. Through time, household heads acquire experience in using improved farm technologies / improved input use/. Moreover, older households may accumulate more wealth than younger ones. Therefore, this variable is hypothesized to have positive impact on improved inputs use. However, if they have insufficient labor within their households, older household heads in rural areas are at a disadvantaged position economically in undertaking the heavy physical labor required in agriculture. Each additional unit increase in age after some point would thus add less to household production obtained and may even reduce household income leading to low inputs use. Therefore, the expected effect of age on input use could be positive or negative.

Marital status (MARSTA): It is represented by 1 if the farmer is married, 2 if the household is single, 3 if the household is divorce and 4 if widow. It is assumed that married households can handle and manage their overall livelihood (social duties and farm activities) better than households who divorce, widowed, or single. Therefore, married households use more fertilizer compared to divorce, widow and single households.

Education level of the household head (EDUCLVL): This is a continuous variable measured by level of educational attainment. It is assumed that households with better education level participate positively in input utilization.

Family size (FAMSIZE): The number of family members living with the households. The larger the family members, the more the labor force available for production purpose. Therefore, it was expected that this variable have a positive impact on use of inputs.

Number of livestock owned (LIVSTNO): This variable is defined in terms of Tropical Livestock Unit (TLU) and may serve as purchase of input such as fertilizer by selling in kind or by products. It is expected that this variable have a positive influence on fertilizer use.

Non-farm income (NONFARM): This is defined as the amount of income generated from activities other than crop and livestock productions. These include: petty trading, casual work, home made drinks, handicraft (weaving, blacksmith, tannery) etc. These additional sources of income would back the farmers up to purchase input even during bad harvesting seasons. During this time, farmers who practice non-farm activities can use input than those who do not involve in non-farm income. Therefore, non-farm income is a very important source of cash for farm households especially to purchase inputs (Reardon *et al.*, 1999). It is assumed that the variable has a positive impact on input use.

On-farm income (ONFARM): Was defined as the total income generated from crops and livestock activities measured in Birr during a particular year. The higher the on-farm income, the greater the purchase and use of fertilizer by farmers. Therefore, the coefficient of this variable is expected to appear with positive sign.

Cultivated land (CULTLAND): It refers to the total cultivated land holding by the household. What is more important is that farmer with large farm size has better chance to earn more income which in turn enables him/ her to use inputs and repay credits. In other words, farmer with large farm size is relatively wealthy than farmer with small farm size. According to Ellis (1992), the larger farm area implies more resources and greater capacity to invest in farmland, purchase inputs like fertilizer, improved seeds and the likes as well as it increases readiness to take risk. Hence, this variable is hypothesized to have positive impact on use of inputs.

Number of oxen (OXENO): It is a continuous variable represented by the number of oxen owned. It is assumed that households who have more number of oxen have a better performance in consuming inputs. Therefore, it is hypothesized that this variable influences input use positively.

Access to extension service (EXTSER): This is a dummy variable, which takes a value 1 if the household receives extension service and 0 otherwise. The variable representing extension service as a source of information has influence on farm households' technology adoption decision (Bezabih, 2000; Nkonya *et al*., 1997). Therefore, it is hypothesized that this variable influences inputs use positively.

Status in the cooperative (COOPSTA): This is a dummy variable which takes a value of 1 if the respondent is an elected committee and 0 otherwise. It is assumed that farmers who worked as an elected committee member have better-input use than other members.

Saving habit (SAVING): This is a dummy variable that is represented by 1 if the respondent has saving and 0 otherwise. Farmers usually save from their proceeds for consumption smoothing purposes through out the year, accumulation of wealth, and for contingency purposes in case of bad harvest or accident. Saving enables farmers to easily purchase agricultural inputs when prices of agricultural products are not conducive or when there is crop failure. The more the amount of savings, the greater the capacity to purchase and use inputs. Therefore, it is hypothesized that this variable positively influences input use.

4. RESULTS AND DISCUSSION

This chapter presents the results from the descriptive and econometric analyses. The descriptive analysis made use of tools such as mean, percentages and standard deviation. In addition, the t- and chi-square statistics were employed to compare defaulters and non-defaulters group with respect to some explanatory variables. Econometric analysis was carried out to identify the most important factors that affect the loan repayment performance and fertilizer use and to measure the relative importance of significant explanatory variables on loan repayment performance and fertilizer use.

4.1. Descriptive Analysis

The demographic, socio-economic and institutional characteristics of the respondents such as age, sex, marital status, family size, level of education, cultivated land, number of livestock owned, health condition of the household, fertility status of the soil, status in the cooperative, saving behavior of the respondents and other variables related to timely credit repayment (defaulters and non defaulters) and input use were analyzed using descriptive statistics.

4.1.1. Household characteristics

Age of the household head

Age of the sample respondents ranged from 27 to 78 years with mean of 47.66 years and standard deviation of 14.49. The average age of non-defaulters was 48.88 years, while that of defaulters was 42.81 years. Therefore, the survey result shows that the mean difference between non-defaulters and defaulters with regard to age was statistically significant at 10% significance level (Table 2). This indicates that non-defaulters are more aged than defaulters implying that through time household heads acquire experience in the farming business and/or credit use. Moreover, older borrowers may accumulate more wealth than younger ones.

Table 2. Distribution of the sample households by age

Characteristics	Non defaulters (N=104)		Defaulters (N=26)		T- value	Total sample (N=130)	
	Mean	Std.Dev	Mean	Std.Dev		Mean	Std.Dev
Age (years)	48.48	15.35	44.38	9.89	1.93*	47.66	14.49
Maximum	78		78			78	
Minimum	27		33			27	

* Significant at 10% probability level
Source: own computation, 2010
N = Number of respondents

Family size of respondents

Family size of the sample respondents ranged from 2 up to 11 persons, with an average family size of 5.91 and a standard deviation of 2.08. The average family size in the sample was higher than the average family size of the region's average family size 5 persons (CSA, 2008). The average family size of the non-defaulters and defaulters was 6.16 and 4.88, with standard deviations of 2.12 and 1.56, respectively. Therefore, family size between the two groups was statistically significant at 1 percent (Table 3). The average number of active labor force (man-equivalent) for the whole sample, non-defaulters and defaulters was 4.32, 4.46 and 3.77 respectively. This also shows that the difference between non-defaulters and defaulters regarding active labor was statistically significant at 10 percent. If this result is compared with the average family size (5.91), on average 73%, of the family members are actively engaged in an economic activity. The larger the family members, the more the labor force available for production purpose. Therefore, there is a possibility to have more alternative sources of income to overcome credit risks

Table 3. Characteristics of the sample households by family size

Characteristics	Non defaulters (N=104)		Defaulters (N=26)		T- value	Total sample (N=130)	
	Mean	Std.Dev	Mean	Std.Dev		Mean	Std.Dev
FAMSIZE (number)	6.16	2.12	4.88	1.56	2.88***	5.91	2.08
Active labor (number)	4.46	1.86	3.77	1.42	1.77*	4.32	1.80
Dependent labor (number)	1.66	1.23	1.35	0.89	1.24	1.61	1.17

*** and * Significant at 1% and 10% probability level
Source: Own survey results, 2010
Note: Active labor is age group lying between 15 to 64 years.
N = Number of respondents

Marital status of the household

With regard to the marital status, from the total sample respondents 90.8%, 0%, 3% and 6.2% were married, single, divorced and widowed, respectively. The marital status of non-defaulters were 92.3%, 0%, 1.9% and 5.8% are married, single, divorced and widow, respectively while for the defaulters it is 84.6%, 0%, 7.7% and 7.7% in the same order. Therefore, the percentage difference between the two groups was found to be insignificant (Table 4).

Table 4. Distribution of sample household heads by marital status

Variables		Non defaulters (N=104)		Defaulters (N=26)		χ^2 -Value	Total (N=130)	
		N	percent	N	percent		N	percent
Marital status								
Marital status-	married	92	88.5	19	73	1.47	111	85.4
	single	4	3.8	3	11.6		7	5.4
	divorce	2	1.9	2	7.7		4	3
	widow	6	5.8	2	7.7		8	6.2

Source: own computation, 2010
N = Number of respondents

4.1.2. Economic characteristics of the household

Cultivated land size

The cultivated land size (own and rented) of sample households vary between 0.5 to 12.5 hectares with an average holding of 2.96 hectares and a standard deviation of 2.23. The average size of cultivated land for non-defaulters was 3.14 with a standard deviation of 2.42, while that of defaulters was 2.26 with standard deviation of 0.98. Statistically, there was a significant difference between non-defaulters and defaulters at 10% related to the size of cultivated land (Table 5).

Table 5. Land holding differentials between sample farmers

Characteristics	Non defaulters (N=104)		Defaulters (N=26)		T- value	Total sample (N=130)	
	Mean	Std.Dev	Mean	Std.Dev		Mean	Std.Dev
Cultivated land size (ha)	3.14	2.42	2.26	0.98	1.82*	2.96	2.23
Maximum	0.5		0.5			0.5	
Minimum	12.5		4.75			12.5	

* Significant at 10% probability level
Source: own computation, 2010

Livestock holding

Farmers in the study area undertake both crop and livestock production activities. Though the holding size varied among the sample households and between non-defaulters and defaulters, all of the sampled respondents owned livestock. In the study area, livestock are kept for various economic and social reasons. The major economic reasons include provision or supply of draught power, generation of cash income, food and energy. The most commonly reared livestock in the study area are cattle, sheep and goats, equines and poultry.

Oxen are the most important source of draught power in the study area. The minimum and maximum number of livestock in TLU maintained by the sample respondents were 2 and 24, respectively. It was found that non-defaulters had on average 10.84 TLU, while defaulters had 7.88 TLU with a standard deviation of 4.72 and 2.87, respectively. Moreover, the mean difference between the two groups was statistically significant at 1 percent (Table 6). This implies that possession of large number of livestock served as a proxy for the capacity of bearing risks in using credit. Livestock may also be served as a proxy for oxen ownership, which could be important for farm operations.

Within the type of livestock possessed by households in the study area, the mean differences between defaulters and non-defaulters were found to be statistically significant for oxen, equines, goats and chicken. On the other hand, the mean difference between defaulters and non-defaulters for cattle and sheep were statistically insignificant.

Table 6. Distribution of sample households by livestock holding

Types of livestock	Non defaulters (N=104)		Defaulters (N=26)		T- value	Total sample (N=130)	
	Mean	Std.Dev	Mean	Std.Dev		Mean	Std.Dev
TLU	10.84	4.72	7.88	2.87	3.05***	10.25	4.56
Cattle	4.73	1.98	4.19	1.65	1.28	4.62	1.93
Oxen	3.19	1.79	2.54	1.21	1.77*	3.04	1.70
Equine	1.15	1.36	0.38	0.64	2.81***	1.00	1.28
Sheep	2.42	1.47	1.96	1.61	1.41	2.33	1.50
Goat	0.68	1.38	0.19	0.57	1.77*	0.58	1.27
Chicken	1.86	1.83	1.15	2.07	1.70*	1.72	1.89

*** and * Significant at 1% and 10% probability level
Source: Survey results, 2010
N = Number of respondents

On-farm and non-farm income of the respondents

Sale of crops, live animals and animal products are the major sources of income for the sample households. The average income earned from crops and livestock in 2009 production year was Birr 16,833.94. On average, non-defaulters obtained Birr 18,368.38 while defaulters obtained Birr 10,696.15. The mean difference between defaulters and non-defaulters with regard to on-farm income was found to be statistically significant at less than 1 percent probability level (Table 7). This implies that the higher the on-farm income the household generated, the greater the repayment capacity of the farmers and the higher the probability to be non-defaulter.

The major non-farm income generating activities practiced in the study area were daily laborers, petty trading, retail shops and local drinks. The income generated from off/non-farm activities varies from household to household with minimum and maximum values of Birr 0 and 12, 500, respectively. Non defaulters earned on average Birr 2134.62 whereas defaulters earned on average Birr 1403.85. However, the mean difference between defaulters and non-defaulters in income generated from non- farm income activities were found to be statistically non-significant (Table 7).

Table 7. Distribution of respondents by on-farm and Non-farm activities

Variables	Non defaulters (N=104)		Defaulters (N=26)		T-value	Total sample (N=130)	
	Mean	Std.Dev	Mean	Std.Dev		Mean	Std.Dev
On-farm income (Birr)	18368.38	10835.15	10696.15	5959.49	3.48***	16833.94	10493.44
Non-farm income (Birr)	2134.62	3808.85	1403.85	2782.40	1.11	1550	3013.14

*** Represents significant at 1% level
Source: own computation, 2010
N = Number of respondents

Amount of fertilizer used by sample respondents

The sample survey obtained from 130 respondents validates that all sample households used chemical fertilizer for their cultivation in the main cropping season of 2009. It is possible to observe from the result that the mean utilization by non-defaulters and defaulters regarding fertilizer was 3.75 quintals and 2.37 quintals, respectively and significant at 10 percent significance level (Table 8).

According to the survey, the utilization of fertilizer varies from a minimum of 1 quintal to a maximum of 21.82 quintals for the whole respondents and from 21.82 to 1 for non-defaulters where as from 8.17 to 1 for defaulters groups. These figures showed that there were significant differences in the use of fertilizer at 10% probability level between the two groups. Fertilizer application is generally far below the widely recommended rate of 100 kg of DAP and 100 kg of Urea per hectare.

Input utilization of the sample respondents in the survey cropping season (2009) and input utilization of Ada district for the last five years (2005-2009) are displayed in Appendix Tables 3 and 4 respectively.

Table 8. Distribution of sample households by fertilizer use

Types of Input	Non defaulters (N=104)		Defaulters (N=26)		T- value	Total sample (N=130)	
	Mean	Std.Dev	Mean	Std.Dev		Mean	Std.Dev
Fertilizer (quintal)	3.75	3.71	2.37	1.56	1.87*	3.48	3.43
Maximum	21.82		8.17			21.82	
Minimum	1		1			1	

* Significant at 10% probability level
Source: Survey results, 2010
N= Number of respondents

4.1.3. Social and Institutional Characters

Educational status of the respondents

The average educational level of the respondents was 4.04 years of schooling with a standard deviation of 3.94. The mean educational level of non-defaulters was 4.09 years with a standard deviation of 3.97 and that of defaulters was 3.85 years with a standard deviation of 3.89. However, the results indicate that there is no significant difference between non-defaulters and defaulters in terms of education level (Table 9).

Table 9. Characteristics of the sample households by education status

Characteristics	Non defaulters (N=104)		Defaulters (N=26)		T- value	Total sample (N=130)	
	Mean	Std.Dev	Mean	Std.Dev		Mean	Std.Dev
Education level (year)	4.09	3.97	3.85	3.89	0.28	4.04	3.94
Maximum	12		9			12	
Minimum	0		0			0	

Source: own computation, 2010
N = Number of respondents

Amount of money defaulted by sample respondents

Most of the cooperatives do not fully repay their loans timely. Even in this study out of the total 130 interviewed households 104 (80%) were non-defaulters and the remaining 26 (20%) were defaulters who did not repay their loans timely in 2009 cropping season. Among these defaulters, 17 (65.38 %) were complete defaulters while 9(34.62 %) repaid 40-70 percent of the total loan of which they borrowed. These defaulters on average defaulted 138.58 Birr with standard deviation of 375.52 Birr and a maximum and a minimum amount of defaulted money 2350 Birr and 230 Birr respectively (Table 10).

Table 10. Distribution of sample households by amount of money defaulted

Characteristics	Mean	Std.dev	Maximum	Minimum
Amount of money defaulted (Birr) [N=26 (20%)]	1209	306.97	2350	230

Source: Own computation, 2010

N= number of household head

Extension contact

The results of the survey indicated that 66.9 % of the respondents have got enough knowledge about cooperatives and credit system from extension agents, while 33.1% did not have any training or education from extension agents regarding credit. Group wise, 69.2% of the non-defaulters and 57.7% of the defaulters reported that they had extension contact. However, the chi-square value reveals that the difference between the two groups was insignificant (Table 11).

Table 11. Distribution of the sample respondents by extension services

Variables		Non defaulters (N=104)		Defaulters (N=26)		χ^2 -Value	Total (N=130)	
		N	percent	N	percent		N	percent
Extension								
	Yes	72	69.2	15	57.7	1.25	87	66.9
	No	32	30.8	11	42.3		43	33.1

Source: own computation, 2010
N= Number of respondents

Status of the respondents in the cooperatives

Regarding participation in the cooperative leadership, 10.8% of the total respondents, 10.6% of non-defaulters and 11.5% of defaulters reported that they were elected up to the time of this survey to lead their cooperatives. This difference was not statistically significant as can be seen from $\chi 2$ value in Table 12.

Table 12. Distribution of sample respondents by status in the cooperatives

Variables		Non defaulters (N=104)		Defaulters (N=26)		χ^2 -Value	Total (N=130)	
		N	percent	N	percent		N	percent
Status in the cooperative								
	Elected	11	10.6	3	11.5	0.68	14	10.8
	Not elected	93	89.4	23	88.5		116	89.2

Source: own computation, 2010
N = Number of respondents

Saving habit of the household

Ability to save refers to the saving behavior of households for future use. According to the survey, 31.5 percent of the sample households saved money in different banks for future use. Accordingly, 38.5% of non-defaulters and 3.8% of the defaulters have saving their money. There is significant difference in saving behavior between defaulters and non-defaulters at 1% significance level (Table 13). The result implies that the more the amount of savings, the greater the capacity to repay input credit.

Table 13. Distribution of sample respondents by saving habit

Variables		Non defaulters (N=104)		Defaulters (N=26)		χ^2 -Value	Total (N=130)	
		N	percent	N	percent		N	percent
Saving habit								
	Yes	40	38.5	1	3.8	11.54***	41	31.5
	No	64	61.5	25	96.2		89	69.5

*** Significant at 1% probability level
Source: own computation, 2010
N = Number of respondents

4.2. Benefits of Input Marketing through Cooperatives

Cooperatives are formed to create a collective capacity that would not be achieved separately. The main reason for the establishment of farmers cooperative is to resolve problems faced by members regarding input and produce marketing. As cooperative marketing in general has its own advantage for its members, input marketing has its inherent quality to give a unique advantage.

A sample survey conducted on 130 members indicated that all of them derive their income mainly from crop and livestock even though 39 respondents (30%) additionally derive their income from non-farms such as petty trade, casual work, etc.

Sample respondents were also asked to mention what benefits they gained from inputs marketed through primary cooperatives and requested to prioritize them.

All the respondents have indicated that they used the inputs they got from their cooperatives for rainy season cultivation. Out of these, 92 (71%) ranked the timely supply of inputs as number one benefit. Among the respondents 72 (57%) members put their preference for quality of the inputs supplied through cooperatives. The third advantage that was identified by 87 (70%) sample members as benefit obtained from cooperative was the availability and quantity of inputs.

The fourth advantage identified by sample members as benefit of input marketed through cooperatives is its distribution site is near by area. Thus, 90 (75%) of them selected the convenient place of input distribution. The collective aggregation demand of all members in one place helps in operating transportation service to the most inaccessible are made close to every member to collect inputs easily. This fact was explained by members as it has definitely reduced many efforts spend to procure inputs including long trip and renting carrying animals.

62 (54%) members indicated that the fair price of inputs supplied by cooperatives as the fifth benefit from input marketing through cooperatives. The primary cooperatives supply inputs with a reasonable price by considering the capacity of farmers in the area. The price increment of

inputs like fertilizers within the last two years are the result of international market price escalation and it would be much higher if it was not handled by cooperatives.

One of the advantages to be organized collectively in cooperatives gives legal recognition that creates an access to credit than acting alone. Thus, 59 (60%) of the respondents were identified getting credit was the six advantage they gained.

The last benefit that 52 (64%) sample households mentioned was the bargaining power they got. The farmers cooperative / unions/ used bidding process to identify different suppliers to supply inputs at least price. This resulted in saving a lot of money for the farmers. Similarly, transportation of the inputs to final users is made by bidding the transporters. This benefit is achieved as the result of bringing members input demand together and creating a bargaining power.

4.3. Challenges of Input Marketing through Cooperatives

The earlier discussion revealed that the major benefits derived by farmers from input marketing through cooperatives. However, these benefits are not totally free from challenges. Some of the challenges arise from the nature of marketing, while others are related to cooperatives organizational structure. In this survey, it was tried to identify these major challenges from all sides starting from individual members, cooperative committee members, cooperative promotion offices and all stakeholders involved in input marketing activity.

The first challenge that was identified by members is the increasing number of defaulters from time to time. The main reason why banks are not providing input credit for primary cooperatives without government collateral is that the cooperatives /members are defaulting their loans. The majority of the cooperatives do not fully repay their loans timely. Even in this study, out of 130 sample members 26 (20%) are found to be defaulters who did not repay their loan timely. Table 14 shows the amount defaulted by the sample cooperatives for the year 2004-2009.

Table 14. Sample cooperatives loan repayment status for the year 2004-2009

	2004- 2008				2009			
Sample cooperatives	Credit (Birr)	Repaid (Birr)	Remaining balance(Birr)	% of defau credit	Credit (Birr)	Repaid (Birr)	Remaining Balance (Birr)	% of defau credit
Godino	2,183,209.31	2,172,214.90	10,994.41	0.50	608,427.59	608,427.59	0.00	0.00
Denkaka	2,076,670.10	1,878,477.90	198,192.20	9.54	557,957.80	476,236.11	81,721.69	14.65
Lugo	3,452,372.85	3,348,171.20	104,201.65	3.02	573,912.48	472,255.52	101,656.96	17.71
Dirre	2,951,961.95	2,257,232.55	694,729.40	23.53	486,453.55	348,409.72	138,043.83	28.38
Dukem	2,847,319.99	2,415,577.64	431,742.35	15.16	859,551.86	558,898.08	300,653.78	34.98
Total	13,511,534.2	12,071,674.19	1,439,860.01	10.66	3,086,303.28	2,464,227.02	622,076.26	20.16

Source: own survey data, 201

The second challenge mentioned was all sample primary cooperatives have an accumulated default starting from 1995 to 2009 that is rolled from time to time. Due to lack of clear delivery system, poor record and weak monitoring system, most of these debts are only figures that were counted year to year on the name of primary cooperatives which can not be recovered.

All sample primary cooperatives have no professional manager except accountants. Honorary committee who lacks sufficient time and efficiency to identify and follow up each loan taker for utilization of credit for the desired purpose and timely repayment are running these cooperatives. In addition to this, absence of timely repayment by executive committee itself, logging for relatives and neighbors, lack of initiatives for taking legal action against defaulters are some of the major problems that arise from absence of strong follows up on credit disbursed to members.

Since agricultural technology of the region is not advanced, its success and failure is mainly dependent on the favorable weather conditions. Even though the occurrence of natural calamity is not a common problem to defaults, by the time it occurred, its repercussion is difficult to overcome shortly. In this survey, some members identified this phenomenon as a cause for the failures of timely input credit return. During the sample survey interview, 73 percent of the respondents who produced wheat in the cropping season of 2008 were mentioning as much reduction of wheat production occurred due to the occurrence of frost.

The last challenge the respondents mentioned was the ever increasing of input price. Since inputs (fertilizers, some of improved seeds and chemicals) are imported from abroad with foreign currency, their price depends on international market situation. In the last 2-3 years, the prices of these inputs increased more than double. This alarming rate of price increase shrank the demand for these inputs and ultimately resulted in the application of inputs far below the recommended level.

4.4. Results of the Econometric Model

4.4.1. Tobit model

Prior to running the Tobit model, the hypothesized explanatory variables were checked for the existence of multicollinearity, heteroscedasticity and doing the diagnostics for normality is very important before interpreting the model's significance, explanatory power, and the significance and estimates of the regression coefficients.

Multicollinearity

Multicollinearity problem arises when at least one of the independent variables is a linear combination of the others. The existence of multicollinearity might cause the estimated regression coefficients to have the wrong signs and smaller t-ratios that might lead to wrong conclusions. Two measures are often suggested to test the presence of multicollinearity. These are Variance Inflation Factor (VIF) for association among the continuous explanatory variables and contingency coefficients for dummy variables. According to Gujarati (2003), VIF can be defined as:

$$VIF_i = \frac{1}{1 - R_i^2}$$

Where VIF_i = Variance Inflation Factor and R_i^2 is the square of multiple correlation coefficient between X_i and the other explanatory variables. The larger the value of VIF_i the more collinear the variable X_i is. As a rule of thumb, if the VIF of a variable exceeds 10, there is a multicollinearity problem. The VIF values are presented in table 15.

Table 15. Variance Inflation Factor for the continuous explanatory variables

Variable	Variance Inflation Factor (VIF)
AGE	1.119
EDUCLVL	1.099
FAMSIZE	1.316
CULTLAND	4.799
LIVSTNO	3.207
NONFARM	1.100
ONFARM	4.097
AMFERT	6.452

Source: Computed from the field survey data, 2010

The VIF values displayed in Table 15 shows that all the continuous explanatory variables have no serious multicollinearity problem. Similarly, contingency coefficients were computed for dummy variables. Contingency Coefficient can be computed as:

$$CC = \sqrt{\frac{\chi^2}{N + \chi^2}}$$

Where, CC = Contingency Coefficient

X^2 = Chi-square random variable, and

N = total sample size

The values of the contingency coefficients were also low (less than 0.75) as shown in Table 16. Based on the tests both the hypothesized continuous and dummy variables were retained in the model.

Table 16. Contingency Coefficients for dummy variables

Variables	MARSTA	EXTEN	COOPSTA	SAVING
MARSTA	1	0.050	0.008	0.045
EXTSER		1	0.109	0.044
COOPSTA			1	0.010
SAVING				1

Source: Own computation, 2010

Heteroscedasticity

One of the assumptions in regression analysis is that the errors (u_i), have a common (constant) variance σ^2. If the errors do not have a constant variance, we say they are heteroscedastic (Maddala, 1992). However, the estimated parameters of a regression in which heteroscedasticity is present are consistent, though they are inefficient. In the case of the limited dependent variable models (such as Tobit), it is more practical to make some reasonable assumptions about the nature of heteroscedasticity and estimate the model than just to say that Maximum Likelihood estimates are inefficient if heteroscedasticity is ignored (Maddala, 1997).

In this study, heteroscedasticity was tested for all variables using robust standard error test (Table 17). There was no serious problem of heteroscedasticity in the model. Hence, all the important variables were included in the analysis.

Table 17. Maximum likelihood estimates using robust standard error to test heteroscedasticity

Variables	Coef.	Robust Std. Err.	t- ratio	P>|t|
AGE	0.0073	0.00971	0.75	0.454
MARST	-0.025	0.38937	-0.06	0.948
EDUC	-0.033	0.03528	-0.92	0.359
FAMSIZE	0.184	0.06905	2.66***	0.009
NONFARM	0.00083	3.04E-05	2.72***	0.004
ONFARM	1E-04	2.9E-05	4.21***	0
LIVSTNO	0.3914	0.22428	1.75*	0.084
CULTLAND	0.0423	0.04565	0.93	0.356
EXTEN	-0.189	0.27262	-0.69	0.490
COOPSTA	-0.229	0.29793	-0.77	0.444
SAVING	0.6779	0.28269	2.4**	0.018
AMFERT	-0.178	0.09827	-1.81	0.117
CONSTANT	-1.7	1.07591	-1.58	0.730

Number of observations = 130
Log likelihood function = - 63.9404
$\sigma = 1.0113$
***, ** and * represent level of significance at 1%, 5% and 10% respectively
Source: Own computation, 2010

Normality

To find out whether the error term follows the normal distribution or not the normality test should be checked formally. A comparatively simple graphical device to study the shape of the probability density function of a random variable is the normal probability plot which makes use of normal probability paper, a special designed graph paper. On the horizontal (X-axis), we plot values of the residuals and on the vertical (Y-axis) we show the expected value of the variable if

it were normally distributed. If the variable is from the normal population, the normal probability plot will be approximately a straight line (Gujarati, 2003).

Figure 2, shows that the residuals are approximately normally distributed, because a straight line seems to fit the data reasonably well.

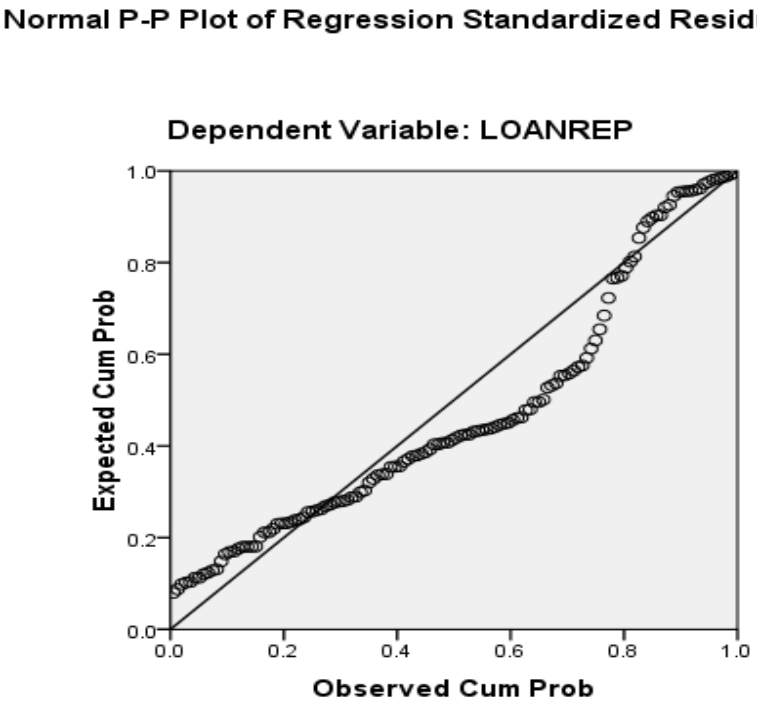

Figure 2. Normality test using normal probability plot of tobit model

The hypothesized determinants of timely input credit repayment are summarized in Table 18. The Tobit model results are depicted in Tables 19.

Table 18. Description of dependent and independent variables used in the Tobit model

Variable	Description	Types	Measurement Values	% With Value 1	Mean	SD
CREDITREP	Credit repayment	Continuous	Ratio of borrowed amt. To total credit disbursed			
AGE	Age of HHs head	Continuous	Number of years		47.66	44.49
EDUCLVL	Education of household head	Continuous	Number of class attended		4.04	3.94
FAMSIZE	Family size	Continuous	Man equivalent		5.91	2.08
CULTLAND	Size of cultivated land	Continuous	Cultivated land in hectares		2.97	2.23
LIVSTNO	No of livestock unit	Continuous	TLU		10.15	4.58
NONFARM	Income from non-farm activities	Continuous	Income in Birr		1550	3013
ONFARM	Income from on-farm activities	Continuous	Income in Birr		16834	10493
AMFERT	Amount of fertilizer used	Continuous	Quintals		3.48	3.43
MARSTA	Marital status	Continuous	1=married, 2=single, 3=divorce, 4=widow			
EXTSER	Extension service	Dummy	1=yes, 0=otherwise	66.9		
COOPSTA	Status in the cooperative	Dummy	1=elected, 0=otherwise	10.6		
SAVING	Saving habit	Dummy	1=yes, 0=otherwise	31.5		

Source: own computation, 2010

In this section, the results of the tobit model are presented and discussed. As already noted in Table 18, eight continuous and four discrete independent variables were selected on the basis of theoretical explanations and the findings of different empirical studies. The influences of each independent variable on the dependent variables are discussed below.

Determinants of loan repayment performance and intensity of loan recovery

The estimated results of the Tobit model are shown in Tables 19. A total of 12 explanatory variables were considered in the econometric model out of which five variables were found to be significant. These were family size (FAMSIZE), on-farm income (ONFARM), Non-farm income (NONFARM), number of livestock owned (LIVSTNO) and saving (SAVING). Among the five variables that were found to be significantly affecting the loan repayment performance, the coefficient of all these significant variables were positive, implying that the variables had a significant impact in enhancing credit repayment performance. The effect of these significant variables on the dependent variable is presented in Table 19.

A closer look at Table 19 shows that the significant explanatory variables do not all have the same level of impact on loan repayment performance. It is, therefore, important to discuss the effect of the significant variables on individual basis.

Family size (FAMSIZE): As expected, family size influenced positively and significantly the loan repayment performance of the households (significant at 5%). Each additional labor force increases the probability of being non-defaulter by 3.64 percent (Table 19). A unit increase in labor force also increases the rate of loan repayment by 0.0331 factors among the whole sample respondents and by 0.0395 factors among non-complete defaulters (Table 20). This result shows that households with larger family size avail more labor force for production purpose, so that the probability of defaulting is less. Therefore, families with sufficient labor force would be expected to be non-defaulters and families with inadequate labor force are expected to default.

On-farm income (ONFARM): This variable is another economic factor that has influenced loan repayment performance positively and significantly at 1 percent probability level. One Birr increase in on-farm income increases the probability of being non-defaulter by 0.00002 percent (Table 19). Each additional unit of on-farm income increases loan repayment performance by 2.21e-05 factors among the whole respondents and by 2.2e-05 factors among non-complete defaulters (Table 20). The possible explanation is that borrowers who earn higher income from their farm products give more consideration to loan repayment and settle their debt timely.

Non-farm activities (NONFARM): Is another economic factor that was positively and significantly affected loan repayment performance of smallholder farmers (significant at 1%). This might be because of non-farm activities were additional sources of income for smallholders and the cash generated from these activities could back up the farmers' income to settle their debt even during bad harvesting seasons and when repayment period coincides with low agricultural prices. One additional birr of Non-farm income increases probability of being non-defaulter by 1.9E-05 percent and on average increases the rate of loan repayment by 1.67E-05 for the entire respondents and by 1.96E-05 among defaulters (Table 20).

Total livestock ownership (LIVSTNO): This variable influenced the loan repayment performance of the respondent households positively and significantly (significant at 10% probability level). An increase in one TLU increases the probability of being non-defaulter by 7.75 percent (Table 19). Each additional unit of livestock (TLU) increases the performance of loan repayment by factors of 0.0704 among the respondents and by 0.0841 among non-complete defaulters (Table 20). The implication is that, Livestock are sources of cash in rural and serve as security against crop failure. Farmers who owned more livestock are able to repay their loans even when their crops fail due to natural disaster. In addition, as a proxy to oxen ownership the result suggests that farmers who have larger number of livestock have sufficient number of oxen to plough their field timely and as a result obtain high yield and income to repay loans.

Saving (SAVING): Saving behavior of the household influenced the loan repayment performance positively and significantly (significant at 5%). Household respondents who developed saving habit increases loan repayment performance by 0.132 and 0.1576 factors among the entire respondents and non-complete defaulters respectively and also increases the probability of being non-defaulter by 0.154 percent (Table 19). This implies that households who save their money gave more emphasis to credit repayment and settle their debt timely than households who do not save.

Table 19. Maximum likelihood estimates of the Two-limit Tobit model.

Explanatory Variables	Estimated Coefficients	Std. Err.	T-ratio	Change in probability
AGE	0.0073	0.0098	0.74	0.0014
MARSTA	-0.0253	0.4469	-0.06	-0.0051
EDUCLVL	-0.0325	0.0381	-0.85	-0.0064
FAMSIZE	0.1840**	0.0839	2.19	0.0364
NONFARM	8.3E-04***	3.04E-05	2.75	1.9E-05
ONFARM	1.2E-04***	3.4E-05	3.61	2.4E-05
LIVSTNO	0.3914*	0.2525	1.55	0.0775
CULTLAND	0.0423	0.0434	0.97	0.0084
AMFERT	-0.1780	0.1127	-1.58	-0.0353
EXTSER	-0.1889	0.3012	-0.63	-0.0389
COOPSTA	-0.2286	0.5662	-0.4	-0.0403
SAVING	0.6779**	0.3101	2.19	0.1543
CONSTANT	-1.7004*	0.9225	-1.84	

Number of observations = 130
Log likelihood function = - 63.94
Threshold values for the model: Lower= 0, Upper= 1
$\sigma = 1.0113$
***, ** and * represent level of significance at 1%, 5% and 10% respectively
Source: Own computation, 2010

Table 20. Marginal effect of independent variables on the intensity of loan repayment

Explanatory variables	Effect of change in independent variable on dependent variable			
	Change for observations at lower limit	Change for observations at upper limit	Change for non-complete defaulters	Change for all observations
AGE	0.0017	0.0012	0.0016	0.0013
MARSTA	-0.0058	-0.0043	-0.0055	-0.0046
EDUCLVL	-0.0074	-0.0053	-0.0069	-0.0058
FAMSIZE	0.0418	0.0307	0.0395	0.0331
NONFARM	2.09E-05	1.59E-05	1.96E-05	1.67E-05
ONFARM	2.3E-05	2E-05	2.2E-05	2.21E-05
LIVSTNO	0.0892	0.0653	0.0841	0.0704
CULTLAND	0.0097	0.0070	0.0091	0.0076
AMFERT	-0.0407	-0.0297	-0.0383	-0.0320
EXTSER	-0.0439	-0.0321	-0.0414	-0.0347
COOPSTA	-0.0493	-0.0361	-0.0464	-0.0389
SAVING	0.1671	0.1225	0.1576	0.1320

Source: Own data, 2010

4.4.2. Multiple regression model

One of the objectives of the study was to identify factors that determine the use of chemical fertilizer among farm households which is an important limiting factor for crop production. The result of the survey indicated that all of the respondent households have used chemical fertilizer supplied through primary cooperatives in 2009 cropping season though the rate of application is by far below the recommendation rate which is 100 kilogram per hectare for DAP and 100 kilogram per hectare for UREA.

A multiple linear regression model was fitted to identify a set of variables that cause variability in the dependent variable (amount of fertilizer used). The regression analysis was carried using statistical software called Stata. The variables are listed in Table 21.

Table 21. Description of independent variables used in the multiple regression model

Variable	Description	Types	Values	% With Value 1	Mean	SD
AMFERT	Amount of fertilizer used (dependent)	Continuous	Quintals		3.48	3.43
AGE	Age of HH head	Continuous	Years		47.66	14.49
EDUCLVL	Education of household head	Continuous	Number of class attended		4.04	3.94
FAMSIZE	Family size	Continuous	Man equivalent		5.91	2.08
CULTLAND	Size of cultivated land	Continuous	Hectares		2.97	2.23
OXENO	Number of oxen owned	Continuous	Number		3.06	1.70
LIVSTNO	No of livestock owned	Continuous	Number		10.15	4.58
NONFARM	Income from non-farm activities	Continuous	Non-farm income in birr		541	970
ONFARM	Income from farm activities	Continuous	Farm income in birr		16833	10493
MARSTA	Marital status	Continuous	1=married,2=single 3=divorce,4=widow			
EXTSER	Extension service	Dummy	1=yes, 0=otherwise	66.9		
COOPSTA	Status in the cooperative	Dummy	1=elected, 0=otherwise	10.6		
SAVING	Saving habit	Dummy	1=yes, 0=otherwise	31.5		

Source: own computation, 2010

Before proceeding to further analysis the data were tested for multicollinearity, normality and heteroscedasticity problem.

Multicollinearity

In this case, the VIF was used to examine the degree of association among independent variables. Table 22 presents the VIF values for the continuous explanatory variables. The results indicated that the variables have low VIF values as a result of which all were retained for further analysis.

Table 22. Variance Inflation Factor for the continuous explanatory variables

Variable	Variance Inflation Factor (VIF)
AGE	1.119
EDUCLVL	1.099
FAMSIZE	1.316
NONFARM	1.100
ONFARM	4.097
CULTLAND	4.799
OXENO	2.263
LIVSTNO	3.207

Source: Computed from the field survey data, 2010

Similarly, Contingency Coefficients were computed to test the degree of association among the 4 discrete variables. Table 23 presents the association among these variables. The results indicated that there was a weak association among them and, thus, all were retained for further analysis.

Table 23. Contingency Coefficients for dummy variables

Variables	MARSTA	EXTEN	COOPSTA	SAVING
MARSTA	1	0.050	0.008	0.045
EXTSER		1	0.109	0.044
COOPSTA			1	0.010
SAVING				1

Source: Own computation, 2010

Heteroscedasticity

One of the assumptions in regression analysis is that the errors (u_i), have a common (constant) variance σ^2. If the errors do not have a constant variance, we say they are heteroscedastic (Maddala, 1992). However, the estimated parameters of a regression in which heteroscedasticity is present are consistent, though they are inefficient.

In this study, heteroscedasticity was tested for all variables using robust standard error test (Table 24). There was no serious problem of heteroscedasticity in the model. Hence, all the important variables were included in the analysis.

Table 24. Coefficient estimation using robust standard error test for heteroscedasticity

Variables	Coef.	Robust Std. Err.	t-ratio	P>|t|
AGE	-0.014633	0.00935	-1.56	0.12
MRSTA	0.459006	0.454657	1.01	0.315
EDUC	0.054202	0.034314	1.58**	0.017
FAMSIZE	0.120195	0.071793	1.67*	0.097
NONFARM	0.089654	0.291231	0.31	0.759
ONFARM	0.000053	2.53E-05	2.09	1.38
CULTLAND	1.698933	0.126554	13.42***	0
OXENO	0.276421	0.114085	2.42**	0.017
LIVSTNO	-0.014024	0.051216	-0.27	0.785
EXTEN	0.097377	0.282008	0.35	0.73
COOPSTA	-0.520408	0.48977	-1.06	0.29
SAVING	0.789034	0.288981	2.73***	0.007
CONSTANT	-2.009567	0.811734	-2.48**	0.015

***, ** and * represent level of significance at 1%, 5% and 10% respectively
R2 = 88%
Adj. R^2 = 86.8%
Source: Own computation, 2010

Normality

To find out whether the error term follows the normal distribution or not the normality test should be checked formally. A comparatively simple graphical device to study the shape of the probability density function of a random variable is the normal probability plot which makes use of normal probability paper, a special designed graph paper. On the horizontal (X-axis), we plot values of the residuals and on the vertical (Y-axis) we show the expected value of the variable if it were normally distributed. If the variable is from the normal population, the normal probability plot will be approximately a straight line (Gujarati, 2003).

Figure 3, shows that the residuals are approximately normally distributed, because a straight line seems to fit the data reasonably well.

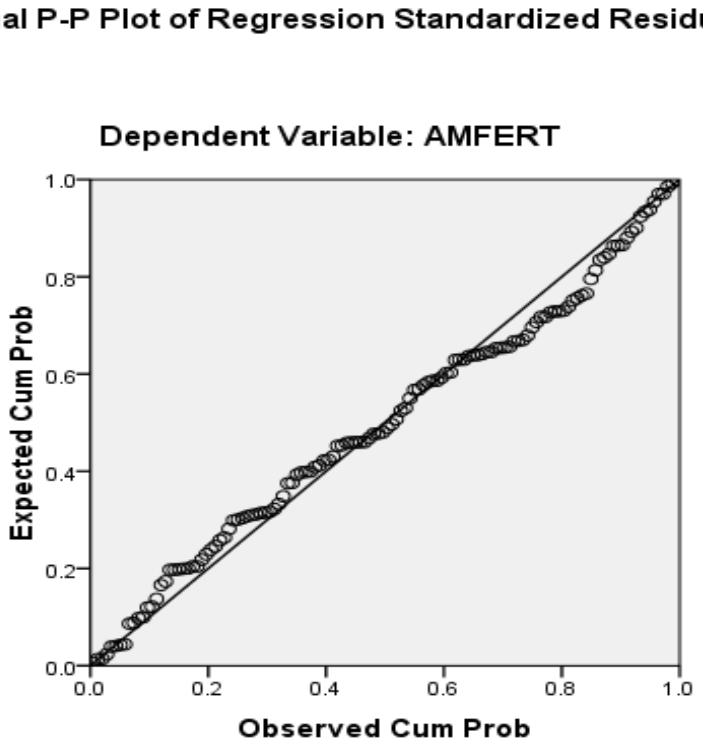

Figure 3. Normality test using normal probability plot of multiple regression

As indicated in Appendix Table 7, the coefficient of determination and the adjusted R^2 values are 0.881 and 0.86.9 respectively. It means that about 88% of the variation in the dependent variable is explained by the independent variables, indicating relatively high explanatory power of the model.

In testing the hypothesis that H_o: b_1, $b_{2,}$…, b_{13}=0, against the alternate hypothesis H_1: b_1, $b_{2,}$…, b_{13} is different from zero, the F statistics was employed. The F-value obtained is significantly different from the critical value of F at 12 and 117 degrees of freedom for numerator and denominator respectively, at significance level of less than 1%. The model output revealed that the null hypothesis is rejected, implying that the model can help estimate the relation ship between fertilizer use and the hypothesized variables.

The results of multiple regression analysis showed that Age, educational status, family size, cultivated land, number of oxen owned and saving money were significantly influence fertilizer use among respondents (Table 25). The effect of these significant variables on the dependent variable is discussed below.

Age (AGE): This variable was negatively and significantly influencing fertilizer use (significant at 10% significance level). As indicated in Table 25, thus, a unit increase in age decreases the use of fertilizer by 0.016 quintals, ceteris paribus. This suggests that each additional unit increase in age after some retiree ages would thus add less to household production obtained and may reduce household income leading to low fertilizer use.

Education level (EDUCLVL): As expected, education level was positively influencing fertilizer use (significant at 5% significance level). As indicated in Table 25, an increase in one year of schooling increases the use of fertilizer by 0.052 quintals, ceteris paribus. This suggests that ability to read and write would improve access to information so that farmer can easily understand the benefit of fertilizer use (improved technology).

Family size (FAMSIZE): was also positively influenced fertilizer use (significant at 10% level). Each additional unit of family labor increases the use of fertilizer by 0.121 quintals, ceteris paribus. This suggests that the use of fertilizer is more attractive to households with large number of family labor force.

Oxen owned (OXENO): The variable was found to influence significantly (at 5%) and positively the amount of fertilizer use. The more oxen available for draught purpose, the more the amount of land to be cultivated and the more fertilizer used as indicated by the coefficient. That is, an increase of oxen by one unit, contributed to fertilizer use of 0.278 quintals, ceteris paribus.

Cultivated land (CULTLAND): This variable was found to influence positively and significantly (at 1%) the amount of fertilizer use. That is, households who owned more land that is cultivated, use inputs in a large amount than those who owned less. Keeping the other factors constant, a unit increases in hectare of land, increases fertilizer use by 1.693 quintals, ceteris paribus.

Saving (SAVING): As expected, saving behavior of the household respondents influence fertilizer use positively and significantly at 1% significance level (Table 25). The ability to save increases fertilizer use of the respondents by 0.795 quintals, ceteris paribus.

Table 25. Output of the multiple linear regression model of fertilizer use analysis

Variables	β	Std. Err.	t-ratio	P>|t|
AGE	-0.016*	0.009	-1.69	0.094
MARSTA	0.484	0.452	1.07	0.286
EDUC	0.052**	0.034	1.51	0.035
FAMSIZE	0.121*	0.0708	1.71	0.09
NONFARM	1.48E-04	1.4E-04	1.07	0.287
ONFARM	4.93E-05	2.5E-05	1.94	0.055
CULTLAND	1.693***	0.126	13.42	0
OXEN	0.278**	0.114	2.45	0.016
LIVSTNO	-0.016	0.051	-0.31	0.755
EXTEN	0.107	0.281	0.38	0.703
COOPSTA	-0.543	0.488	-1.11	0.268
SAVING	0.767***	0.288	2.66	0.009
(Constant)	-2.049**	0.807	-2.54	0.012

***, ** and * represent level of significance at 1%, 5% and 10% respectively
R2 = 88.1%
Adj. R^2 = 86.9%
Source: Own computation, 2010

5. SUMMARY AND CONCLUSIONS

5.1. Summary

In the process of transforming traditional and subsistence agriculture into modern and market-oriented system, the introduction of yield increasing and improved technologies is indispensable. However, the performance of the agricultural sector in terms of both productivity and production in our country is poor and so food self-sufficiency has not been attained. This might be related to limited use of modern agricultural technologies such as chemical fertilizers, improved seeds, crop protection chemicals and farm implements. Even though the use of such technologies was introduced several years ago in Oromia, still the use of these inputs is very low.

The use of these improved technologies demands more capital than what the farmers can afford. There is a wide gap between owned and required capital to finance these technologies since the income from subsistence agriculture has no much surplus beyond family consumption and other basic obligations for the majority of the households. Furthermore, in agricultural production process there is a time gap between incurring production expenses and receiving farm income.

All these factors call for the availability of input credit from external sources to fill the gap of financial deficiencies. One of the features of agricultural cooperatives is their supply of input in credit for the farmers with some prepayment. The credit is extended until the next harvesting season (for one year). The loan should be paid back to the lending cooperative to have sustainable supply of input in credit. Contrary to this fact, it has been reported that the loan have been infected by arrears and there has been delinquency problem in the past two to three decades even in good harvesting seasons. In most cases, this repayment problem went beyond the capacity of cooperatives themselves and started seeking assistance from government. That is why the regional government development budget is used for loan repayment and civil servants and other government personnel have bean striving on loan repayment campaign.

This study was intended to analyze factors responsible for input credit repayment performance and input use in Ada district in the 2009 production season. To study the problem of defaulting behavior and smallholders' loan repayment performance, institutional, personal and socio-economic characteristics were included in the model. Primary data were collected from five randomly selected primary cooperatives and 130 sample households that obtained inputs in credit from their primary cooperatives. Moreover, secondary data were obtained from regional, zonal and wereda CPO and ARDO.

For data analysis, descriptive statistics, Tobit and multiple regression models were used. Descriptive statistics results show that 20 percent of the sample households defaulted on the loans they obtained. In addition, descriptive statistics results show that there were significant differences between defaulters and non-defaulters with respect to Age, family size, cultivated land size, number of livestock owned, income from on-farm activities, amount of fertilizer used and saving habit. On the other hand, from 12 explanatory variables used in the Tobit regression model, five variables (family size, income from non-farm activities, number of livestock owned, income from on-farm activities and saving status) had a statistically significant positive influence on loan repayment performance of the sample households.

Finally, multiple regression analysis was employed to identify important variables that cause variation in amount of fertilizer use. Twelve variables were entered into the regression analysis and six variables were found to be statistically significant at less than 10% level. These variables are Age, education level, family size, cultivated land, number of draught oxen owned and saving habit of the household. All variables had the expected sign which is supported by economic theory.

Sample respondents were asked to mention the benefits of inputs marketed through primary cooperatives and requested to prioritize them. Accordingly, timely input supply, getting quality and quantity required (especially fertilizer), convenience of place of distribution, reliable price, credit availability, production increment and strengthened bargaining power in this order as the

benefits of agricultural inputs marketed through cooperatives. They also mentioned the major problems as the growing number of defaulters, absence of decision on bad debits, natural calamities and increased price of inputs especially that of fertilizer.

5.2. Conclusion and Recommendation

Based on the findings of the study, the following recommendations are forwarded.

- The finding of this study revealed that, livestock are important farm assets that improve farmers' repayment performance or sufficient input purchase. It is, therefore, important that more attention should be given to the livestock sector to improve their genetic, feed and management conditions.

- The results also showed that, farmers engaged in non-farm activities earn more income and able to settled their debts timely and can also pay down payment to purchase inputs. This shows that, rural development strategies should not only emphasis on increasing agricultural production but concomitant attention should also be given to promoting non-farm activities in the rural areas.

- Both saving habit and credit facilitation are an integral part of economic development, which engages people in economic activities that enhance self-reliance. Savings and credit scheme increases the productive potential of poor farmers particularly of women-headed households. Credit facilitation through cooperatives plays a crucial role in agricultural production in countries like Ethiopia if managed in a proper way.

- The study revealed that education level of a household head positively and significantly influenced farmer's input (fertilizer) use. This clearly indicates that for effective utilization of improved technologies, enhancing the educational status of the farmers

through adult education, training and the expansion of primary education should be given due attention.

- The result of the study showed that family size was positively and significantly related to input (fertilizer) use and credit repayment performance. This indicates the importance of human labor in the development of the country in general and credit repayment in particular. Therefore, the capacity of this active labor force should be improved through education and training to make them more productive.

- Farmers' dependency on credit of input has to be eliminated by developing saving culture in the rural communities.

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7. APPENDICES

7.1. Appendix I. Different tables of descriptive statistics and data

Appendix Table 1. Conversion factors used to estimate man equivalent.

Age group	Male	Female
<10	0	0
10-13	0.2	0.2
14-16	0.5	0.4
17-60	10	0.8
>50	0.7	0.5

Source: Bekele Hundie (2001)

Appendix Table 2. Conversion factors used to estimate TLU

Types of animals	TLU
Cow	1
Ox	1
Bull	1
Heifers	0.75
Cafe	0.40
Sheep/ Goat	0.10
Donkey	0.50
Horse/ mule	0.80
Camel	1

Source: Freeman et al. (1996).

Appendix Table 3. Summary of input utilization of sample respondents of the year 2009

Type of crops	Area cultivated (ha.) /own + rented	Inputs utilized				
		DAP (Qt.)	Urea (Qt.)	Improved seed (Qt.)	chemicals (Qt.)	Total
Tef	189.25	168	136.75	9.05	0.5	314.3
Wheat	101.5	77.75	61.75	20.9	0.32	160.72
Lentil	20.125	0	0	6.45	0.09	6.54
Chickpea	38	0	0	7.1	0.1	7.2
Bean	20.75	0	0	0	0	0
Pea	10.75	0	0	0	0	0
Others	5	4.5	3.25	0	0.02	7.77
Total	385.375	250.25	201.75	43.5	1.03	496.53

Source: Own data, 2010

Appendix Table 4. Inputs used in the Ada district in the year 2005-2009

Cropping Season	Type of inputs				
	DAP (Qt.)	Urea (Qt.)	Improved seeds(Qt.)	Herbicides (lt)	Pesticides (lt)
2005	37,247	22,544	2,823.60	7,200	340
2006	39,274	22,587	1,420.50	6,500	660
2007	37,304	22,877.50	2,544.90	8,310	200
2008	25,164	21,349.50	2,224.55	6,700	500
2009	31,065	20,617	930.57	6,196	320
Total	170,054	109,975	9,944.12	34,906	1,680

Source: ACPO annual report of 2009

Appendix Table 5. Loan repayment status of Ada district for the year 2004/05-2008/09

Cropping Season	Credit (Birr)	Repaid (Birr)	Remaining balance (Birr)	% of default credit
2004/05	11,188,854.41	9,920,084.00	1,268,770.41	11.34
2005/06	16,333,048.15	15,095,324.09	1,237,724.06	7.578
2006/07	12,178,771.29	11,667,000.49	511,770.80	4.20
2007/08	8,129,175.98	7,369,557.61	759,618.37	9.344
2008/09	11,711,886.24	10,003,747.87	1,708,138.37	14.58
Total	59,541,736.07	54,387,048.78	5,154,687.29	8.657

Source: ACPO annual report

Appendix Table 6. Analysis of Variance (ANOVA)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Model	1856.541	12	154.712	72.6	.0000
	Residual	249.1332	117	2.12934		
	Total	1856.541	12	154.712		

a Predictors: (Constant), SAVING, COOPSTA, OFFARM, AGE, OXEN, HEALTH, MARSTA, EXTEN, FERTSTA, EDUC, SEX, FAMSIZE, CULTLAND, LIVSTOCK
b Dependent Variable: FERTIUSE
R2 = 88.1% Adj. R^2 = 86.9%

Source: Own computation, 2010

Appendix Table 7. Members of primary cooperatives in Ada district

No	Name of cooperative	Male	Female	Total
1	Akako	991	215	1206
2	Bekejo	701	136	837
3	Chelleba Sillase	549	47	596
4	Deko	512	40	552
5	**Denkaka**	**944**	**129**	**1073**
6	**Dire**	**1484**	**156**	**1640**
7	**Dukem**	**1193**	**173**	**1366**
8	Giche Garababo	1037	115	1152
9	Genda Gorba	622	112	734
10	**Godino**	**635**	**119**	**754**
11	Golbo	422	288	710
12	Hidi	637	71	708
13	Keta Jara	410	61	471
14	Kerfe	1340	207	1547
15	**Lugo**	**634**	**114**	**748**
16	kajima	1089	105	1194
17	kaliti	642	138	780
18	katila	742	134	876
19	koftu	1013	127	1140
20	Ude	1270	201	1471
21	Yerer Silase	722	302	1024
	Total	17589	2990	20579

Source: ACPO annual report

7.2. Appendix II. Survey questionnaire

Determinants of Credit Repayment and Agricultural Inputs Use Marketed through Primary Cooperatives in Ada'a District

Instructions for the interviewers

- Introduce your self and tell the purpose of the study before starting interview
- Circle the letter for the closed questions
- Write interview questions clearly
- Use only pencil

N:B - This questionnaire is used only for the academic purposes. Thank you for your cooperation.

A. General information

1. Name of the District_____
2. Name of the cooperative _____
3. Name of the respondent _____
4. Name of the enumerator_____
5. Signature of the enumerator_____
6. Date _____

B. Farmer/ Household information

7. Age_____ (years)
8. Gender
   a) Male b) Female
9. Martial Status
   a) Married b) Single c) Divorced d) Widowed
10. Educational level _____ (in grade)
11. What is your family size? Male_____ Female _____ Total_____
12. What is economic status of your family?
    a) Economically dependent_____ (in number)
    b) Economically active _____ (in number)
13. What are the main sources of your income in order of importance?
    a) Sale of grains _____%
    b) Sale of livestock_____%
    c) Sale of vegetables _____%
    d) Others /Specify_____ (_____) %
14. Did the household involve in any off/non-farm activities in 2001/02 E.C.?
    a) Yes b) No
15. If yes, in what type of activity?
    a) Petty trade (poultry & egg, milk & milk products, hides & skins, crop residue, honey)
    b) Casual work
    c) Handicraft

d) Others /Specify_____

16. What was the estimated amount of income for the year?
    a) From farm production _____ birr
    b) From off-farm (if any) _____birr
    c) Total income (a + b) _____birr
17. Health condition of the household
    a) Seriously ill b) In good condition c) Other (specify)_____

C. Farm characteristics

18. How much is your cultivable land size in hectares (own land)? _____
19. Did the household rented in /shared in someone land?
    a) Yes b) No
20. If the answer to question no 19 is yes, what was the size of the cultivable land rented in/ shared in(ha)
    _____ and _____
21. If the answer to question no 19 is yes, what was/ were the reason (s) for renting in/shared in?
    a. Availability of fertilizer and other farm inputs
    b. Because of land shortage
    c. Because of the extra labor I had
    d. Others/ specify _____
22. If the answer to question no 19 is yes, the type of agreement is
    a) In birr b) In grain
23. If it was in birr, how much it was? _____Birr/ha
24. If it was in grain, how much quintal and what type of grain it was? _____birr per hectare
25. Have you rented out/shared out land to other farmers?
    a) Yes b) No
26. If the answer to question no 25 is yes, what was the size of the cultivated land rented out/ shared out? _____ and _____(ha)
27. If the answer to question no 25 is yes, what was the reason for renting out/ sharing out?
    a) Shortage of money to buy fertilizer and other inputs b) Disabled
    c) Shortage of ox d) Others (specify)_____
28. If the answer to question no 25 is yes, the type of agreement is
    a) In birr b) In grain
29. If it was in birr, how much is it? _____Birr/ha
30. If it was in grain, how much quintal and what type of grain it was? _____qt. per hectare
31. What is the fertility status of your farm land?
    a) Good b) Medium c) Poor
32. How many oxen do you have for drought purpose? _____
33. How many livestock do you have?

No	Type of livestock	Amount (in number)
1	Cattle	
2	Sheep	
3	Goat	
4	Horse	
5	Donkey	
	Others(specify)	

34. Total cultivated land in the year 2008/09 crop season

No	Crop type	Hectare
1	Tef	
2	Wheat	
3	Lentil	
4	Chickpea	
5	Bean	
6	Pea	
7	Barley	
8	others	
	Total	

35. Did the land increasing or decreasing in the past three cropping seasons?
    a) Increased b) Decreased c) No difference
36. Do you use agricultural inputs for your cultivation for the past three years?
    a) Yes b) No
37. For which crops you have used inputs for the cropping year 2008/09?

No	Crop type	DAP (Qt)	Urea (Qt)	Improved seed (Qt)	Pesticide (Kg/Lt)	Insecticide (Kg/Lt)
1	Tef					
2	Wheat					
3	Lentil					
4	Chickpea					
5	Bean					
6	Pea					
7	Vegetables					
8	Others(specify)					
	Total					

38. Who was the supplier of the inputs you utilized in the past three cropping seasons?
    a) Cooperatives b) Private companies c) Others (specify)_____
39. How did you pay for procuring these inputs?
    a. Down payment with _____ %
    b. 100 percent cash purchase

c. On 100 percent credit base
d. Other (specify) _____

40. If it is on credit which institution provides you?
    a. Cooperatives b) Micro Finance Institutions c) Others (Specify) _____
41. If the input was supplied by cooperatives was it
    a. the quantity demanded? a) Yes b) No
    b. the desired quality? a) Yes b) No
    c. timely supplied? a) Yes b) No
    d. supplied at the right distribution center? a) Yes b) No
    e. At fair price? a) Yes b) No
42. Was your application of the inputs as per the recommendation?
    a) Yes b) No
43. If the answer to question no 25 is no, what are the reasons?
    a. Its affordability b) Shortage of supply c) Lack of credit
    d. Others (specify)_____
44. What was the price of your produce?
    a. Better price b) Fair price c) Unfair price

D. **Education/ training**

45. Did you get education/ training from the cooperative in 2001/02 E.C.?
    a) Yes b) No
46. If Yes, on what points it gave you education/ training?
    a) The benefits of the cooperative
    b) The need of the members commitment to the cooperative
    c) The principles of the cooperative
    d) Others/specify_____
46. Did you get any training or education about the cooperative from any other sources?
    a) Yes b) No
47. If yes, which sources give you that education/ training?
    a) The Woreda cooperative promoters and organizers
    b) The Union c) NGOs d) Development agent (DA)
    e) Others/ specify_____

E. Cooperatives

48. For how long you have been a member of cooperative? _____(in years)
49. What was the main reason you become member of the cooperative?
    a) For inputs supply _____ %
    b) For credit facilities _____ %
    c) To get grain marketing service _____ %
    d) others (specify)_____ (_____) %
50. What is your current status in the cooperative?
    a) Member b) member of board of director
    c) Other committee members d) employed staff

51. Did you face problem on input distribution? A) Yes B) No
52. What problem did you face mostly in getting inputs?
    a) Not available on time b) Not available in required quantity
    c) Price is high d) Low quality e) No problem
53. If the answer to question no 3 is not available how did you overcome the shortage of inputs? _____
54. Have you ever got training from your cooperative? a) Yes b) No
55. If the answer to question no 54 is yes, on what topic?
    a) Importance of cooperative b) Credit utilization and loan repayment
    c) Use of improved technologies d) saving e) other (specify) _____
56. How did you measure the efficiency of the cooperative in input supply, loan administration and credit repayment?
    a) Strong b) Fair c) Weak d) I don't know

F. Credit

57. How did you get inputs?
    a) In cash b) In credit c) Both
58. Which one do you prefer?
    a) In cash b) In credit c) Both
59. If in credit for how long you have bean taking credit for input purchase? _____ Years.
60. Which input did you take in credit for the past three years?

No	Inputs taken with credit	2008/09		2007/08		2006/07	
		Yes	No	Yes	No	Yes	No
1	Fertilizers						
2	Improved seeds						
3	Pesticides						

61. Why did you take inputs with credit?
    a. I don't have money to pay
    b. Since it is available in credit
    c. Because others take it
    d. Other (specify) _____
62. Did you pay the entire inputs loan you take timely?
    a) Yes b) No
63. Have you ever default your loan?
    a) Yes b) No
64. If not paid, how could you get inputs loan for the next production season?
    a. Not to use improved inputs
    b. Share it with others who get through credit
    c. Get as others through negotiation to repay all loans next year

d. Other (specify) _____

65. In your opinion what are the main reasons for some households to be a defaulter for loan? And rank according to their significance.

Reasons	Rank
a. Unwilling to pay	_____
b. Lack of market for the produce	_____
c. Inappropriate repayment time	_____
d. Inefficiency of the cooperatives in collecting timely	_____
e. In appropriate delivery system	_____
f. Natural hazards	_____
g. Other (specify) _____	_____

Benefits and Challenges of Agricultural Inputs Marketed through Cooperatives

66. What are the benefits you gained being involved in agricultural inputs marketed through cooperatives?

No	Type of Benefits	Do you get benefits?		
		Yes	No	Rank
1	Timely input supply			
2	Quality of the supplied inputs			
3	Quantity of the supplied inputs			
4	Convenient place of distribution			
5	Reasonable price			
6	Availability of credit			
7	Strengthen the bargaining power			
8	Help in increasing productivity			
9	Capacity building			
10	Dividend			
11	Others (specify)			

67. what are the major problems that you have observed regarding input marketing through cooperatives

No	Problems	Yes	No	Rank
1	Dependency on credit			
2	Lack of Saving habit			
3	Growing number of defaulters			
4	Making faults in screening system			
5	Inappropriate procedure in for distribution			
6	Lack of awareness on credit taking and timely repayment			

7	Absence of strong follow up on credit given			
8	Absence of taking measures against defaulters			
9	Others (specify)			

68. Do you save regularly? a) Yes b) No
69. Where do you save? (specify) _____

Checklist for discussion with ARDO, CPO, Union, Administrative office at woreda and Zonal level

How do you see input use performance for the past five years?
If not fair what are the reasons?

_____
_____
_____
_____
_____

Cropping year	Fertilizer		Improved seeds (Qt.)	Herbicides (lt.)	Insecticides (lt.)	Remark
	DAP (Qt.)	Urea (Qt.)				
2005						
2006						
2007						
2008						
2009						

How do you see timely credit repayment activities for the past five years?
If not fair what are the reasons?

_____
_____
_____
_____
_____

Cropping Season	Credit (Birr)	Repaid (Birr)	Remaining balance (Birr)	% of default credit
2004/05				
2005/06				
2006/07				
2007/08				
2008/09				
Total				

What is the role of your organization in input distribution, technology dissemination, and in credit repayment activities?

_____
_____
_____
_____
_____

What are the major benefits/advantages of Agricultural inputs being marketed through primary cooperatives?

_____
_____
_____
_____
_____

What are the major Problems of Agricultural inputs use and timely credit repayment marketed through primary cooperatives?

_____
_____
_____
_____
_____

Do you have any strategy to overcome these problems? If your answer is yes what are they?

_____
_____
_____
_____
_____