Mekelle University
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Factors Affecting Adoption and Profitability of Fertilizer Marketed Through Cooperatives in Enderta Woreda, Ethiopia

By
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In
Cooperative Marketing

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DECLARATION

This is to certify that this thesis entitled "Factors Affecting Adoption and Profitability of Fertilizer Marketed through Cooperatives in Enderta Woreda, Ethiopia" submitted in partial fulfillment of the requirements for the award of the degree of M.Sc., to the School of Graduate Studies Mekelle University, through the Department of Cooperatives, done by Tsehaye Kidanu Id. No. 0021/99 an authentic work carried out by him under my guidance. The matter embodied in this project work has not been submitted earlier for award of any degree or diploma to the best of my knowledge and belief.

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ABSTRACT

In spite of the high potential of agriculture, the country could not yet attain self-sufficiency in food production. Various development strategies have been undertaken to improve the performance of agriculture. Intensification of agriculture through the establishment of various projects and institutions has been emphasized over the last three decades. The results of a number of fertilizer use demonstrations and trails played a significant role in encouraging farmers to apply fertilizer. The farmers began to learn the value of fertilizer as the key input to increase production. However, fertilizer adoption rate leaves much to be desired, given the fast growing population and the rapidly declining fertility of the soil.

This study attempted to address the factors associated with fertilizer adoption and profitability marketed through Enderta cooperative union. The study area is located in the south east zone of Tigray region. Livestock and crop husbandry are the dominant farming practices. Wheat, barley and teff are the major cereal crops grown in the district, in about 83% of the total cultivated area. Data were collected from 140 sample cooperative members and 64 non-members, using a pre- tested and structured interview schedule. Female headed households constituted 13.24% of the total sample. A bout 87.9% of cooperative members and 68.8% of the non-members adopt chemical fertilizer in 2006/7 crop season.

To examine and quantify the factors of fertilizer marketed through cooperative the logit model was used. Value-Cost-Ratio (VCR) was used to estimate fertilizer profitability. The results of logit model showed that Credit, extension service, oxen ownership, age of the farmer, family size,

farmers level of education and availability of manure, are the most important factors of fertilizer adoption. The VCR indicated that teff growers in the study area obtained less profit from the use of fertilizer.

Fertilizer price, location specific rate of fertilizer application, interest rate or cost of capital and development of rural feeder roads for timely delivery of inputs (fertilizer), improved extension services and education are areas where interventions are needed.

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ABBREVIATIONS

ADLI : Agricultural development led industrialization

GDP : Gross domestic product

GoE : Government of Ethiopia.

SDPRP : Sustainable Development and Poverty Reduction Program.

FSS : Food Security Strategy

PASDEP : Plan for Accelerated and sustained Development to End Poverty

MOFED : Ministry of Finance and Economic Development.

HYV : High Yielding Variety.

CADU : Chillalo Agricultural Development Unit.

WADU : Welayta Agricultural Development Unit.

ADDP : Ada District Development project.

EPID : Extension and project Implementation Development.

PADEP : Peasant Agricultural Development and Extension Project.

PPS : Probability proportionate to size.

DBE : Development Bank of Ethiopia.

DCSI : Dedebit Credit and Saving Institution.

CBE : Commercial Bank of Ethiopia.

CSA : Central Stastical Agency.

IAR : Institute of Agricultural research

NBE : National Bank of Ethiopia.

MOARD : Ministry of Agriculture and Rural Development.

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BIOGRAPHY

A. Birth date and educational background.

March 1965 Born in Tigray Region, Eastern zone, Adigrat town.
1975- 1981 Completed Grade 1-6 at Mekelle Atseyohanes Elementary school.
1982- 1983 Completed Grade 7-8 at Mekelle junior Secondary High school.
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1988- 1992 Enrolled at Asmara University and transfer to Addis Ababa University and obtain a Bachelor of Arts degree in economics.

B. WORK EXPERIENNCE.

1. February 1993---September 1993 served the Bureau of Natural Resource as planning expert.
2. October 1993- 1997 served DCSI as a Branch manager in different woredas of Tigray i.e. Endasilassie Shire, Tsirae and Quiha.
3. May 1998—2000 in World Vision Kilteawlaelo Area development program as monitoring and evaluation officer.
4. From 29/03/2000 up to 05/03/2001 at Messebo cement factory as sales division and marketing study head.
5. From 06/03/2001 up to July 2004 in the regional EDRP office working as Monitoring and Evaluation Expert.
6. From July 2004 up to September 2007 in Tigray Flour Share Company as a General Manager.
7. From December 2007 up to now working in Tigray Agricultural Marketing Promotion Agency as acting Department head of Agricultural Marketing Infrastructure and Technology Promotion.

CHAPTER I

1. INTRODUCTION

1.1. Background of the study

Ethiopia presents one of the most important global challenges in agricultural development. Being among the poorest countries in the world, the agricultural sector accounts for about 47.3 percent of national GDP, 90 percent of exports and 85 percent of employment.(Annual report of NBE. 2005/06). Rural poverty is compounded by extreme shortages of land in the highlands, with per capita land area falling from 0.5ha in the 1960s to only 0.2ha currently, and with marginal productivity of labor estimated at close to zero (World Bank, 2005b).

The Government of Ethiopia's (GOE's) economic growth strategy, Agriculture Development Led Industrialization (ADLI), formulated in 1991, accordingly placed a very high priority on agricultural growth and achieving food security. Agriculture has been at the core of the GOE's poverty reduction strategy, including the Sustainable Development and Poverty Reduction Program (SDPRP) approved in 2002, the 2004 Food security Strategy (FSS), and, most recently, the 2006 plan for Accelerated and Sustained Development to End Poverty (PASDEP) (MOFED, 2002:2006).

The agriculture sector plays a prominent role in determining overall economic growth as it consistently accounts for more than half of overall economy. During the Imperial period, the share of agriculture in real GDP declined steadily from 75.8% in 1960/61 to 61.7% in 1973/74. However, this trend slowed down and agriculture share of GDP averaged 55.9% during the military regime. In post-Derg regime, the share of

agriculture to GDP resumed to decline and reached 44.2% in 2004/05. (YU,Diao, Taffesse and Wamisho 2007).

Though nearly 66% of total land area of 112 million ha is suitable for cultivation, only about 29% of it is cultivated. Smallholder farming dominates agriculture. Rural households having access to less than 0.5ha of land constitute 40%; those cultivating between 0.5ha and 1 ha are 24%, and those with land holding of 1 ha to 2 ha are 25% of rural households. In other words, 89% of rural households have access to farm sizes less than 2 ha. There are some large commercial farms also, but they contribute only about 2% of agricultural output (Ethiopian Agricultural Sample Enumeration, 2001/02 part 1).

Ethiopia was self-sufficient in food supply until the 1960s but this was reversed. With the drought of 1975 (Marco and Takele, 1996) the resulting food gap was bridged with imports, either through commercial purchase or food aid. According to the World Bank (994:168), cereal crop imports ranged from 397 to 1045 thousand tons and food aid from 111 to 963 thousand tons between 1980s and 1992. But still food availability rose to only 76% of the recommended intake. It is estimated that 50% to 60% of the population who live below the poverty line did not have access to adequate food (Marco and Takele, 1996; Croppenstedt and Mulat, 1992).

The low performance of agriculture under the former government was mainly attributed to political strife and recurrent drought and famine. The drought in 1974/75 and 1984/5 claimed hundreds of thousands of lives. Furthermore, collectivization, villagization, resettlement scheme and other misguided polices of the Derg government were defective and biased against agriculture (Asmerom and Abler, 1994; Sime 1994).

In order to alleviate food shortage and/or eliminate food insecurity and improve the performance of the agricultural sector productivity, modern technologies need to be introduced. In this regard, intensification of agriculture should depend on adequate and sustained use of improved agricultural inputs such as High Yielding Varieties (HYV), Fertilizer (both organic and inorganic) other agrochemicals, machineries and implements. Low-cost and appropriate technology is to be developed and disseminated among the farmers. Efficiency of micro finance system has to be ensured considering the recurrent drought and water scarcity, water harvesting has to be given top priority. Private sector initiatives are to be encouraged to support the objective of providing access to inputs. Social consciousness driven cooperatives are to be promoted and strengthened for the benefit of the resource poor farmers of Ethiopia. Moreover, the agricultural marketing system has to be improved and remunerative marketing is to be ensured.

1.2. Statement of the problem

At present, the challenge for Ethiopia is to produce sufficient food for its growing population. As agriculture is vulnerable to natural hazards like drought, famine, etc. self-sufficiency in food production has become more difficult, if not impossible. Considerable efforts have been made by the government to achieve self-sufficiency on food production. But still, we are far behind the target. There is a felt need of an evergreen revolution symphony in Ethiopia

Improvement in land productivity can be realized either by increasing cropping intensity or by increasing crop yield per unit of land. The first alternative requires double cropping /area expansion while the second necessitates increased application of fertilizer and HYVS. (Hailu,1985;

Assefa Admassie and Franz Heidhves, 1996). Since the 1970s, the distribution of inputs like fertilizer and improved seeds were directed to high potential areas. This approach generally focused on areas, which receive relatively good climatic conditions, and middle and rich farmers who owned relatively fertile land. The small farmers failed to benefit from the program.

Economic theory underscores that technical change is a cornerstone to increase agricultural production, leading to food self-sufficiency and food security.

The rapid population growth and the consequent scarcity of arable land accompanied by the declining of soil fertility should have led to high rate of fertilizer purchase and consumption, but the consumption per hectare is far below the recommended rate. Demand for fertilizer has fallen short of supply in recent years. A report by Mulat et al., (1997) for instance indicated that the national fertilizer sale in 1996 was only slightly more than 59% as of the total supply. Only 64.4% of the total DAP was available for sale and 43.3% of UREA was sold in 1996. A study by Sarah Gavian and Gemechu Degefa (1996) reported that though most of the new packages are superior in yield, their profitability is not markedly different from the traditional farmer practices in most regions.

The SG 2000 project in Ethiopia, which started its operation in 1993, and the Participatory Demonstration and Training Extension System (PADETES), initiated by the government in 1994/95, are making remarkable effort to increase the productivity of small farmers. These new agricultural extension packages involve demonstration on a ½ hectare of farmer's own plot under close supervision of the extension agents. (Mulat et al., SG 2000.1996). The SG 2000 project reported to

have increased crop yields by several folds over the national average: teff 1.5 time, wheat 2.7 time and maize 3 time, on the average (Coulibaly, 1996). But the expansion of these packages to resource poor farmers is limited because of the 25 to 50% down payments.

As some studies indicate (eg. Ellis, 1988; Binswanger, 1980) farmers are risk averse because they prefer the safety of acting as if the worst possible outcome will happen even though they know the extent to which the bad event would happen. There are various types of risks (for the details Ellis, 1988 ;) but crop damage (including rainfall variability) is to be considerable in this study.

Even though some adoption studies were conducted in Ethiopia, the determinants that impede the buying behavior of farmers have not been fully investigated and quantified. In appropriate price policy, shortage of credit facilities, inadequate transportation and distribution mechanism etc in the past hampered the adoption of fertilizer. The available evidence is in sufficient and the factors affecting adoption of fertilizer marketed through cooperatives need to be fully understood.

1.3. Purpose of the study

The broad purpose of this study is to examine the adoption behavior of member farmers or the buying intension of farmers to fertilizer marketed through cooperatives with particular reference of Enderta-woreda, South Eastern Zone of Tigray region and come-up with major findings about the buying patterns, general conclusions and points of recommendations helpful for future development of the multi-purpose cooperatives in the input marketing activities.

1.4. Research questions

Discussion with the members of cooperatives who are users of fertilizer and from the basis of adoption studies, the following questions emerge.

What decisions- making pathways individuals follow when considering whether or not to adopt chemical fertilizer? Which sources of information are important?

How does chemical fertilizer use diffuse among members in the cooperative society?

What is the yield per hectare before and after using chemical fertilizer?

When do they decide to use chemical fertilizers? Why?

What are the problems in fertilizer marketing through cooperatives?

1.5. Objective of the study

This study intends to analyze the factors that contribute to the adoption behavior of fertilizer by member farmers and assess its profitability, and finally suggest on the possibility of increasing fertilizer marketing through cooperatives.

The specific objectives of the study are:

1) To examine the extent of adoption of the different types of fertilizers (urea and DAP) marketed through cooperatives in Enderta woreda.
2) To identify the members' and non-members socio-economic characteristics, institutional and physical factors, which affect fertilizer adoption.
3) To assess the profitability of chemical fertilizer use.
4) To suggest recommendations for fertilizer marketing through cooperatives in Enderta Woreda.

1.6. Research hypothesis

1) There is a relationship between human resource conditions of a household and member's adoption behavior.
2) There is a positive relationship between extension service and the adoption behavior of members.
3) There is a positive relationship between access to credit and the adoption behavior of members.
4) There is a positive relationship between irrigation facility and the adoption behavior of members.
5) There is a positive relationship between availability of manure and the adoption behavior of members.
6) There is a positive relationship between land fertility status, land size and the adoption behavior of members.
7) There is a positive relationship between livestock holding and the adoption behavior of members.
8) There is a positive relationship between availability of farm oxen and the adoption behavior of members.

1.7. Scope and limitation of the study

1) The finding of this study can be taken with some caution due to the expected data limitations. Since none of the members keep records of their farming activities, obtaining accurate and reliable farm level information was the major limitations of the study. Members provide information based on recall.
2) Enderta is one of the agricultural potential areas with relatively high fertilizer consumption in the Tigray Region. It receives relatively good rainfall as compared to other woredas in the region. Therefore, the findings of the study will be interpreted only for farm households, which are members of Enderta woreda cooperative union, and for those areas, which deserve similar situations.

3) The study was deficient in estimating the efficiency of fertilizer use because sample farmers were unable to estimate labour and oxen time as well as other inputs for each farming operation.

1.8. Significance of the study

This study will draw attention of policy-makers towards enhancing technology adoption for small farm households marketed through their cooperatives. It tries to provide adequate and reliable information to potential researchers, increase awareness of extension agents and others related development institutions which are aimed at improving agricultural production and productivity. The study intends to identify the factors that either positively or negatively influence adoption and profitability of fertilizers use. It is also expected that development planners and policy- makers would benefit in terms of designing development plan and formulation of policies.

1.9. Chapter plan

The content of this study is organized as follows: The first chapter deals with introduction and objectives, review of literature is given in the second chapter. Third chapter deals with methodology used in the Study. The fourth chapter covers the results and discussion and the Fifth deals with conclusion and recommendation.

CHAPTER II

2. LITERATURE REVIEW

2.1. Fertilizer adoption, extension and profitability

2.1.1. Concepts on adoption

According to Feder et al., (1985), adoption is classified into farm level adoption and aggregate adoption. The frequency distribution of adopters over time follows a bell-shaped curve and its cumulative frequency looks like the S-shaped curve (Rund Quist, 1984). This notion was supported and discussed by Mansfield (1961); Mahajan and Robert (1985).

As noted by Mahajan and Robert (1985), the S-shaped curve implies that few farmers initially adopt new technologies. However, as time goes, an increasing number of adopters appear. In the end, the trajectory of the diffusion curve slows and begins to level off attaining its apex. Mosher (1979) has also similar idea but he underlined the importance of information. He noted that because of fear of risks associated with the introduction of new technologies, at early stages, few adopters acquire full information.

Mansfield (1961) hypothesized that the S-shaped diffusion curve is a function of the extent of economic merit of the new technology, the amount of investment required to adopt the new technology and the degree of uncertainty associated with the new technology. Byerlee and Hesse de Polanco (1980) also reported that the adoption pattern of a particular component is a function of profitability, riskiness, divisibility, or initial capital requirements, complexity and availability.

According to Mosher, (1979) the level of adoption varies due to several factors. These include; location specificity of the introduced technology, stages of rural infrastructure development, agronomic conditions,

distribution mechanisms of the new technology, profitability of the new technology and cultural factors.

Rund Quist, 1984; Supe, 1983; Mosher, 1979 and Rojers, 1962 categorized adopters of new technology into innovators, early adopters, early majority, late majority and laggards. They also classified stages of adoption process into five: awareness, interest, evaluation, trial and adoption. Rund Quist (1984) noted that these stages of adoption processes imply a time lag between awareness and adoption.

According to Rojers (1962) and Supe (1983), the characteristics of innovation that affect adoption include: compatibility, relative advantage, divisibility, complexity, communicability and the cost of adoption and group action requirements of technologies.

2.1.2 Extension service and fertilizer adoption

Inorganic fertilizer was introduced in Ethiopia with the objective of increasing agricultural production. The initial fertilizer demonstration was carried out during the period 1967-69. Before the introduction of inorganic fertilizer, shifting cultivation was practiced. At that time, some estates and commercial farms imported 1000-2000 metric tons of fertilizer (FAO, 1979, World Bank, 1995).

Chillalo Agriculture Development Unit CADU (1967), Welayta Agriculture Development, WADU (1970) and Ada District Development Project, ADDP (1972) have been caring out fertilizer dissemination. The objective of these projects were: Integration of agronomic research and dissemination of research results, provision of modern farm inputs, development of appropriate technologies, marketing and credit facilities as well as the promotion of cooperative societies for different purposes. But these

comprehensive packages were expensive and could not be replicated in other parts of the country. Hence, under the Extension and Project Implementation Development, EPID (1971) the Minimum Extension Package Project (MPP) provided fertilizer and credit to farmers resided along all-weather roads (FAO 1979). The effort of this project has not brought significant change due to inadequate skilled manpower, soil and climatic variations, loose co-ordination between research and extension services and less knowledge of the extension service about the rural situation, (Kebede, 1982).

In 1985, a project known as Peasant Agricultural Development and extension Project (PADEP) was established in eight zones. Each of them classified into surplus and non-surplus producing areas, to prioritize the allocation of scarce resources and to strengthen extension services. A modified Training and Visit (T and V) system was adopted (Asfaw et al., 1978).

Over time, the benefit of fertilizer application to crops become popular among the farming community, hence its use has increased but the intensity of use remained low, i.e. below the recommended rates.

Since the introduction of inorganic fertilizers, considerable efforts have been made to expand its use but the progress is not encouraging. With regard to area of farmland, only 29 percent of the total cultivable land is under cultivation. In 1996/97, about 83% of the total cultivated land was covered by cereal crops: of which teff constituted 26.9% 17.3%, millet 3.6% and oats 0.5% (CSA, 1997).

2.1.3. The effect of technical change on agriculture

According to the World Bank (1989:89)

> *The task facing African Agriculture in the 1990s and beyond is formidable indeed. It must cope with the needs of a rapidly growing population. It must achieve sufficient growth in food crops not merely to maintain output per person, but also to reduce food calorie deficits and to lower food imports. In the process it must be a major employer of Africa's growing labour force and compete on world market to earn the foreign exchange that Africa needs to fuel its economic growth. And it must do all that while reversing the degradation of natural resources that threatens long-term production. This challenge requires a transformation of agriculture.*

Therefore, intensifying agriculture through the use of fertilizer is considered to be a strategic component for increasing agricultural productivity and sustainability. Promotion of fertilizer usage, including the use of governmental subsidies, can be expected to have multiple benefits: growth in agricultural out put, 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. Higher levels of fertilizer application, particularly nitrogen, increase both grass and broad leaf weed populations. Hence increased fertilizer usage must be accompanied by improved weed control practices (Mohammed et al. 1994).

2.1.4. The effect of credit and extension services on fertilizer use

Because of limited cultivable land, intensification requires technical change. This technical change needs to be accompanied by appropriate policy such as input policy that plays a vital role. Ellis (1992) classified input policies into four dimensions price level to influence input price like fertilizer paid by the farmers; information available to farmers and, credit for the purchase of variable inputs. He further provides that the simultaneous increase of new seeds, fertilizer and irrigation water in correct proportion enable to achieve the highest level of yield hence should be delivered to farmers in package. This package of technological component must be complete, reliable and suitably designed for the conditions within which to be applied. FAO (1992) further strengthened this idea in that the availability and quality of various services such as credit supply, distribution centers, storage, rural road, etc. is important.

According to Bingwanger and Braun (1991) extension and credit are among the major instruments to speed up adoption on the other hand, the cost of inputs like fertilizer can significantly impede its adoption by small farmers.

The cost of fertilizer is high owing to small procurement lot, in efficient marketing by government parastatals and high shipping, handling and domestic transport costs (World Bank, 1994 and 1989; Mulat, 1994, Alemayehu, 1996).

Credit is a key financial instrument to break low productivity (Ellis, 1992). It is critical in financing investment and purchase of new inputs. The process of technological transformation and adoption of new

technologies depends on credit availability (World Bank, 1996; Ellis, 1992; Itana, 1985).

According to World Bank (1989)

> *To provide funds for farm investment and to improve farmer's cash flow, efficient financial intermediaries are needed to serve rural area. Many parastatal credit institutions established to serve the agricultural sector have been unsuccessful, mostly owing to poor management; politically motivated loans have also tended to maintain below-market interest rates… It is hardly surprising that these institutions have suffered big losses.*

In this regard, Ethiopia's formal (DBE and CBE) and informal (Iddir and Ikub) financial institutions contributed to some extent though financially under developed (Dejene, 1993). As it was reported by Itana (1985), small farmers need credit for consumption to bridge food shortage during wet season and for production to purchase inputs like seed, fertilizer, oxen, etc. depending upon their wealth status, but the previous government's agricultural policy was biased towards state farms and procedures cooperatives, neglecting small farmers. During the Derg regime, the interest rate was 6% for state farms and 5% for producers' cooperatives. But the present government of Ethiopia undertook a radical change on interest rate, increased to 10.5% to 15 depending upon the economic situation of the country and the terms of trade.

Itana further reported that the loan recovery rate has been deteriorated. The implemented financial sector reform that includes the entrance of the private sectors into the financial market did not prove whether the small farmers demand is met.

Anthieu and Laverga (1978) reported that lack of knowledge about correct crop fertilization, low level of the extension service, unfavorable price ratio (Fertilizer/farm produce) and shortage of credit are the most important determinants of fertilizer use in the context of developing countries.

In Mexico, Carlos (1976) used stochastic linear programming model to measure adoption rates. He reported that observed low adoption rates and peasant's participation in modernization projects are explained by opportunity costs of time (which was relatively high in labour market) and uncertainty. Peasants at a low rate will adopt modern technologies when the opportunity cost of their time in the labour market is relatively high. This will be true when the recommended technology is labour using and when access to modern inputs and credit markets is through a community organization process that is also time consuming.

Another adoption study by Bahu (undated), in the context of Indian agriculture, reported that lack of knowledge on fertilizer use, illiteracy, poor extension services, lack of credit facilities, higher cost of fertilizer and its improper distribution and low levels of the farmer's knowledge were the major factors that influenced fertilizer use.

In Northern Nigeria, Igodon et al., (1988), reported that family size (with negative sign), social participation, level of formal education/literacy, source of agricultural information and extension contact were significantly related to adoption. They emphasized that the positive and significant relationship between the level of education and adoption indicates that as educated farmers have greater access to agricultural information, their tendency to become more innovative increases.

A study by Evenson (1996) indicated that awareness, experience, observation and the critical ability to evaluate data and evidence attribute to the increase of knowledge of adoption. Both technical and a locative efficiency can be achieved; hence farmer's productivity increases through sustainable extension service effort. In this regard, the study in Burkina Faso showed that female farmers had lower levels of literacy and of extension participation, lower levels of awareness, testing, and adoption of most technological practices.

Coulibaly (1996) further reported that (based on Mali and Burkina Faso) sufficient rain fall, availability of subsidized credit for organic fertilizer, agro-ecological conditions profitability, institutional environment, access to input market and liquidity and guaranteed higher price for crop production affect the adoption of improved technologies. He noted that the input-tied credit system and the delivery of inputs through village associations has led to the wide diffusion of new technologies including high levels of inorganic fertilizer. He further suggested that government policy should gear towards the ease of financial and in put market constraints, formation of rural financial institutions and the promotion of infrastructure investments.

In order to bring about a yield-based growth, soil fertility constraint should be removed and technical change has to be promoted. In effect, chemical fertilizers being one of the sources to plant nutrients have become increasingly important to remove the constraints and continuously raise land productivity through facilitating technical change. The growth of fertilizer consumption is influenced by various factors such as soil quality, climatic environment, cropping pattern, genetic characteristics of crops, knowledge about fertilizer response function, distribution, credit provision, agricultural research and

extension and use of in puts other than fertilizer. Low rate of application is largely attributed to lack of knowledge. Educating the farmers is necessary in efficient fertilizer use practice such as balanced use of nutrients, collect training and placement of fertilizers. (Desai, 1986)

2.1.5. Profitability and efficiency of chemical fertilizers

Regarding fertilizer productivity, a study made in 1983 and 1984 in India indicated that though urea accounts 80% of the total N consumption on rice, its efficiency is found to be very low, ranging between 30 and 50% (Chauhan and Mishra, 1989).

Another study was conducted on time-series data from 1966 to 1973 and 1974 to 1986 in Pakistan Punjab and Indian Punjab. It was reported that poor quality of irrigation and deficient soil in trace elements accompanied by farmers' failure to follow the recommended time and application of fertilizer resulted in low crop yield (Sagar, 1995)

Another experimental study consisted of data of sowing, plant density, fertilizer dose and plant protection measures in India showed that a 50% reduction in fertilizer dose to both rice and wheat caused nutrient stress at late growth period and resulted in 19.4 % loss of productivity of this crop sequence (Singh and Gosh, 1992). Earlier Rao and Sharma (1977) also reported that 75% and 50% reduction in fertilizer doses resulted in the total net return reduction of 13.4% and 34.8% in 1972-73 and 15.3% and 35.3% in 1973-74, respectively, when compared with the 100% dose.

2.1.6. The effect of subsidy on fertilizer use

In developing countries, government intervention on fertilizer use is not un common because of its great contribution to agricultural production. But fertilizer market intervention must be justified in terms of the cost of

intervention it self. For instance, in India farm gate fertilizer price increased tremendously from 1967-68 due to devaluation of rupee in the Mid 1960s, and 1973-74. The effect of devaluation caused a cost increase in both imported and domestically produced fertilizer. Therefore, the government of India introduced, for the first time, subsidy to imported fertilizer in 1973-74 which was followed by domestically produced fertilizer subsidy reached at 86% of the total 1983-84 fertilizer subsidy and declined to 78% in 1985-86 (Quizon, 1995; Desai, 1986).

Barker and Hayami (1976) used a simple demand supply model to analyze the Philippines rice economy and underlined the importance of fertilizer subsidy. They reported that subsidizing modern inputs such as fertilizer was more beneficial than supporting production prices. They also noted that the increase in government budget due to fertilizer subsidy expansion could be compensated for by the increase in export tax revenue. The fertilizer price subsidy ranging from very low level to over 50% provides an incentive for more rapid adoption of fertilizer than would occur in its absence. Subsidy my also be used as a method for maintaining the declined levels of return in farm production. The withdrawal of subsidy would reduce input use hence should be used as a temporary incentive. Input subsidy with appropriate output price support facilitates the adoption and learning of new technologies (Ellis, 1992; FAO, 1979; Barker and Hayami, 1976). Another study by Gladwin (1996) also argued that the removal of input subsidy in general and fertilizer subsidy in particular in the late 1980s (in Malawi and Cameron) should be resumed but targeted only at women food procedures.

The opponents of fertilizer subsidy say that, withdrawal of fertilizer subsidy in some African countries did not lower crop production. Tanzania and Malawi reported that the removal of large subsidy could ease supply constraints and result in greater fertilizer use, despite higher

fertilizer prices. In Tanzania, fertilizer price subsidy was 80 percent of the farm gate price in 1985 but then reduced to 40% in 1993 without a fell in fertilizer use. In Malawi, the average subsidy fell from 30% in 1983-84 to 20% in 1987 but retained its 30% because of a rise in transport cost and devaluation. In Nigeria, a heavy subsidy had led to supply shortage. The government reduced fertilizer subsidy from 85% in 1985 to 28% in 1986. But due to devaluation, about 90% of the fertilizer price was subsidized in 1989 accounting for 70% of total agriculture budget (World Bank, 1994).

The removal of the subsidy on fertilizer price is controversial, some proponents argue that lifting the fertilizer price subsidy would reduce the demand for fertilizer, make private sectors reluctant to become involved in crop production (World Bank, 1994; Ellis, 1992; Alemayehu, 1992; Tesfaye, 1994)

Supporters of the policy on the hand claim that subsidies must be removed to make the market competitive and reduce budget deficits. A study made by others (Bays, 1985; Quizor, 1995; World Bank, 1989) argued that there is no justification for subsidizing fertilizer use because subsidy has a problem of divergence between a low domestic price to farmers and a high import price, unpredictable budgetary burden reaching up to 20-30% of government budget. Ellis (1992) also argued that in the long run, subsidy would cause a problem of resource misallocation.

2.1.7. The effect of organic fertilizer and inorganic fertilizer use

Regarding organic fertilizer use, Fowler et al., (1993) reported that both the government and farmers in India have been showing an increasing

interest in a wide spread adoption of organic farming (provided that provision of sufficient N, P and K Fraun Manule is possible to give acceptable yield/ha) methods and the consequent reduced dependence on chemicals fertilizers. The study further noted that consumers are prepared to pay more prices for food produced with out the aid of purchased chemicals. Even son (1996) reported that women were more likely to adopt organic fertilizer and crop rotation technologies than men.

In the case of Malawi, Gladwin (1996) reported that 44 out of 75, of the farmers believed that organic fertilizer was needed for maize in addition to chemical fertilizer. Almost half of them did not use it due to lack of animals and cash to provide the manure or compost. The study further reported that credit and use of manure or compost significantly increased the quantity of fertilizer per ha. applied.

2.2. Empirical studies conducted in Ethiopia

2.2.1. Results of fertilizer field trials

The demonstration carried out in three places in Arsi Zones of Digelu, Itheya and Assela revealed that potassium (K) gave no response. Nitrogen (N) fertilization gave a yield increase of 25% and phosphorus (P) 34%. The highest yield was obtained by applying 46 kg each of N and P_2O_5 per hectare, gave 54% yield advantage over the check. However, the highest VCR was obtained with P fertilization only. The response of barley top in combination with N was very high. The benefit from the treatment was + 37 (Daniel, 1995).

On farm Research to derive fertilizer recommendations for small-scale bread wheat production conducted by Amanuel Gorfu et al., (1991) based on Zone-specific optimum fertilizer level (different from the previous national blanket and the recent MOA recommendations) resulted in

mean yield increase ranging from 29% to 178% which is sufficient to address the rational wheat deficiency. It also generated a total rate of return on farmer's investment in excess of 100%.

Further, the on-station trials conducted by IAR in Arsi, Bale and Gojam zones indicated that bread wheat production could be increased by up to 88% with fertilizer application. However, according to MOA estimates, only 24% of the natural wheat receives fertilizer-Arsi 43% (highest) and Bale 15% (lowest). The commonly supplied fertilizer by MOA to smallholder through out Ethiopia is diammonium phosphate (DAP) with an analysis of 18% N and 46% P_2O_5 urea (46%N) is less frequently available (Mohammed et al., 1994).

The research recommendation rate – 50 kg of urea and 100 kg of DAP was ignored over the last two decades by the MOA and extension agents as well as farmers because of relatively large farm size for following and crop rotation during this period. However, a research trial conducted on fertilizer (From 1988 to 1991) by agricultural development department (National Fertilizer and Inputs unit recommended higher application rates, which vary, by crop and region. According to this trial, farmers needed to apply larger amount of both nitrogen and phosphorous if they wanted to use economically optimum application rates. For instance, farmers in Shewa needed to apply 91 kg of urea and 124 kg of DAP per hectare on teff field and 114 kg of urea and 130 kg of DAP per hectare on wheat field (Mulat et al., 1997).

Under farmers conditions, 100 kg of DAP is estimated to yield an additional 3.4 quintal to 7.44 quintals of cereal output. It is estimated that of the total 8.27 million tons of cereal output in 1995/96, 1.07

million tons (13%) is attributed to the use of fertilizer. If this holds, it is 50% of the total cereal marketed in the same year (Mulat et al., 1997).

2.2.2. Factors influencing adoption and intensity of fertilizer use

Teressa (1997) using a log it model for fertilizer adoption and a simultaneous equation for the intensity of fertilizer use found that extension service, oxen, labour, access to credit and off farm income were the major variables contributing to fertilizer adoption and intensity of its use, in the case of Lume district of central Ethiopia. On the other hand, variables like distance from asphalt road, sick persons in the household, dependency ratio, availability of family labour, age, education and sex were statistically insignificant, land holding with negative coefficient become significant implying that farmers who own large farm land may use fallowing to fertilize the soil. Regarding fertilizer intensity, farm size and off-farm incomes have a negative coefficient, while oxen, access to credit distance from asphalt road and fertilizer crop price ratio has positive coefficients and all are significant. Others like availability of labour on farm hired labour, household's health condition and household characteristics were statistically found insignificant.

A similar study in Tegulet-Bulga district by Yohannes et al., (1990), using a log it model, reported that debt has a negative effect on the adoption of fertilizer and pesticides. They further reported that farm size, family size, education, exposure to outside information and experience as represented by age have a positive effect on the probability of fertilizer and pesticide adoption.

A probit and tobit models used to analyze factors influencing adoption of new wheat technologies in Wolmera and Addis Alem area of Ethiopia

identified that (a) there was a high degree of awareness of improved varieties of wheat, (b) farming experience, though not significant, had a negative and weak impact on the intensity of fertilizer use (c) cultivated land per person was not significantly related to adoption, and (d) the probability of the average framers who could get fertilizer on time and would use it on wheat was 98% (Chilot et al., 1996)

Asfaw et al., (1978) used a logit model to analyze factors that affect the adoption of maize production technology in Bako area. They study concluded that extension service, credit provision, improving farmers literacy level and availability of oxen are critically important to increase adoption rate of maize production technology in the study area. Another study in same area by Beyene et al., (1991), reported that cash shortage, manuring maize fields and status of soil fertility were found to affect the adoption of fertilizer.

A probit and self-selection models application to analyze fertilizer determinants showed that farmers literacy, access to all-weather roads, access to banking, extension service and the labour availability play a role in fertilizer adoption. Regarding fertilizer consumption, cultivated land, farmers experience, supply of fertilizer, total value of output, oxen and the price of output to cost of fertilizer ratio are the most important factors determining the level of per hectare fertilizer (crppenstedt and Mulat, 1996).

Tesfaye (1994) used log line or multiple regression model (Enter and step wise methods) to analyze fertilizer consumption and distribution in Baso and Worana and Akaki Woreda Central Ethiopia. He reported that the major explanatory variables for fertilizer demand were livestock, improved seed varieties and distance from fertilizer sales centers for Baso

and Worana Woreda for Akaki woreda, income from crop sales, adoption of improved seeds, livestock and credit problems were significant, other variables, Tesfaye reported, like farmers years of experience in using fertilizer, age of the farmer, education and level of soil fertility were found to be inconclusive.

Mulugeta (1995) used logit and tobit models to measure the relative importance of the variables influencing farmers' adoption decision. He reported that access to credit herbicide use and timely availability of fertilizer, farm size, oxen and application of herbicide had significant effect on adoption and use of fertilizer.

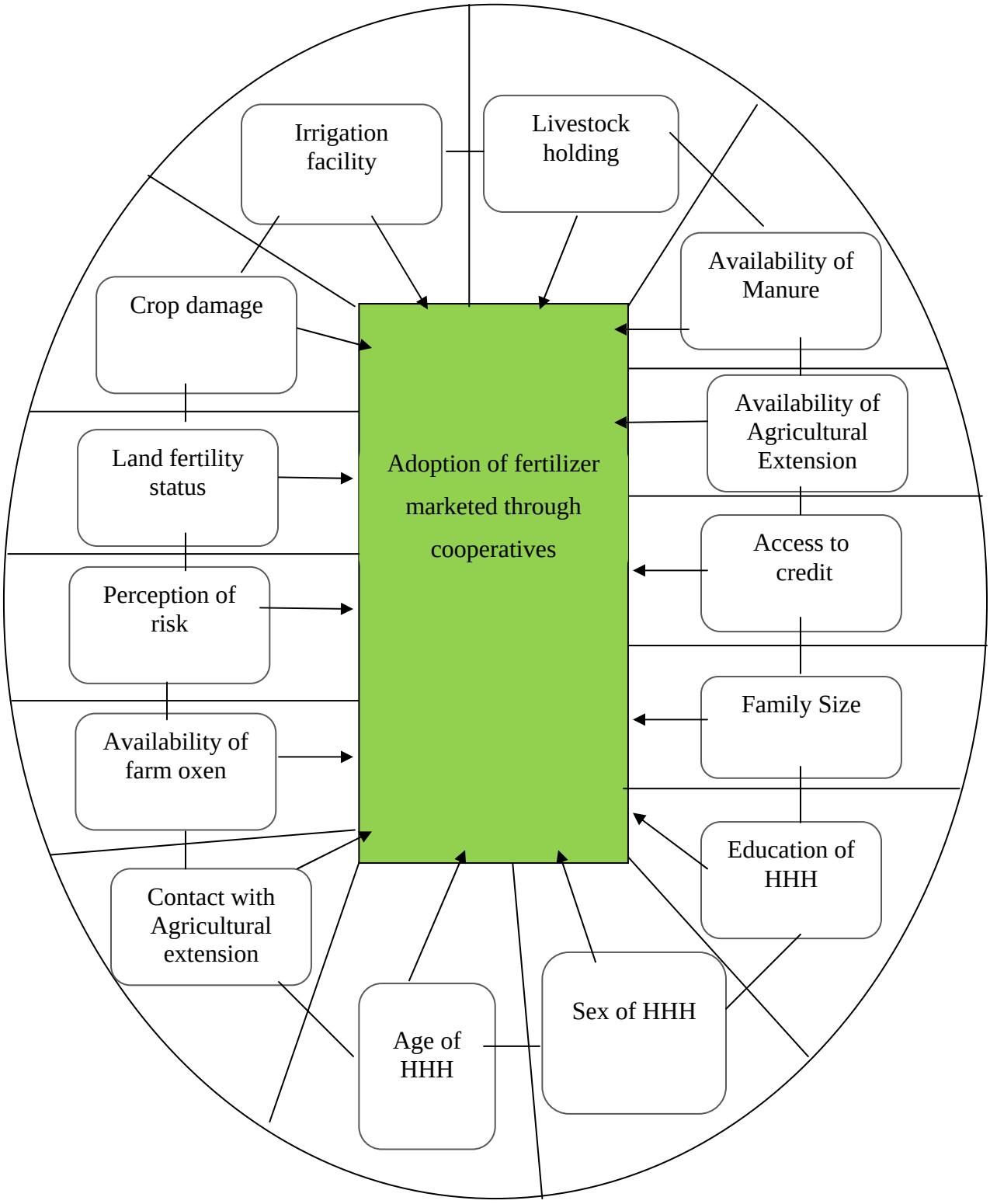
Market liberalization since 1991 appears to have had a differential impact on the profitability of fertilizer and herbicide inputs for bread wheat production by peasant farmers in Ethiopia. The reassessment of the technical results generated prior to market liberalization revealed the following! (1) Zone-specific fertilizer recommendations either remain unchanged or in several zones, have increased in response to the price for inputs and outputs. There was not a single instance of the recommended nutrient rate being reduced. Thus, in terms of improving the profitability of and farmer adoption of fertilizer usage in wheat productivity, market liberalization appears to have been positive, and (2) the removal of the current fertilizer subsidy *16%) did not markedly alter zonal nutrient recommendations, but reduced the rate of return on the farmer's investment in fertilizer.

This also suggests that the current level of subsidy may not be sufficiently high to motivate farmers to increase their usage of fertilizer. For the future, policy makers must carefully consider the negative

implication of removing the fertilizer subsidy-reduced fertilizer usage and decreased grain production in Ethiopia (Mohammed et al., 1994).

In summary, the different results, reported from the above literature review were attributed to variations in information, resource endowments and agro-climate factors among specific localities. From this general understanding, we note that fertilizer adoption vary mainly due to differences in perceptions about benefits and risks associated to fertilizer and resource holdings of the farmers. Hence conducting such studies in different localities, help in promoting fertilizer marketing through cooperatives thereby effectively promoting the fertilizer technology and agricultural production simultaneously.

Fig. 1. Conceptual Frame Work



CHAPTER III

3. MATERIALS AND METHODS

3.1. Site selection and description

The study was undertaken in Enderta woreda, the south-eastern zone of Tigray region. The woreda is purposively selected because it is the top woreda in fertilizer distribution and use. In the year 2006, Enderta union imported 2500mt out of the total 5125mt fertilizer imported to the region. This means 50% 0f the total import by the region has been accomplished by this union. According to the Data from MOARD, it is the second cooperative union next to Licha Hadiya in the volume of fertilizers imports in the year 2006.

According to the information from the woreda BOARD the population size is 129,876, the total house holds number is 28,432 out of which 18, 879 are men headed and 9553 are female headed. Enderta has an area of 46,047.3 hectares. The total farmland cultivated through rainfall and irrigation is 29,498.12 and 564.18 hectares respectively.

The capital of the woreda is Quiha , found 12 km away from Mekelle on the way to Addis Abeba road bordering Afar region in the east; Wukro woreda in the north; Degua Tembien in the west and Hintallo Wojerat in the south.

The major source of lively hood of the woreda population is agriculture and the major crops are wheat, barley and maize. Agricultural Activities are mainly done through irrigation and rainfall. The annual average rainfall recorded is 450mm and the climate of the woreda is classified into lowland 3%(below 1500m), Temperate 96%(b/n 1500- 2000m) and highland 1%(from 2300).

Its soil type is dark reddish brown and dark black clays and other types. The PH (acidity of the soil) ranges between 5.5-7 and 6.5-8 for the red and balk soils, respectively. It is accessible to different local markets such as Mekelle, Analem, Quiha, Aratto, Adigudom and Shiket markets.

According to the Enderta woreda BOARD office, the 2006/7 cropping season land use pattern was as following.

Table 1: Land Use Pattern, Enderta Woreda 1998/99

Description	Enderta Woreda		Sample	
	Hectare	%	Hectare	%
Total holdings	46,047.30	100	20,641.25	44.8
Cultivated land	27,214.60	59.1	12,647.50	46.4
Arable land	3,137	6.81	1,206	38.4
Uncultivable land	40	0.086	-	-
Grazing land	6,246	13.56	1,870	29.9
Forest land	9,983	21.68	4,302	43
Others	46,620			

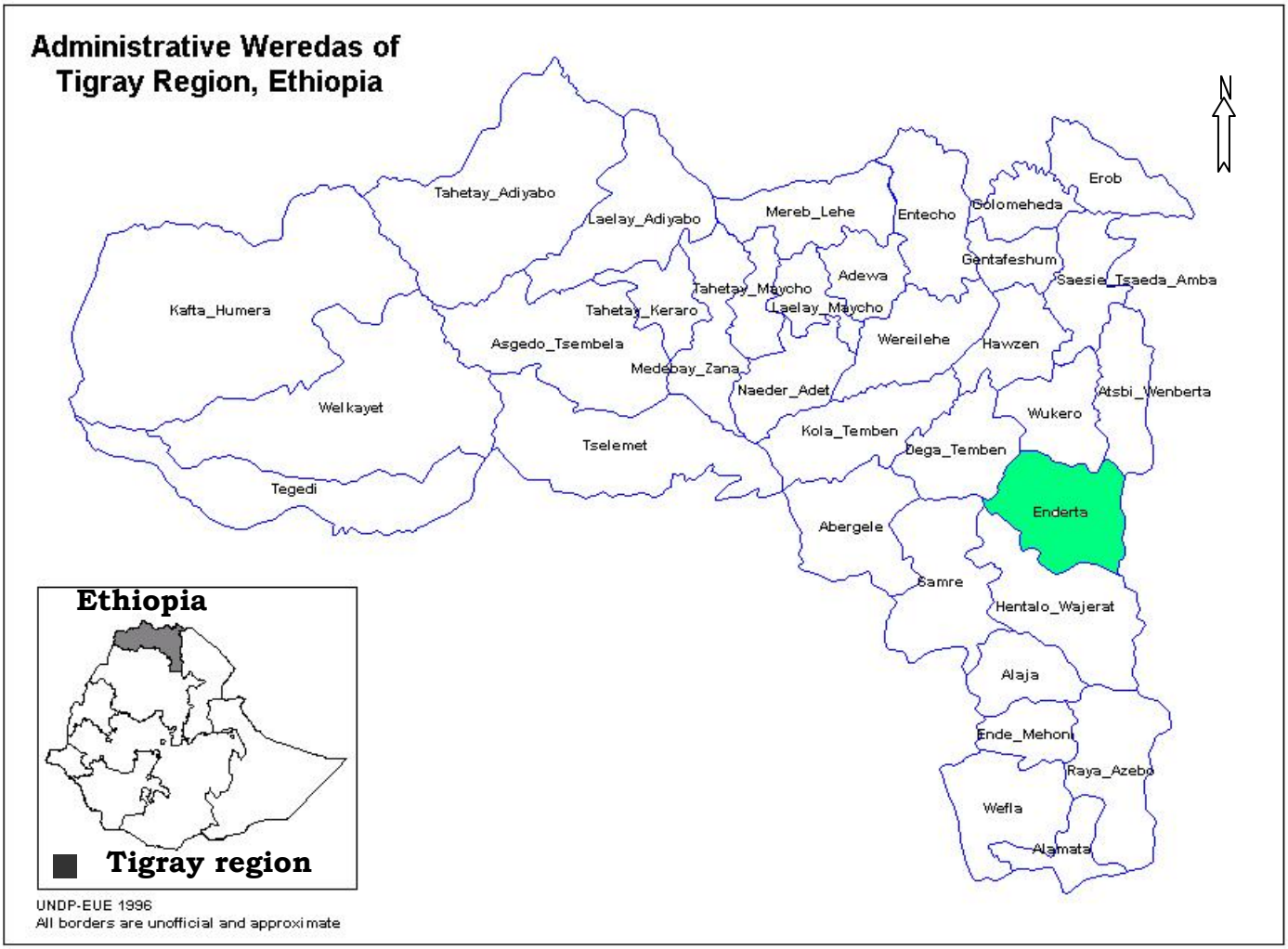
Source: -The Enderta woreda BOARD.

Smallholder mixed farming is the typical mode of farming system in the Woreda. Different types of cereal crops and vegetables are grown by farmers mainly for household consumption. The cultivated land is dominantly covered by cereal crops: wheat, barley and teff. These crops have additional usage other than food: teff straw is used as livestock feed and for construction material; wheat and barley straw for making thatched roof.

Farming is carried out by using a traditional plough which is pulled by a pair of oxen. The mean average of the oxen holding of the farmers is less than two that means there is a shortage of oxen for tilling their farm

land. In this case farmers do practice share cropping and other means of solving lack of oxen.

Fig. 2. Location of Enderta woreda in Tigray Region.



3.2. Data collection procedure

In conducting the study in the Woreda Cooperative unions and primary societies, a number of methodologies and approaches have been used by the researcher, among which the major ones are the following.

- Create awareness about the objective of the study among the local administrative officials at different levels.
- Review different literature and documents regarding the subject under study.
- Develop schedules for interviewing and gathering relevant information.
- Recruit 2 enumerators and train them to assist the researcher in gathering the required qualitative and quantitative information.
- Conduct field investigations concerning the local community in general and members of primary cooperative societies in particular.
- Conduct focus group discussion with management committee members of the cooperatives.
- Conduct detailed discussions with the woreda officials specially Head of Rural Development and Cooperative Promotion Offices in the specified woreda.

During the process of collecting the required information, the researcher utilized both primary and secondary sources of information.

The sources of the secondary information are different documents compiled by different researchers on fertilizer marketing, reports compiled by primary cooperatives and the unions involved in the activities of fertilizer marketing and documents of Federal Cooperative Agency.

The sources of all primary information are members of the cooperatives and other officials of rural development organizations involved in the fertilizers distribution, extension activities and promotion of cooperatives in the specified area.

The dependent variable in the study is

1. Adoption of fertilizer.

Adoption of fertilizer is operationalised in the study as actual use of chemical fertilizer made available from the Cooperatives for the crops grown by the farmer in his own land. Use of chemical fertilizer in the context refers to Urea and DAP marketed through cooperatives in Enderta woreda. For the primary data, information on all demographic and socio-economic variables that are expected to influence adoption and profitability of fertilizer use was collected. In particular, the information includes:

- Household characteristics, of sample farmers such as education status, age and social or administrative responsibility.
- Demographic data of the household, size and composition of the family (household head spouse, son/daughter), age and sex.
- Landholding, ownership and utilization;
- Livestock holding: type and number of animals;
- Availability of farming tools;
- Availability inputs;
- Availability of extension service;
- Availability of credit service;
- Types of crops cultivated;
- Annual income
- Annual expenditure;
- Irrigation facilities
- Availability of subsidy
- Perception about risk

- Availability of fertilizer
- Perception of profitability of fertilizers use.
- Trainings undergone in fertilizer use.
- The problem currently faced by the union, the constraints in adoption of fertilizer and the proposed strategies to alleviate the problems have been documented from the data available through interviews with farmer members and officials.

3.3. Sampling techniques

The Enderta Woreda has 17 Tabias. From the 17 Tabias, 8 Tabias have been selected at random for the study. From each Tabia one Multi-purpose cooperative dealing with fertilizer marketing has been selected at random. From the members of the 8 cooperatives of the 8 Tabias, a total sample size of 140 respondents have been selected at random, based on the PPS (Table 1).

Table 2.Coop.Member Household sample, Enderta Woreda

S/n	Sample Tabias	Selected Cooperative from each Tabia	House Hold Head Size			Distance in km from Qhuiha
			Total members	Sample	%	
1	D/Agen	Aragure	529	12	8.6	10
2	Aratto	Semha	963	21	15	12
3	Didba	Didba	1168	27	19.3	13
4	Lemlem	Degen	577	13	9.3	17
5	Cheleqote	Cheleqote	511	12	8.6	20
6	Debiry	Debiry	1037	24	17.1	19
7	Feleg-mayat	Feleg-Mayat	740	17	12.1	16
8	Messebo	Messebo	613	14	10	17
	Total		6138	140	100	

From the same Woreda, a total number of 64 non-members of cooperatives who are farmers have been selected at random at the rate of 8 respondents from each of the selected tabia.(Table 2)

Thus there were 140 member respondents and 64 non-member respondents, who have been interviewed for the collection of primary data.

Table 3.Non coop. Member Household sample, Enderta Woreda

S/N	Sample Tabias	Total House Hold size	Sample from the non-members	Distance in km from Quiha.
1	D/Agen	1891	8	10
2	Aratto	1933	8	12
3	Didba	1885	8	13
4	Lemlem	1595	8	17
5	Cheloqute	1248	8	20
6	Debry	1909	8	19
7	Feleg-Mayat	806	8	16
8	Messebo	1279	8	17
	Total	12546	64	

The data collection tool was the interview schedule; a structured interview schedule was constructed to quantify and collect relevant data. The interview schedule has been pre tested before use. Besides collecting primary data from the farmer respondents, focus group discussion was conducted with members of the managing committee and other officials.

3.4. Variables selected for the study

3.4.1. Adoption of fertilizer

Adoption of fertilizer marketed through Cooperatives is the dependent variable.

The farm household decision to adopt or reject a particular technology, in the case adoption of fertilizer is hypothesized to be influenced by a combined effects of various factors such as household characteristics, social, economic and physical environments (crop damage) in which farmers operate. The degrees of influence of these factors vary from one locality to another without uniform effects on adoption of fertilizer use. Therefore, the following variables were hypothesized to determine adoption of fertilizer use in the study area.

Age of household head: This variable was used as a proxy for experience of a cooperative member and non member since he/she started farming. The more experience a farmer has about the use of fertilizer, the more he/she is likely to use a higher rate of fertilizer per hectare. Therefore, it was expected that Age will have a positive effect on fertilizer adoption.

Sex of household head: Evidence in the literature indicates that women have less access to improve technology, credit, extension service and land (Ellis, 1992). The variable SEX was used to assess whether female-headed household have less access to fertilizer use.

Education of household head: It was hypothesized that literate farmers are likely to be aware of the existence of new technology, more willing to receive new ideas and concepts provided to them through any media. As farmers' education level improves, the proportion of decision to adopt fertilizer would increase.

Family size: The adoption of fertilizer requires additional labour for application. The availability of farm labour is expected to relax the

constraints to adoption of fertilizer use. A large number of dependents in the household (if economically inactive) may be expected to influence fertilizer adoption negatively due to the need to give priority for food requirement instead of purchasing fertilizer.

Oxen per farmers: Traditionally a pair of draught oxen is required to plough a field. A farmer who has less than a pair of ox may incur additional cost of hiring. Because of oxen shortage, the farmers may not timely accomplish his /her agricultural activities hence may lead to substantial crop loss. The untimely accomplishment of farming operation in turn may attribute to the less demand (or not at all) of fertilizer. Thus it was hypothesized that this variable will influence the adoption of fertilizer positively depending up on the nature of farmer's possession.

Livestock Holding: Farmers keep livestock either for social prestige (as a measure of wealth) or to sell during poor crop harvest or to repay debt. Farmers may also sell livestock to purchase fertilizer in order to increase their crop output. It was expected the variable livestock holding will affect fertilizer adoption.

Cultivated land per farmer: Farm land is a key factor of production in farming community. The large farm area implies more resource and greater capacity to invest in farm land, purchase inputs like fertilizer, improved seed, etc. and an increased readiness to take risk that may affect adopting new technologies (Ellis, 1992). Therefore, the farmer who owns relatively more farm land was hypothesized to be more likely to be fertilizer user.

Land quality: If farmers have relatively fertile farm land, they would be reluctant to purchase fertilizer. Hence it was expected that soil fertility and fertilizer adoption will have an inverse relationship, i.e., the less the fertility of the soil, the more incentive to invest in fertilizer.

Access to Credit: Small farmers often face cash constraints to invest in land and to purchase new inputs. Thus the availability of fertilizer on credit was expected to affect farmers willingness to adopt fertilizer positively (Mulat, 1996).

Access to Extension service: One of the major ways of disseminating new technological information to farmers is through extension agents. The frequency of visits measures the extent to which farmers have access to information on new technologies. It is hypothesized that farmers who have frequent contact with extension agents are more likely to adopt fertilizer than those who are not.

Availability of Manure: The source of manure is animal dung, crop residue left in the field after harvest, household refuses, compost, and green manure-all constitute organic manure. In practice, animal dung and crop left over after harvest are used as a fuel. Thus it is hypothesized that the lower the availability of manure, the more likely a farmer is to adopt fertilizer.

Crop damage: Farming operations in general are vulnerable to many physical factors. Among these factors, vagaries of weather, crop pest/disease, wild-life attacks, etc, may result in uncertain production inducing farmers not to purchase inputs such as fertilizers at a given price. That is the adoption of new agricultural technologies is associated to such factors. Hence the occurrence of crop damage is hypothesized to affect negatively the adoption of fertilizer use.

Improved seed availability: The provision of improved seed contributes to high response of fertilizer. It was hypothesized that adequacy and timely availability of improved seed will positively affect the adoption of fertilizer use.

Off-farm income: Farmers may hire-out their labour in order to generate additional income. This off- farm income may be allocated to consumption or farm activities. Hence it was hypothesized that off-farm income will positively affect adoption of fertilizer use.

Subsidy: Provide an incentive for more rapid adoption of fertilizer than would occur in its absence. Input subsidy with appropriate output price support facilitates the adoption and learning of new technologies (Ellis 1992). It is hypothesized that the availability of subsidy will positively affect the adoption of fertilizer.

Availability of irrigation: Irrigation contributes a lot in increasing agricultural production. The availability of irrigation encourages farmers to produce more and to get better income and this also encourages farmers to buy modern agricultural inputs. Hence access to irrigation facility is directly related to fertilizer adoption.

Training of farmers in fertilizer use: Training of farmers in fertilizer use if it is properly given can encourage farmers to use fertilizer. It is un questionable that training on fertilizer use have a direct relationship with fertilizer adoption.

3.4.2. Measurement of variables

1. Dependent variable.
   a) FERT use= 1, if they use in year 2006/7 cropping season.
      = 0 otherwise

2. Explanatory Variables
   a. AGEHHH = Age of household in years ($\leq$ 75 years included in the analysis). The inclusion of age is used as a proxy for farming experience as well as to reflect non- linearity, showed no significant difference hence dropped from the analysis.
   b. SEX HHH = 1; if male-headed household (0 otherwise).

c. EDU. = 1; if household heads read and write (o otherwise).

d. FAMi = Family size in man-equivalent (in nature logarithm)

e. V2.1.1 = Size of cultivated land. (in natural logarithms).

f. V2.2 = Condition of the farm land. (in natural logarithms)

g. V3.1 = Livestock owner ship.(in natural logarithms)

h. V3.2a = Number of oxen.(in natural logarithms)

i. V4.21 = Use of animal dung (manure). 1 if used (0 otherwise).

j. V4.29 =Improved seed availability. 1 if used (0 otherwise).

k. V6.2 = Access to extension. 1 if there is (0 otherwise).

l. V7.1 = Access to credit. 1 if there is (0 otherwise).

m. V8.4 = Crop damage. 1 if there is (0 otherwise).

n. V9.1 = Availability of irrigation. 1 if there is (0 otherwise).

o. V11.1 = Availability of subsidy.

p. V15.1 = Training on fertilizer.

q. V10.8 = Off farm income.

3.5. Data analysis

3.5.1 Fertilizer profitability estimation

Taking in to consideration that farming is a business enterprise; one has to expect that it should generate profit for the farmer. The cost of inputs (fertilizer) incurred in farming operation optimistically should result in attractive profit. This view requires further economic analysis and the value cost ratio (VCR) method was employed for the purpose.

$$VCR = \frac{\text{Yield increment due to fertilizer/ha} * \text{price of output.}}{\text{Cost of fertilizer/ha.}}$$

3.5.2 Logistic regression model

Regression models in which the regress ant evokes a yes or no response are known as dichotomous or dummy. The dependant

variable in this section is a dummy variable, which takes a value of zero or one depending on whether or not the borrower defaults. However, the independent variables are of both types that are continuous or categorical or discrete.

Adoption of fertilizer is the dependent variable, which is dichotomous taking on two values, one if the member or non-member adopt and zero otherwise. Estimation of this type of relationship requires the use of qualitative response models. In this regard, the non-linear probability models, viz, logit and probit models are the possible alternatives.

Probit and logit models are similar and yield essentially identical results. Aldrich and Nelson (1984) indicate that in practice these models yield estimated choice probabilities that differ by less than 0.02 and which can be distinguished, in the sense of statistical significance, only with very large samples. The choice between them therefore, revolves around practical concerns such as the availability and flexibility of computer program, personal preference, experience and other facilities.

Hosmer and Lemeshw(1989) pointed out that a logistic distribution(logit) has got advantage over the others in the analysis of dichotomous outcome variable in that it is extremely flexible and easy used model from mathematical point of view and result in a meaningful interpretation. Hence, the logistic model is selected for this study.

CHAPTER IV

4. RESULTS AND DISCUSSION

4.1. Input use

The woreda has access to modern inputs like fertilizer, herbicide and improved seeds. The road that passes from Addis Abeba to Mekele and to Shire and its proximity to Mekele, the capital town of the Region makes the woreda to be favorable in getting the most important agricultural inputs as compared to other woredas. Mostly proximity to bigger towns, the availability of access to roads and better transport facilities are assumed to contribute a lot in the distribution and adoption of new agricultural technologies. Fertilizer consumption over the years is presented in Table 4.

Table 4: Enderta Woreda Fertilizer Consumption

Crop year	Fertilizer Amount Applied (Quintal)				
	DAP	Urea	Total	DAP: Urea	Organic
2003/4	3,081	2,221	5,302	1.3:1	4,801
2004/5	4,359	3,413	7,772	1.2:1	3,099
2005/6	4,179	2,705	6,884	1.5:1	4,667
2006/7	4,123	3,087.5	7,210.50	1.3:1	10,436
2007/8	6,798	4,012.5	10,810.5	1.7:1	10,810.50

Source: - Enderta woreda BOARD.

As shown in the Table 4, the ratio of DAP to UREA consumption in the woreda is not as required or it is not equivalent to the recommended rate i.e. 1:1 (one quintal DAP and one quintal UREA per hectare for all major crops).

The study is conducted in Enderta woreda cooperative union to asses the factors affecting fertilizer adoption. The union sells chemical fertilizer to

members and non members as business venture customers of a cooperative society are the members and the general public.

Enderta woreda union was formed in 2003/4 in Enderta woreda with 9 primary cooperatives. Now 12 primary cooperatives out of the 17 primary cooperatives existing in the woreda are included in the union. The size of members during foundation was 9,757 out of which 7,608 are male and 2,149 are female. Currently the members' size has increased into 19,068 out of which 13,160 are male and 5,908 female. The initial capital of the union is 590,000 birr. The union has 32 shares with a price of birr 1,000 and the registration fee of membership is 1,000 birr.

The objectives of the union are:-

1. Supply modern agricultural inputs.
2. Purchase of members' produce at reasonable price.
3. Value adding of agricultural products produced by members or processing.
4. Improve member's income by assembling and marketing of members' produce.
5. Support the primary cooperatives under it to increase production and productivity.

4.2 Descriptive analysis

4.2.1 House hold characteristics

Sample farmers in the study area are 204 out of which 140 are cooperative members and 64 non cooperative members. 27 of the total Respondents are female the remaining 177 respondents are male. 92.8% of male and 7.2% of the female respondents used chemical fertilizer in the year 2007/8 cropping season. 2.7% of the respondents commenced using Fertilizer before 20years. The Larger age groups of most respondents are between the ages of 31 and 64 (Table 5).

Table 5: Age Group of HH heads

		Member of Cooperative				*Total*	
		Member		*Non-Member*			
		Count	***Percent***	***Count***	***Percent***	***Count***	***Percent***
Age group of respondents	*15-30*	*8*	*5.7*	*15*	*23.4*	*23*	*11.3*
	31-45	*51*	*36.4*	*26*	*40.6*	*77*	*37.7*
	46-64	*51*	*36.4*	*16*	*25.0*	*67*	*32.8*
	65-70	*30*	*21.4*	*7*	*10.9*	*37*	*18.10*
Total		***140***	***100***	***64***	***100***	***204***	***100***

Source: - Primary data

According to the (CSA, 1996), economically active age groups lie between 15 to 64 years. To this effect, the study evidenced that 37.7% of the respondents are between the age of 31-45 and 32.8% are between the age of 46-64. This implies that most of the member and non-member respondents are in economically active age (Table 5). from this Point of view, this age categorization does not seem realistic because in Most rural farming communities, people in the age group of 10 to 14 and 65 to 75 actively participate in farming operation. When we see the association of age group of respondents against the fertilizer use, 35.9% are between the age group of 31-45 and 35.3% are above 45 years. The table for fertilizer adoption by independent variable (annex table) shows that 10.25 of the age group 15-30, 35.9% of the group 31-45, 35.3% of the age group 46-64 and 18.6% above the age of 65 years adopt fertilizer in the year, 2006/7. That means the younger age groups adopts more than the older once.

Table 6: Sex of Household heads.

Coop. Member	Sex of HHH				Total	
	Male		Female			
	Count.	Percent.	Count.	Percent.	Count.	Percent.
Yes	132	74.6	8	29.6	140	68.6
No	45	25.4	19	70.4	64	31.4
TOTAL	177	100.0	27	100	204	100

Source: Primary data.

29.6% and 70.4% of the respondent's are female cooperative members and non-cooperative members respectively . This implies that the female household head cooperative members who are involved in agricultural farming are very few in number.

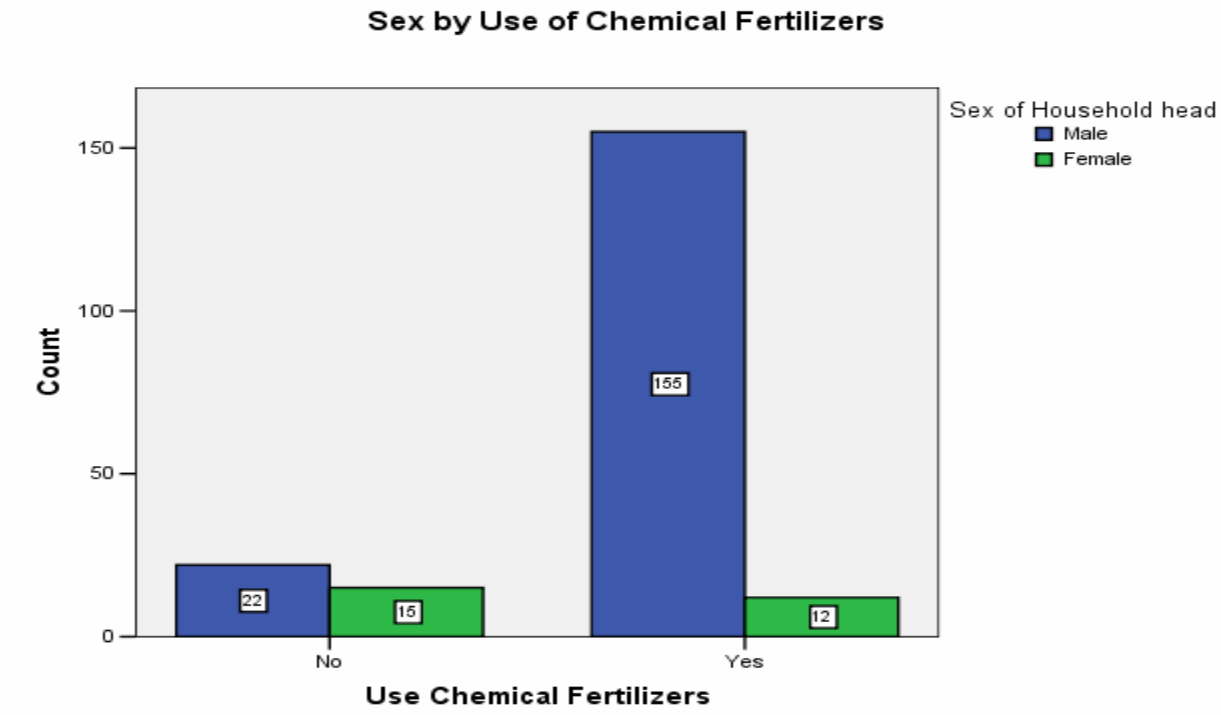


Fig. 3

Table 7: Educational Status of Respondents

		Membership status				Total	
		Member		Non-member			
		Count	Percent	Count	Percent	Count	Percent
Educational Status of HH	Illiterate	17	12.1	13	20.3	30	14.7
	Read and write	102	72.9	41	64.1	143	70.1
	Primary & above	21	15.0	10	15.6	31	15.2
Total		**140**	**100**	**64**	**100**	**204**	**100**

Source: - Primary data

With regard to educational attainment of the sample household heads, 72.9% of the coop. members read and write, 15% are primary school educated and above and 64.1%, 15.6% and 20.3% of the non member farmers read and write, primary school educated and above and illiterate respectively.(Table 7).

Table 8: Chemical Fertilizer s by Educational Status

Educational status of household head	Use of chemical fertilizer				Total	
	Yes		No			
	Count	Percent	Count	Percent	Count	Percent
Illiterate	20	12.2	9	25.7	29	14.6
Read and write	122	74.4	20	57.1	142	71.4
Primary & above	22	13.4	6	17.2	28	14.0
Total	**164**	**100**	**35**	**100**	**199**	**100**

Source: - Primary data

In general, the farmers' level of education in the study area is not so low. The cross tabulation of fertilizer users by education level (Table 8) indicated that 14.6% are illiterate, 71.4% of those who read and write and 14% primary and above. The cooperative members and non members use chemical fertilizer in the year 2007/8 cropping season.

In terms of material, the use of both urea and DAP increase with higher level of education and the proportion of non adopters decreased as the level of education increased (Table 8) 25.7% of the illiterate and 57.1% of the non members who read and write use chemical fertilizer. This shows that education has its contribution in fertilizer adoption.

Table 9: Family Size of Respondents

	Member		**Non-Member**		**Total**	
	Count	**Percent**	**Count**	**Percent**	**Count**	**Percent**
1-3	27	19.3	27	42.2	54	26.5
4.-5	63	45.0	24	37.5	87	42.6
6-8	38	27.1	13	20.3	51	25.0
9-11	12	8.6	-	-	12	5.9
Total	140	100	64	100	201	200

Source: primary data.

Family size has its role in the availability of labor in the house hold. The largest the family size, largest can be the possibility of having adequate labor force in the house hold. Hence result of the sample households showed that 45.0% of the cooperative member respondents have a family size 4-5, 27.1% have a family size of 6-8, and 8.6% have 9-11 and 19.3% less than 3. And in the non member respondents 42.2% have a family size less than 3, 37.5% 4-5 and 20.3% 6-8 respectively. In general 26.5% of the total size has less than 3 family members and the rest of the

sample farmers have greater than 4 family members implying there is no serious labor shortage in the study area.

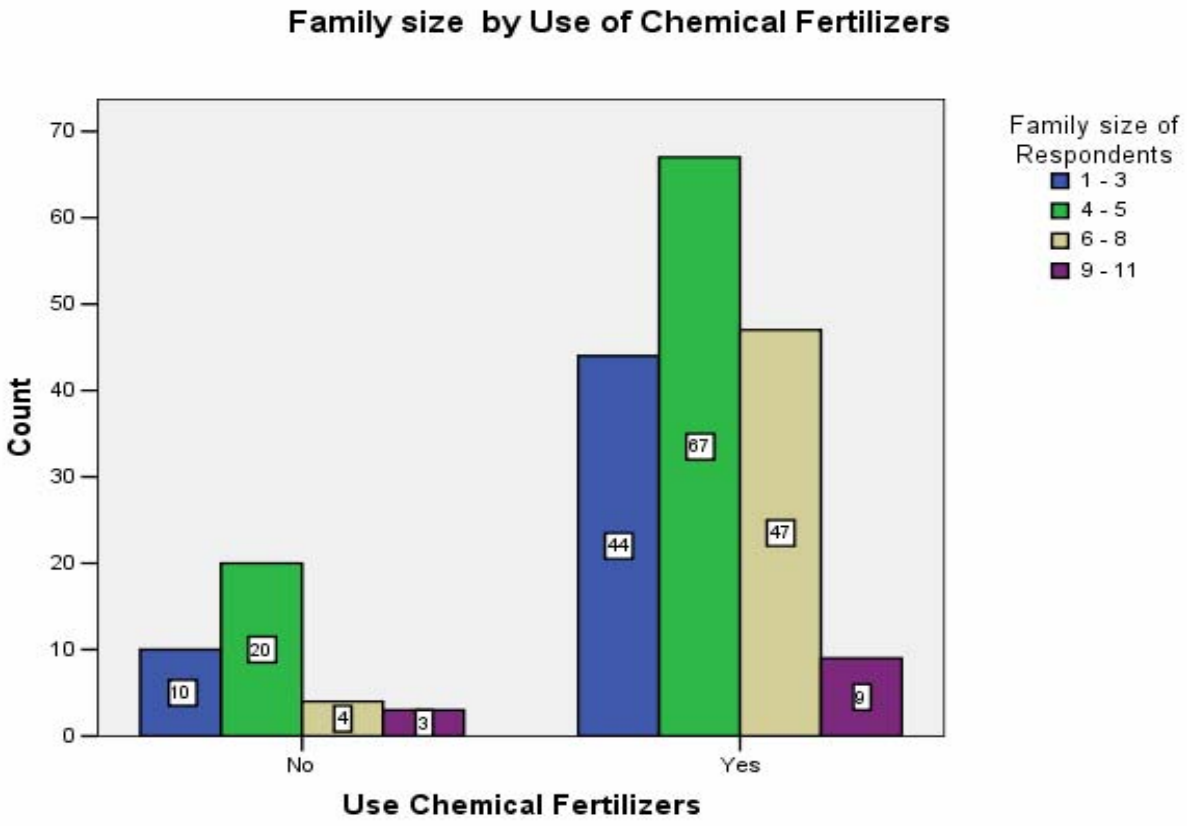


Fig. 4

4.2.2 Household farm characteristics.

Table 10: Land holding of Respondents

		Maximum	Minimum	Mean
Members	Size of cultivated area	10	0.00	1.87
	Size of grazing area	.00	0.00	.00
	Size of fallow area	1.50	.00	.06
	Size of others	0.75	0.00	.01
Non members	Size of cultivated area	5.00	.00	.01
	Size of grazing area	9.00	.00	.28
	Size of fallow area	1.50	.00	0.07
	Size of others	.00	.00	.00
Total	Size of cultivated area	10.00	.00	1.69
	Size of grazing area	9.00	.00	0.09
	Size of fallow area	1.50	.00	.06
	Size of others	0.75	.00	.01

Source: - Primary data

The mean average land holding for cultivated land is 1.87, grazing area 0, fallow area .06 and other areas 0.01 for members. And the mean average land holding of non member's size of cultivated area .01, grazing area .28 fallows areas .07 and other area .0.

Table 11: Fertility Status of Respondents' Land

	Member		***Non-Member***		***Total***	
	Count	***Percent***	***Count***	***Percent***	***Count***	***Percent***
Very good			*2*	*3.1*	*2*	*1.0*
Good	*57*	*40.7*	*20*	*31.3*	*77*	*37.7*
Moderate	*83*	*59.3*	*42*	*65.6*	*125*	*61.3*
Total	***140***	***100***	***64***	***100***	***204***	***100***

Source: - Primary data

According to different studies, the relationship between land fertility status and fertilizer use is inverse i.e. most farmers with good fertility status are less adopters than those with poor fertility status. In fact the response of the respondents to the status of their farm land is simply based on the amount of yield it gives every cropping season regardless of other necessary agro- climatic factors. Then the result shows that the fertility status of land owned by the cooperative members is 59.3% moderate and 40.7% good and the fertility of farm land owed by non members 65.6% moderate, 31.3% good and 3.1% very good. Then according to the result, the natural fertility of the land owned by non-cooperative is better than the members of a cooperative. And this shows that the cooperative members with less fertile farm land adopt fertilizer than the non-members.

4.2.3. Livestock holding vs fertilizer use.

Table 12: HH Livestock Holding Status of Respondents

Own Livestock	Member		Non-Member		Total	
	Count	Percent	Count	Percent	Count	Percent
Yes	129	92.1	57	89.1	186	91.2
No	11	7.9	7	10.9	18	8.8
Total	**140**	**100**	**64**	**100**	**204**	**100**

Source: - Primary data

Livestock serves several purposes. Farm animals are a source of cash income hence enabling to get access to input use and to bridge food gap in case of food insecurity. Drought powers for land preparation and animal dung as an organic fertilizer to improve soil fertility are important contributions of the livestock sector. In the latter case, it may affect the use of chemical fertilizer depending up on its availability.

Cross tabulations are made to see the relationship between livestock holding and fertilizer use among both members and non members of the cooperative society.

It is seen that 92.1% of members and 89.1% of non members own livestock and 97% of those who own livestock use chemical fertilizer in year 2006/7. The Pearson correlation result shows that (-.437*) that there is significant relationship at .05 level between fertilizer use and livestock ownership. This shows that there is significant difference between those who own and do not own livestock in the use of chemical fertilizer or there is relationship between chemical fertilizer use and livestock holding.

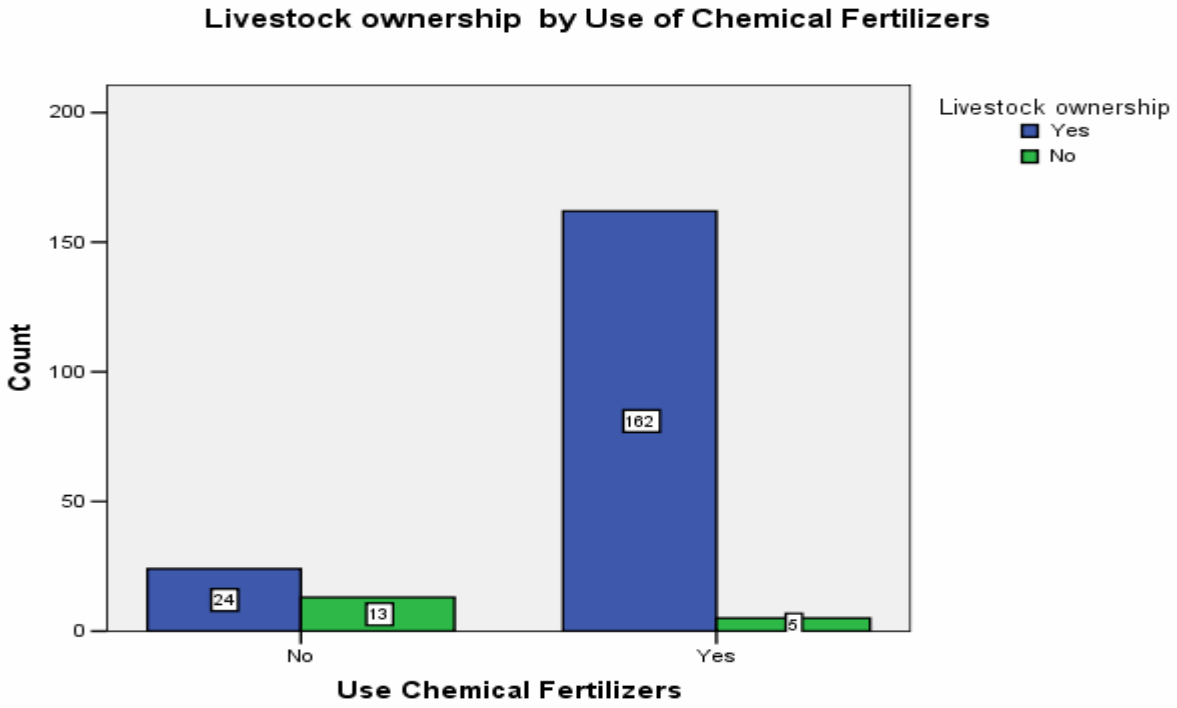


Fig. 5

Table 13: Livestock holding of Respondents by Type

		Maximum	Minimum	Mean
Members	Ox(en)	4	0	2
	Cows	31	0	2
	Calves	6	0	1
	Heifer	3	0	0
	Bulls	2	0	0
	Horses	2	0	0
	Mules	2	0	0
	Donkey	3	0	1
	Sheep	13	0	1
	Goats	30	0	2
Non members	Ox(en)	4	0	1
	Cows	6	0	1
	Calves	3	0	1
	Heifer	2	0	0
	Bulls	2	0	0
	Horses	0	0	0
	Mules	1	0	0
	Donkey	2	0	1
	Sheep	10	0	2
	Goats	15	0	3
Total	Ox(en)	4	0	2
	Cows	31	0	2
	Calves	6	0	1
	Heifer	3	0	0
	Bulls	2	0	0
	Horses	2	0	0
	Mules	2	0	0
	Donkey	3	0	1
	Sheep	13	0	1
	Goats	30	0	2

Source: Primary data.

The study result shows that the mean average of oxen is 2 which mean there is no problem in tilling of their farm land. And the mean average for sheep and goat is 1&2 that means according to their response they have the opportunity of paying their repayments by selling them in their local market in festival days. The mean average for donkey is also 1 helping them to transport their input from the purchase center and transport their produce to the market.

4.2.4. Use of chemical fertilizer

Of the total sample farmers, 2.7% have been using chemical fertilizer since the late 1980s. The study result shows that the commencement year is very scattered and slow implying that adoption is not fast.

Table 14: use of Chemical Fertilizer by Respondents during 2006/7

Chemical fertilizer	Members		Non-Members		Total	
	Count	Percent	Count	Percent	Count	Percent
Dap	38	32.2	16	39.0	54	34.0
Urea	3	2.5	1	2.4	4	2.5
Both	77	65.3	24	58.5	101	63.5
Total	118	100	41	100	159	100

Source: - Primary data

According to the recommended rate given by MOARD, DAP and Urea must be applied on all type of crops at the ratio of 1:1. Of all the farmers who applied fertilizer, 34% use DAP, 2.5% use Urea and 63.5% both.
According to the information collected during discussion, many of the respondents apply according to the recommended rate during the 2006/7 cropping season. But some do not apply based on the recommend rate because of the unaffordable fertilizer price and lack of cash for down payment.

Table15. Year of Chemical Fertilizer use.

	Members		Non-Members		Total	
	Count	Percent	Count	Percent	Count	Percent
1987/8	3	2.7	1	2.7	4	2.7
1995/6	8	7.1	1	2.7	9	6.0
1996/7	1	.9	1	2.7	2	1.3
1997/8	9	8.0	3	8.1	12	8.1
1998/9	8	7.1	2	5.4	10	6.7
1999/0	9	8.0	1	2.7	10	6.7
2000/1	7	6.3	1	2.7	8	5.4
1999/0	3	2.7	1	2.7	4	2.7
2000/1	4	3.6	1	2.7	5	3.0
2001/2	9	8.0	2	5.4	11	7.4
2002/3	13	11.6	5	13.5	18	12.1
2003/4	9	8.0	4	10.8	13	8.7
2004/5	13	11.6	8	21.6	21	14.1
2005/6	16	14.3	5	13.6	21	14.1
2006/7			1	2.7	1	.7
Total	112	100	37	100	149	100

Source: - Primary data

The data for the commencement year of fertilizer shows that most farmers started using chemical fertilizer after 2002. They started using fertilizer in a scattered manner; 2.7% started using in the year 1987/8 and 14.1% started in 2006EC and the remaining majority started between the 1987 and 2006/7. That means the level of adoption of chemical fertilizer was not so efficient before 1995 until the cooperative union was established.

Table 16: Additional Fertilizer Bought from Other Sources

	Member		Non-Member		Total	
	Count	Percent	Count	Percent	Count	Percent
Yes	9	7.8	5	12.5	14	9.0
No	107	92.2	35	87.5	142	91.0
Total	**116**	**100**	**40**	**100**	**156**	**100**

Source: - Primary data

According to the survey result, only 7.8% members and 12.5% of non members or 9% of all the respondents bought fertilizer from other source. This shows that chemical fertilizer in the study area is marketed almost totally by Enderta cooperative union.

Table 17. Fertilizer adoption by member respondents.

Fertilizer adoption status	Count	Percent
Adoption	123	87.86
Non-adoption	17	12.14
Total	**140**	**100**

Source:- Primary data.

The level of chemical fertilizer adoption by cooperatives is progressing in very good manner; this is mainly because the cooperative extension workers are teaching their members to use chemical fertilizers in order to maximize production. According to the study, 87.86% of the cooperative members adopt chemical fertilizer while only 12.14% do not adopt (Table 17).

Table 18. Fertilizer adoption by non- member respondents.

Fertilizer adoption status	*Count*	*Percent*
Adoption	*44*	*68.75*
Non-adoption	*20*	*31.25*
Total	***64***	***100***

Source:- primary data.

About 69% of the non-members adopt fertilizer while 31.25% do not adopt. The Pearson chi-square value of the relationship between cooperative membership and chemical fertilizer use is less than .05 and this imply that there is a relationship between chemical fertilizer use and cooperative membership Table36.

Table 19: Response of Farmers on how They Buy Fertilizer

	Member		***Non-Member***		***Total***	
	Count	***Percent***	***Count***	***Percent***	***Count***	***Percent***
In cash	*4*	*4.3*	*4*	*14.8*	*8*	*6.7*
In loan	*80*	*87.0*	*23*	*85.2*	*103*	*86.6*
Both loan and cash	*8*	*8.7*			*8*	*6.7*
Total	***109***	***100***	***34***	***100***	***143***	***100***

Source: - Primary data

Table shows that in the year 2006/7 crop season 4.3% of cooperative members and 14.8% of non-members purchase chemical fertilizer in cash, 87%of members and 85% non-members purchase on credit and 8.7% of members and 8 non-members purchase on both credit and cash.

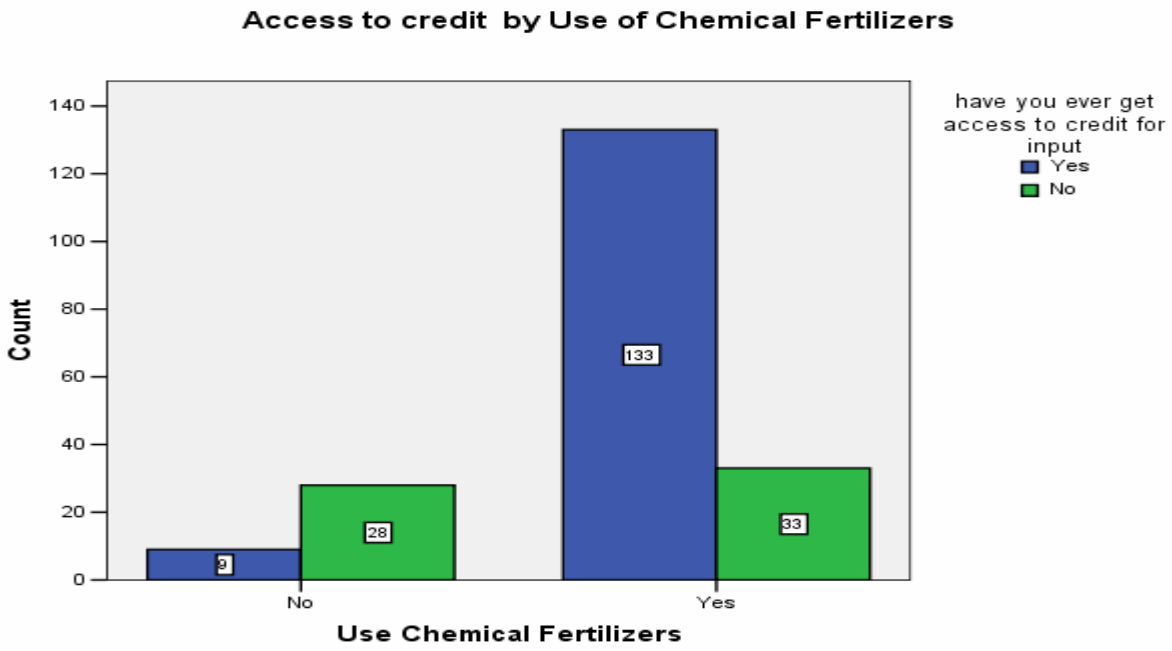


Fig. 6

Table 20. Reasons given by farmers for increasing fertilizer use

Reasons for increasing use of fertilizer			***Member***	***Non member***	***Total***
Reason for Increasing Use of Fertilizer	*Increased due to knowledge increased*	*Count*	*104*	*51*	*155*
		Percent	*67.1*	*32.9*	*100*
	Increased due to it is profitable	*Count*	*86*	*35*	*121*
		Percent	*71.1*	*28.9*	*100*
	Increased due to its early arrival	*Count*	*59*	*29*	*88*
		Percent	*67.0*	*33.0*	*100*
	Increased due to better provision of credit	*Count*	*79*	*34*	*113*
		Percent	*69.9*	*30.1*	*100*
Total	***Count***		***117***	***58***	***175***
	Percent		***66.9***	***33.1***	***100***

Source: Primary data.

According to result showed in table 14, more than 65% of non members and members' commenced using fertilizer after 2002, which is after the establishment of Enderta cooperative union. And for most of the farmers the reason for increasing usage of fertilizer is increase of knowledge, due its profitability and provision of credit (Table 20).

4.2.5. Use of animal dung

Table 21: Use of Dung (Manure) on farm land

Use cattle dung of farm land.		Member		Non-Member		Total	
		Count	Percent	Count	Percent	Count	Percent
Usage of animal dung on farm land	Yes	79	56.4	36	56.3	115	56.4
	No	61	43.6	28	43.8	89	43.6
Total		**140**	**100**	**64**	**100**	**204**	**100**

Source: - Primary data

Most farmers say that they do not use chemical fertilizer if they have animal dung at their disposal. But this study shows that 56% of the member farmers and 56.4% non-members farmers use animal dung on their farm land.

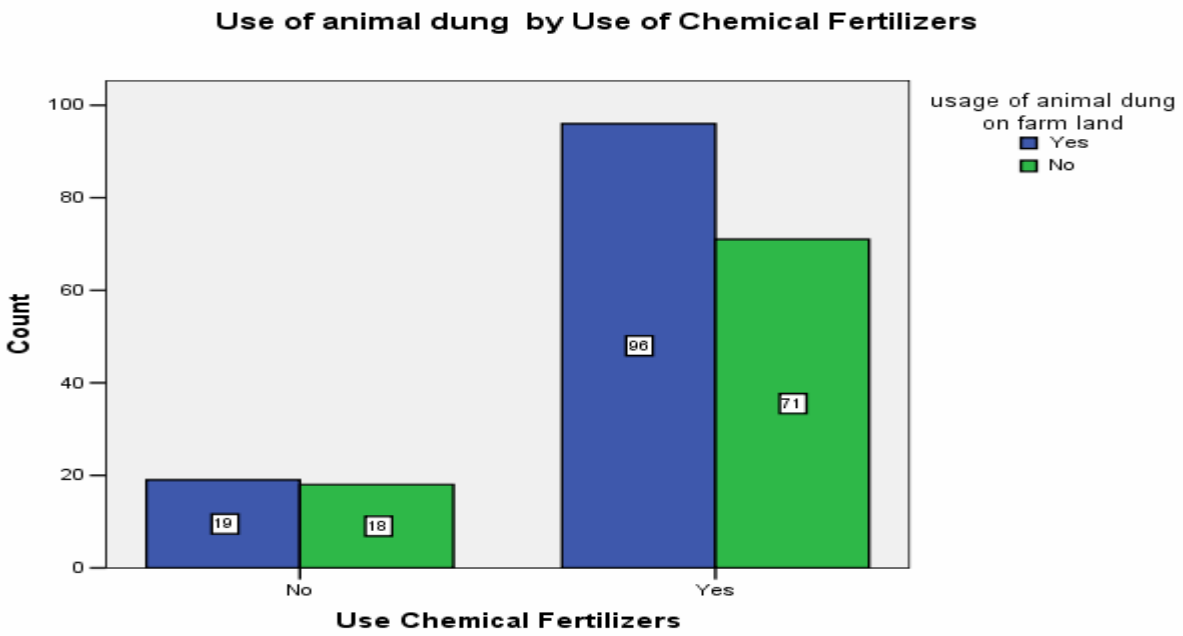


Fig. 7

4.2.6. Use of crop rotation

Table 22: Crop Rotation

Following crop rotation		*Use of crop rotation*		*Total*
		Yes	*No*	
Use of chemical fertilizer	*Yes*	*147*	*10*	*157*
	No	*22*	*13*	*35*
Total		***169***	***23***	***192***

Source: - Primary data

Both empirical experiences of farmers and scientific researches showed that crop rotation enhance land fertility by restoring the required nutrients. This study showed that 147of the total respondents practice crop rotation and at the some time use chemical fertilizers; 22

respondents do not use chemical fertilizers and do practice crop rotation. Ten respondents use chemical fertilizer but do not use crop rotation and 13 respondents do not use both.

4.2.7. Access to credit

Table 23: Access to Credit Service.

Access to credit.		*Coop-Member*		*Non-Member*		*Total*	
		Count	*Percent*	*Count*	*Percent*	*Count*	*Percent*
	Yes	*106*	*75.7*	*36*	*57.1*	*142*	*70*
	No	*34*	*24.3*	*27*	*42.9*	*61*	*30*
Total		***140***	***100***	***63***	***100***	***203***	***100***

Source: - Primary data

Credit is the most important development tool that could enable resource poor farmers to get access to modern agricultural technologies like chemical fertilizer, agricultural implements and improved seeds. This study also shows that most of the member and non-member fertilizer adopters get credit either from Enderta cooperative union or any other sources like DECSI. Table 23 shows 75.7% of the cooperative members, 57.1% non-members got access to credit and only 24.3% of the cooperative members and 42.9% of the non-members did not get access to credit during the cropping season 2006/7. Table.37 shows that 80.1% of the farmer respondents got access to credit and use chemical fertilizer.

Table 24: Source of Credit

		Coop-Member		Non-Member		Total	
		Count	Percent	Count	Percent	Count	Percent
Source of credit in last season	Enderta union	86	84.3	15	50.0	101	76.5
	Private companies	0	.0	1	3.3	1	.8
	DECSI	16	15.7	14	46.7	30	22.7
Total		**102**	**100**	**30**	**100**	**132**	**100**

Source: - Primary data

The major sources of credit facilities in the woreda are Enderta union and DECSI. 84.3 % of cooperative members and 50.0% of the non-members got credit from the Enderta cooperative Union. 15.7% of the cooperative members and 46.7% non-members got credit from DECSI during the 2006/7 cropping season (Table 24).

4.2.8. Availability of irrigation facility

Table 25: Availability of Irrigation facility

Availability of irrigation facility.	Coop-Member		Non-Member		Total	
	Count	Percent	Count	Percent	Count	Percent
Yes	19	14.2	7	10.9	26	13.1
No	115	85.8	57	89.10	172	86.9
Total	**134**	**100**	**64**	**100**	**198**	**100**

Source: - Primary data

85.8% of cooperative members and 89.10% of non-members do not have irrigation facility. Only 14.2% of the cooperative members and 10.9% of the non-members have got irrigation facility (Table 25). This result is mainly because most of the sample tabias at which the multi-purpose cooperative is functioning do not have irrigation facilities.

4.2.9. Use of improved seeds

Table 26: Use of improved/selected/ Seeds

		Use of selected seed		Total
		Yes	No	
Usage of fertilizer	Yes	108	45	153
	No	3	31	34
Total		111	76	187

Source: - Primary data

The result in the table above shows that 108 respondents use both selected seeds and chemical fertilizer and the chi-square test (-.448*) shows that there is relationship between the use of fertilizer and use of selected seed. It is seen that the availability of improved seeds together with chemical fertilizers contribute to yield increment and the adoption of fertilizer use itself.

4.2.10. Availability of extension service

Table 27: Availability of extension service

Availability of extension service during last cropping season		*Member of cooperative*				*Total*	
		Coop-Member		*Non-Member*			
		Count	*Percent*	*Count*	*Percent*	*Count*	*Percent*
	Yes	*109*	*80.1*	*49*	*77.8*	*158*	*79.4*
	No	*27*	*19.9*	*14*	*22.2*	*41*	*20.6*
Total		***136***	***100***	***63***	***100***	***199***	***100***

Source: - Primary data

In Enderta woreda there are 48 male and 7 female development agents of which 15 male and 1 female are working in the areas of Agronomy. These agents are assigned to serve 25,733 household heads. In 2006/7, 79.4%

of the respondents have access to agricultural extension service. 85.8% of the farmer respondents who have got extension service use chemical fertilizer and 14.2% of the respondents who have got extension service do not use chemical fertilizer. The chi-square test shows that the Pearson chi-square is -.331* which means there is close relationship between agricultural extension service and fertilizer use at .05 significant level (Annex 1).

4.2.11. Availability of subsidy

Table 28: Availability of Subsidy.

	Coop-Member		Non-Member		Total	
	Count	Percent	Count	Percent	Count	Percent
Yes	31	22.8	19	31.7	50	25.5
No	105	77.2	41	68.3	146	74.5
Total	**136**	**100**	**60**	**100**	**196**	**100**

Source: - Primary data

22.8% of the cooperative members and 31.7% non-members say they have received subsidy for chemical fertilizer buying, and 77.2% of members and 68.3% of non members respond that they have not received subsidy for buying chemical fertilizer (Table 28). According to the information from the bureau officials during discussion the Federal Government is still subsidizing fertilizer imports and they also assume that the amount of subsidy will be increased for the next cropping season due to international price rise.

Table 29: Reasons for Not Getting Subsidy.

	Coop-Member		*Non-Member*		*Total*	
	Count	***Percent***	***Count***	***Percent***	***Count***	***Percent***
No problem in buying	*13*	*11.5*	*4*	*7.8*	*17*	*10.4*
Cooperative union is unable to do so	*63*	*55.8*	*31*	*60.8*	*94*	*57.3*
Regional government don't consider to do so	*5*	*4.4*	*3*	*5.9*	*8*	*4.9*
To avoid dependency syndrome	*31*	*27.4*	*11*	*21.6*	*42*	*25.6*
Others	*1*	*.9*	*2*	*3.9*	*3*	*1.8*
Total	***113***	***100***	***51***	***100***	***164***	***100***

Source: - Primary data

The response of farmers to the reason for not getting subsidy for fertilizer buying is that 10.4% have no problem in buying, 57.3% the cooperative union is unable to do so, 4.9% regional government do not consider and 25.6% to avoid dependency syndrome(Table 29).

4.2.12. Perception of risk

Table 30: Perception of risk

	Member		Non-Member		Total	
	Count	Percent	Count	Percent	Count	Percent
Strongly agree	32	23.2	5	7.9	37	18.4
Agree	84	60.9	43	68.3	127	63.2
Undecided	19	13.8	15	23.8	34	16.9
Disagree	3	2.2	0	.0	3	1.5
Total	138	100	63	100	201	100

Source: - Primary data

63.2% of respondents take risk in using chemical fertilizer to get more yields. The most common risks of using chemical fertilizer are rain fall shortage both intensity and distribution, price of out put and damage due to pest and other calamities.

4.2.13. Training undergone in fertilizer use

Table 31: Training undergone in fertilizer use.

		Coop-Member		Non-Member		Total	
		Count	Percent	Count	Percent	Count	Percent
Received training on fertilizer usage	Yes	35	41.7	9	16.1	64	34
	No	77	58.3	47	83.9	124	66
Total		132	100	56	100	188	100

Source: - Primary data

41.7% of cooperative members and 16.1% of non-members received training in fertilizer use and 58.3% of the cooperative members and 83.9% of the non members do not receive training on the use of fertilizer.

4.3 Analysis of fertilizer profitability for major food crops

4.3.1 Value cost ratio analysis

The minimum ratio required to induce fertilizer use is 2 but this does not include farm operation cost (Mulat, 1994). In this study, due to inability of sample farmers to accurately estimate the different farming operations costs, especially the cost of family labour and oxen cost for each activities which all have effect on fertilizer use, the average yield obtained by fertilizer users and non-users was considered. The incremental yield (Qt/ha) - the difference between yield of fertilizer users and non-users of each crop (wheat, barely, and teff), the average annual farm gate price of these crops and the average cost of fertilizer per hectare (at farm gate) were considered for the VCR calculation. (Equation 1).

Assuming the minimum required VCR for Ethiopia is 2.5(Mulat, 1994), the use of fertilizer on teff is only slightly above this threshold. It fetches the least profit where as wheat and barley fetches relatively more profit. As can be calculated from Table 31, the incremental benefit per quintal was 7.9, 7.3 and 5.2 for wheat, barley and teff in that order.

Producers of both wheat and barley were relatively better-off than teff producers. The value cost-ratio (VCR) according to the equitation for wheat, barely and teff is found to be 2.9526, 2.9681 and 2.5754 respectively. Therefore, this result shows that the VCR for the major crops in the Woreda is some how better than the minimum required ratio for Ethiopia.

Table 32. Estimate of VCR of major cereal crops.

Description	Wheat	Barley	Teff
Incremental yield(Qt/ha)	7.9794	7.3345	5.2957
Annual ave. price (birr/qt)	150	113	188
Average fertilizer applied:			
Kg/ha	158	108.8	150.8
Birr/ha	405.38	279.24	386.57
Value-cost-ratio (VCR)	2.9526	2.9681	2.5754

Source: Primary data.

4.4. General problems

Table 33: General problems with respect to fertilizer use.

S/N	Problems/constraints in fertilizer use	Count	Percent
1	Lack of knowledge to use the recommended rate	45	11.87
2	Lack of cash for down payment	32	8.44
3	High price of fertilizer	46	12.13
4	Problem of using improved seed along with the application of fertilizer.	8	2.11
5	Most farmers are not convinced with the profitability of fertilizer.	20	5.27
6	High price of improved seeds	7	1.84
7	Distance of the fertilizer distribution center and DA's offices	9	2.43
8	Environmental problems like erosion and water logging.	5	1.31
9	Very high cost of credit/interest rate/.	67	17.67
10	Availability of different types of debit for inputs, agri. implements and livestock etc.	53	13.98
11	Lack of proximity to extension services	34	8.97
12	Lack of effective demonstration site and on farm experiment.	21	5.54
13	Lack of rural feeder roads	5	1.32
14	Lack of female development agents to assist the female headed households.	27	7.12
	Total	379	100.0

Source: Discussion with Officials

According to the respondents the major problem of fertilizer adoption is very high cost of credit to be paid by farmers at the time of repayment (17.67%). And 13.98%, 12.13%, 11.87%, respond that the problems of availability of different types of debit of inputs, high price of fertilizer and lack of knowledge to use the recommended rate are the major problems in the adoption of fertilizer.

4.5. Econometric results

The researcher employed the Logit model to estimate the effects of the hypothesized independent variable (section 3.4.2) on the probability of fertilizer adoption. Statistical packages-SPSS for WINDOWS was used for descriptive and econometric analysis.

As discussed in chapter three, the Logit model is a popular tool to estimate technology adoption (fertilizer). The variable fertilizer adoption is used as dependent variable. In this model, the explanatory variables included are: sex of the household head, Age of the household head, Education status of the household head, family size, and size of the cultivated land, condition of the cultivated land, availability of manure, access to credit, and Access to agricultural extension service, improved seeds, crop damage and number of oxen. The maximum likelihood estimates of the Logit regression result is shown in Table30.

Age:

The variable AGEHH has a negative and strong relationship with fertilizer adoption, inconsistent with the expectation. The implication is as farmers get older, they tend to reject fertilizer use.

Sex of the household head: The variable SEXHH was inversely and significantly related to fertilizer adoption, as expected. The implication is

that male household heads adopt fertilizer more than female household heads.

Family size: The variable family size was negatively related to fertilizer adoption with significance value of .025 which is less than .05 that means there is inverse and significant relationship between the family size and fertilizer adoption.

Education: The variable EDU has no significant influence on fertilizer adoption. There is insufficient level of schooling (< 1 year, on the average) hence farmer's decision making ability to adopt fertilizer adoption.

Oxen per farmer: The result of the variable was consistent with the expectation. The coefficient was positive but not statistically significant. It implies that as the number of oxen increases, the probability of fertilizer adoption will increase.

Land size: The coefficient of cultivated land per farmer (Ls) is positive and statistically significant. The implication is that large farm size affects the probability of fertilizer adoption.

Land fertility: Land fertility has a negative relationship and statistically significant that .03 significant level. That means as the quality of land increases the level of fertilizer adoption deceases.

Access to credit: The variable credit is statistically significant at .05% probability level and has a positive relationship. The implication is that the probability of fertilizer adoption was very sensitive to farmer's accessibility to credit. In other words, farmers who have access to credit are more likely to adopt fertilizer.

Access to extension service: Extension service was positively related to fertilizer adoption but was not statistically significant.

Availability of Manure: According to the result found, this variable is a very important factor for fertilizer adoption. The variable is negatively and significantly (5% probability level) related to use of fertilizer. Other factors held at their mean level, a change in the variable manure 0 to 1 will negatively influence the probability of fertilizer adoption rate by 10%. This implies that using of manure to the required level will probably reduce the commercial fertilizer adoption by 10% and hence decrease its cost by equivalent amount.

Crop damage: Although it was statistically insignificant, the variable has a negative coefficient in the model of fertilizer adoption.

Improved seed: Availability of seed showed that it is positively related and statically significant. That means as the application of improved seed increased, the rate of fertilizer adoption increases. Or there is a direct and significant relationship.

Independent variables subsidy, availability of irrigation and training of farmers in fertilizer use were removed by multi –co linearity effect.

Table 34: Model Summary

		-2 log likelihood	Cox & Snell R Square	Nagelkerke R Square
Step	1	56.248a	.489	.791

a. Estimation terminated at iteration number 20 because maximum iteration has been reached. Final solution cannot be found.

Table 35: Maximum likelihood Estimates of Fertilizer adoption: Logit Analysis.

		B	SE	Wald	df	sig	Exp(B)
	Sex	-2.347	1.186	3.920	1	0.048	0.096
	age	-.083	0.34	5.946	1	0.015	0.920
	Edu.	-.755	.780	.935	1	.333	.470
	Fami	-.544	.243	5.022	1	.025	.580
	V2.1.1	2.043	.771	7.031	1	.008	7.714
	V2.2	-2.292	1.059	4.683	1	.030	.101
	V3.1	-2.644	1.752	2.277	1	.131	.071
	V3.2a	.470	.521	.812	1	.367	1.600
	V4.21	-.772	.827	.872	1	.050	.462
	V4.29	-3.137	.995	9.941	1	.002	.043
	V6.2	-1.251	1.158	1.169	1	.280	.286
	V7.1	-3.882	1.041	13.898	1	.000	.021
	V8.4	1.454	1.053	1.905	1	.168	4.278
	V9.1	-21.758	5865.713	.000	1	.997	.0000
	Constant	73.234	11731.431	.000	1	.995	6E+ 031

Note: based on the "sig" value the following variables are only included: sex, age, Edu, family size, v2.1.1.v2.2,v.4.21,v4.29,v6.2,v7.1 and v9.1.

Table 36. Chi-square test for coop. membership and fertilizer use.

	Values	df	Sig 2-sided	Exact-sig 2-s	Exact sig 1-s
Peason chi-sq	10-800b	1	.001		
Continity correction	9.551	1	.002		
Fishers' ET				.002	.001
Linear by linear association	10.747	1	.001		
N of valid cases	204				

Table 37: Fertilizer adoption by independent variables

		Use of chemical fertilizer				Total	
		No		Yes			
		Count	Percent	Count	Percent	Count	Percent
Sex of household head	Male	22	59.5	155	92.8	177	86.8
	Female	15	40.5	12	7.2	27	13.2
Total		**37**	**100.0**	**167**	**100.0**	**204**	**100.0**
Age group of respondents	15 – 30	6	16.2	17	10.2	23	11.3
	31 – 45	17	45.9	60	35.9	77	37.7
	46 - 64	8	21.6	59	35.3	67	32.8
	65+	6	16.2	31	18.6	37	18.1
Total		**37**	**100.0**	**167**	**100.0**	**204**	**100.0**
Family size of respondents	1- 3	10	27.0	4	26.3	54	26.5
	4 – 5	20	54.1	67	40.1	87	42.6
	6 – 8	4	10.8	47	28.1	51	25.0
	9 - 11	3	8.1	9	5.4	12	5.9
Total		**37**	**100.0**	**167**	**100.0**	**204**	**100.0**
Livestock ownership	Yes	24	64.9	162	97.0	186	91.2
	No	13	35.1	5	3.0	18	8.8
Total		**37**	**100.0**	**167**	**100.0**	**204**	**100.0**
Condition of your land	Very good			2	1.2	2	1.0
	Good	8	21.6	69	41.3	77	37.7
	Moderate	29	78.4	96	57.5	125	61.3
Total		**37**	**100.0**	**167**	**100.0**	**204**	**100.0**
Have you ever get access to credit for input?	Yes	9	24.3	133	80.1	142	70.0
	No	28	75.7	33	19.9	61	30.0
Total		**37**	**100.0**	**166**	**100.0**	**203**	**100.0**
Have you got extension service last cropping season?	Yes	19	51.4	139	85.8	158	79.4
	No	18	48.6	23	14.2	41	20.6
Total		**37**	**100.0**	**162**	**100.0**	**199**	**100.0**
Usage of animal dung on farm land	Yes	19	51.4	96	57.5	115	56.4
	No	18	48.6	71	42.5	89	43.6
Total		**37**	**100.0**	**167**	**100.0**	**204**	**100.0**
Have you ever faced crop damage?	Yes	27	73.0	123	73.7	150	73.5
	No	10	27.0	44	26.3	54	26.5
Total		**37**	**100.0**	**167**	**100.0**	**204**	**100.0**
Use of selected seed	Yes	3	8.1	110	65.9	113	55.4
	No	34	91.9	57	34.1	91	4.6
Total		**37**	**100.0**	**167**	**100.0**	**204**	**100.0**
Do you earn off-farm income?	Yes	15	40.5	35	22.0	50	25.5
	No	22	59.5	124	78.0	146	74.5
Total		**37**	**100.0**	**159**	**100.0**	**196**	**100.0**

Source: - Primary data

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5. CONCLUSION AND RECOMMENDATION

5.1. Conclusion

The agro-climatic condition of Ethiopia is conducive for crop and animal husbandry. Nonetheless, the contribution of agriculture to the overall economic development of the country is very low. Limited application of new technologies is one of the major reasons for the poor performance of agriculture.

Fertilizer technology was introduced about three decades ago to the study area, Enderat woreda. However, the degree of fertilizer adoption is still inadequate. This study examined the extent to which farmers who are members and non members of a cooperative society in the study area adopt chemical fertilizer and analyzed the factors that affect their adoption.

Field survey data collected through direct interview were used. A probability proportionate to size and random sampling procedure were used to select 204 sample farmers i.e. 140 cooperative members and 64 non cooperative members. Value Cost Ratio was employed to estimate fertilizer profitability by crop (wheat, barley and teff). A Logit model was used to examine the factors affecting fertilizer adoption marketed through the cooperative union.

It was evidenced that 37.7% of the respondents are between 31-45 and 32.8% are between the age of 46-64, this implies that most of the non-members and members are in the economically active age. About 42.6% of the total respondents have a family size of 4-5. 70.1% of the total respondents read and write and only 14.7% are illiterates.

Fertilizer was adopted by 87.86% of the cooperative members and 68.75% of the non members i.e. 56.4% of member farmers and 43.6% of

the member's farmers and 43.8% of the non members do not use animal dung on their farm.

The contribution of improved seed along with the use of inorganic fertilizer to increase yield is very high. However, the adoption rate of improved seed in the study area was not very high. About 54.4% of the total sample farmers used improved seeds in the 2006/7 cropping season. This was mainly due to the high improved seed price and most farmers want to use own source.

Although the VCR estimation for the three major cereal crops (wheat, barley and teff) is above the threshold, it needs to be higher to convince farmers about the profitability of fertilizer adoption.

The result of the logit model showed that the dependent variable i.e chemical fertilizer adoption is explained by the independent variables mentioned by 79.1% while the remaining 19.9% is explained by other factors.

The factors that significantly determine adoption of fertilizer are: access to credit, oxen ownership, use of manure and age of household head.

As the fertilizer technology has been in use since the 1970s in the study area, farmers with higher experience (AGHHH) appear to have gained adequate information and better knowledge. Hence, they were able to evaluate the advantage of the fertilizer technology, as captured by the logit model.

Although it was found insignificant, the problem of crop damage due to various factors should not be overlooked. Environmental factors like soil erosion and water logging problems exerted a negative influence on fertilizer adoption.

5.2. Recommendations.

1. Policy-makers ought to re-think about alternative methods of dealing with high fertilizer price so as to appropriately address the problem of subsistence farm households (especially resource- poor farmers). Various options can be suggested: (a) the government should improve importing time and associated costs of fertilizer and hence this would reduce fertilizer cost or farm gate price. This can be achieved by close co-ordination and supervision of importers, wholesalers and retailers of fertilizer and improving transportation and storage facilities from port up to marketing centers; (b) farmers in the study area and elsewhere in the country mainly grow rain-fed cereal crops which are used for both consumption and as a source of cash. Rain- fed agriculture is often associated with high risk like shortage or excess of rainfall. This exacerbates the fear of farmers not to show readiness to use modern inputs (fertilizer).When crop failure occurs due to such events, the government need to support farmers either through the removal of input (fertilizer) debt or crop insurance;(c) the current cost of credit seems very high (120%) as compared to the past. This sudden shock imposed negative influence on fertilizer adoption in the study area. The low credit cost on fertilizer has a great advantage in light of national food production strategy. Notably, the implementation of low cost credit should sustain at least up until the country is in a position to supply sufficient food ether from domestic production or import to the rapidly increasing population. (d) The fertilizer price is growing at a higher rate over the years. But the growth of output price seems constant as compared to input (fertilizer) price. The fertilizer price subsidy may not be consistent with the market liberalization policy of the country. However, output price support on major cereal crops should be sought as alternative policy measure.

2. Create awareness among the members and officials of cooperatives about the role and importance of fertilizer use and also the appropriate recommendation for each crop.
3. To sustain the positive effects of the extension services on adoption of fertilizer, effective demonstration sites and on-farm experiments should be encouraged by the government. In line with this, the assignment of female development agents along with the female headed households calls for attention.
4. The construction of rural feeder roads improves timely delivery of fertilizer and access to extension services.
5. Promote irrigation and water harvesting facilities in the farms to enhance adoption of fertilizer.
6. Promote increased use of organic manure such as farm yard manure, compost and vermi-compost. This is because of the reason that soil health as well as the effectiveness of fertilizer application will be more when a basal dressing of organic manure is given to the land.
7. The cooperatives may start new units of vermi-compost production as organic manure to be used besides fertilizers.
8. Training programs may be organized by the multi purpose cooperatives to train the farmers in application of fertilizer and also organic manure.
9. Result demonstration may be organized to convince the farmers about the high agricultural production by using fertilizers.
10. Marketing infrastructure (godowns, store, transport etc) may be developed for marketing fertilizer through cooperatives.
11. Dedicated extension works are to be undertaken by competent cooperative extension workers with the help of experts from MOARD for increasing agricultural production by effective application of fertilizers.

12. Village leadership may be activated to promote appropriate fertilizer use and fertilizer marketing through cooperatives.
13. Availability of the required fertilizer may be ensured in the cooperative depot for supplying to farmers in the cropping season.
14. Seminars may be organized in the villages to involve rural youth, adults and women to impart knowledge on scientific cultivation of teff, wheat, barley and other crops.
15. Area under vegetables may be given special attention in the distribution of fertilizers.
16. The multipurpose cooperatives may give more attention to the marketing of fertilizers and quality planting materials to the members and non-members.
17. Mass media, especially television may be exploited to create awareness about judicious and appropriate use of fertilizers and its distribution through the multi purpose cooperative.

In summary, this study implies that fertilizer price, appropriate rate of fertilizer application to specific localities, provision of credit to resource-poor farmers (to purchase oxen and input), development of feeder road for timely input delivery, improved extension service and up-grading farmers' education level are areas of priority for successful national food production strategy. The researcher suggests that a special focus on credit and fertilizer price would enhance the promotion of fertilizer adoption, there by contributing towards achieving self-sufficiency in food production.

5.3. Implications for future research

The adoption behavior may vary from Woreda to Woreda. Hence similar research studies on adoption behavior and profitability of fertilizer marketed through cooperatives of the Western Zone of Tigray Region may be worth conducting.

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ANNEX-I

MEKELLE UNIVERSITY

School of GRADUATE STUDENTS

Factors affecting adoption and profitability of fertilizer marketed through cooperatives in Enderta woreda, Ethiopia.

INTERVIEW SCHEDULE

Remark: 1. Introduce yourself politely before you start interviewing the respondent

2. Use pencil to fill out the interview schedule
3. Information is gathered on Meher Season
4. Use (✓) mark where necessary

Date of Interview _____

Name of Interviewer_____

Tabia and Primary Cooperative _____

1. Household characteristics

No.	Name	Sex 1. Male 2.Female	Age	Education level	Occupation
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

1= Farming 2 = Trading 3 = Weaving 4 = Wage employee

5 = Student 6 = others, specify_____

1 = Illiterate 0 = Read and write Grade = 1,2,…12

2. Land holding

2.1. What was your land use pattern in 1999 cropping season?

1. Cultivated area _____ha.
2. Grazing area _____ha.
3. Fallow area _____ha.
4. Others, specify _____ha _____

2.2. In your opinion, what is your land condition?

1. Very good B. good C. Moderate

2.3. Did you rent out land during last cropping season?

1. Yes_____ 2. No_____

2.4. If yes, 1 Area rented out _____ha.

2. Amount received _____ birr/ha

2.5. If land is rented out, why?

	Yes	No
1. Shortage of oxen	_____	_____
2. Shortage of cash to purchase input	_____	_____
3. Shortage of labour	_____	_____

2.6. Did you practice share cropping out last cropping season?

1. Yes _____ 2. No _____

2.7. If yes, what was the share of output?

1. ½ mine _____ 2. 2/3 mine __ 3. 1/3 mine

4. ¾ mine _____ 5. ¼ mine

2.8. What were the terms of share cropping in terms of input contribution?

	By the land owner (%)	**By the partner(%)**

1. Oxen _____ _____
2. Fertilizer _____ _____
3. Seed _____ _____
4. Labour _____ _____
5. Others, specify _____ _____

2.9. Why did you practice share cropping out?

	Yes	No
1. Lack of oxen	_____	_____
2. Lack of seed	_____	_____
3. Shortage of labour	_____	_____
4. Shortage of cash	_____	_____

3. Livestock holding.

3.1. Do you have some livestock? 1. Yes_____ 2. No_____

3.2. If yes, would you tell me the type and number?

Livestock Type	**Quantity in Number**
Ox (en)	_____
Cows	_____
Calves	_____
Heifer	_____
Balls	_____
Horses	_____
Mules	_____
Donkey	_____
Sheep	_____
Goats	_____

3.3. Did you face shortage of oxen last cropping season?

1. Yes_____ 2. No _____

3.4. If yes, how did you solve the problem?

1. Through teaming up_____
2. Through hiring oxen _____
3. Through assistance from friends & relatives_____
4. Through exchange of labour for oxen_____
5. Through deploying labour (digging by hand) _____
6. Through share cropping out _____

3.5. If oxen was hired, what was the amount paid?

1. In birr_____ 2. In kind_____

3.6. Did you sell livestock last crop season? _____

1. Yes _____ 2. No _____

3.7. If yes, what was the type sold and amount received?

Type sold	**Number sold**	**Amount received in Birr**
Oxen		
Cow		
Heifer		
Bull		
Goat		
Sheep		
Donkey		
Horse		

3.8. Why did you sell livestock?

1. To purchase fertilizer or to pay for fertilizer debt
   1. Yes _____ 2. No _____
2. To purchase improved seed 1. Yes _____ 2. No _____
3. To purchase oxen 1. Yes _____ 2. No _____
4. To repay credit 1. Yes _____ 2. No _____
5. To purchase food grains 1. Yes _____ 2. No _____

3.9. When did you sell most of your livestock in the last crop season?

1. Dec. – Feb_____ 2. Mar – May _____3. Jun-Nov. _____

3.10. What do you suggest about the price you received?

1. Very high _____ 4. Very low_____
2. High _____ 5. Low _____
3. Medium_____

4. Input use/adoption/.

4.1. Have you ever used chemical fertilizer?

1. Yes_____ 3. No _____

4.2. If yes, when did you first start using it? Since 19 _____

4.3. What type of chemical fertilizer did you use?

1. DAP _____ 2. Urea _____ 3. Both_____

4.4. What amount of fertilizer did you purchase last season?

1. DAP _____kg 2. Urea _____kg

4.5. What was the price of one quintal of chemical fertilizer?

1. DAP _____Birr 2. Urea _____Birr

4.6. Did you use all of the fertilizer purchased last season?

1. Yes _____ 2. No _____

4.7. From where and how did you get fertilizer last season?

No.	**Source**	**1 = Yes 2 = No**	**How do you get?** **1 = On cash 2 = On credit 3 = both**
1	Enderta union		
2	Private traders		
3	Others, specify		

Agricultural input Supply Corporation.

4.8. How did you transport the purchase chemical fertilizer?

1. By own labour _____

2. by pack animals /own/hired) _____

3. by transport _____

4.9. What was the transport cost of the purchased chemical fertilizer? (If used vehicle or rented animal's _____birr/quintal.

4.10. What was the area cultivated and fertilizer during the last cropping season?

Description	Wheat		Barley		Teff		Others Specify	
	1998	1999	1998	1999	1998	1999	1998	1999
Total cultivated area in hactar								
Fertilized area by DAP Urea								
Amount of fertilizer used in kg DAP Urea								

4.11. Did you apply the recommended fertilizer rate?

1. Yes_____ 2. No_____

4.12. If no, why?

1. Not affordable_____

2. Shortage in supply_____

3. Manure is supplementary_____

4. Others, specify_____

4.13. In your opinion, why the amount of fertilizer used increased/decreased in the last crop season?

Increased due to	**Decreased due to**
1. Use of knowledge increased	1. High fertilizer cost
2. It is profitable	2. Date arrival
3. Early arrival	3. Not convinced of benefit
4. Better provision of credit	4. Shortage of cash

4.14. Did you purchase the amount of fertilizer you needed last season? 1. Yes _____ 2. No _____

4.15. If no, why?

	Yes	No
1. Shortage in supply	_____	_____
2. Lack of cash	_____	_____
3. Late delivery	_____	_____
4. Others, specify	_____	_____

4.16. Do you think chemical fertilizer price is too expensive?

1. Yes _____ 2. No _____

4.17. If yes, what would you suggest to solve the problem?

	Yes	No
1. Increase output price	_____	_____
2. Low fertilizer price (subsidy)	_____	_____
3. Low interest rate on credit	_____	_____
4. Debt removal when crop failure occurs	_____	_____
5. Others, specify	_____	_____

4.18. If you did not use fertilizer so far, why?

	Yes	No
1. Lack of knowledge	_____	_____
2. Lack of cash	_____	_____
3. Shortage in fertilizer supply	_____	_____
4. Others specify.		

4.19. Did you ever use animal dung on your farm land?

1. Yes _____ 2. No _____

4.20. If you did not use animal dung, why?

1. Use for fuel_____ 3. Distance too long _____

2. Not available_____ 4. Others, specify_____

4.21. Do you leave stalk of previous harvest on the field?

1. Yes_____ 2. No _____

4.22. Did you practice fallowing? 1. Yes _____ 2. No _____

4.23. If yes, what was the usual cycling?

1. One year_____ 2. Two years_____3. Three years_____

4. Four years_____ 5. Five years_____

4.24. If you did not practice fallowing, why?

	Yes	No
1. Shortage of farmland	_____	_____
2. Own land is fertile	_____	_____
3. Fertilizer is available	_____	_____
4. Others specify	_____	_____

4.25. Have you ever practiced crop rotation?

1. Yes _____ 2. No _____

4.26. If yes, how did you sequence cropping? (Specify type of crops in order)

1. First_____ 2. Second _____

3. Third_____ 4. Fourth _____

4.27. If no, why?

1_____

2_____

3_____

4.28. Have you ever used improved seed? 1. Yes_____ 2. No _____

4.29. If yes, what was the amount and area plated?

Type of seed used	Amount of seed used and area planted					
	2006/7		2005/6		2004/5	
	Seed in Quintal/kg	Area in ha	Seed in Qui./kg (circle one)	Area in ha	Seed in Qui/kg (circle one)	Area in ha.
Wheat						
Barley						
Teff						

4.30. From where did you get improved seed last season?

1. Enderta Cooperative Union_____
2. Bureau of Rural Agriculture and Rural Development_____
3. Ethiopian Seed Enterprise_____
4. Private traders_____
5. Own selected seed from last season harvest_____
6. Relative/friends_____
7. Others, specify_____

4.31. Did you purchase the amount of improved seed you needed last cropping season? 1. Yes _____ 2. No _____

4.32. If improved seed purchased, what was the price? Paid

Crop type	**Amount in qut/kg**	**Birr**
Wheat	_____	_____
Barely	_____	_____
Teff	_____	_____

4.33. If you did not get improved seed, why?

	Yes	No
1. Not available	_____	_____
2. Lack of knowledge	_____	_____
3. Too expensive	_____	_____
4. Shortage of supply	_____	_____
5. Others, specify	_____	_____

5. Profitability of fertilizes

5.1 What is the amount of yield (qt/ha) increment in the year 2006/7 by using fertilizer?

s/n	Description	Wheat	Barley	Teff
1	Incremental yield(qt/ha)			
2	Annual ave. price (birr/qut)			
3	Average fertilizer applied (kg/ha)			
4	Annual ave. price of fertilizer (birr/kg).			
5	Annual ave. profit generated in birr			

6. Extension service availability.

6.1. When did you start getting extension services? Since 19_____

6.2. Did you get extension service last cropping season?

1. Yes_____ 2. No _____

6.3. If yes, what type of service did you receive last cropping season?

1. Visit to demonstration site 1. Yes _____ 2. No _____

2. Attending field days arranged by MOA/Research Centers

   1. Yes_____ 2. No _____

3. Through hosting on-farm experiments 1. Yes_____ 2. No _____

4. Attending training program 1. Yes_____ 2. No _____

5. Through direct contact with development agents

   1. Yes _____ 2. No _____

6.4. How often did you make contact with development agents

1. Once during the season
2. Twice during the season
3. Three times during the season
4. Several times during the season

6.5. How many hours did it take you to reach at extension office_____hours.

6.6. Did you benefit from extension service? 1.Yes_____2. No _____

7. Credit service

7.1. Have you ever get access to credit for input or otherwise to improve your farming activities? 1. Yes _____ 2. No _____

7.2. What was the source of credit last season?

1. Enderta cooperative union
2. Friends/relatives
3. Private companies
4. DECSI

7.3. Did you take improved seed on credit last cropping season?

1. Yes_____ 2. No_____

7.4. Did you take credit for other reasons? If yes, specify

1. Yes _____ 2. No _____

7.5. If you used credit during the last cropping season or before, did you pay back your debt? 1. Yes_____2. No _____

7.6. If yes, which year? 200____

7.7. If no, why?

	Yes	No
1. Due to low output	_____	_____
2. Due to low output price	_____	_____
3. Due to others, specify_____		_____

7.8. If you did not take credit, why?

	Yes	No
1. No cash for down payment	_____	_____
2. High interest rate	_____	_____
3. In accessibility to credit Institutions	_____	_____
4. Failure to provide collateral	_____	_____
5. Cumbersome bureaucratic Processes	_____	_____

8. Physical environment

8.1. In your opinion, was the amount of rainfall adequate during the last cropping season?

Year	1 = Yes		2 = No
	Normal	**Too much**	**Too small**
2006/7			
2005/6			
2004/5			

8.2. How did you describe the start of rainfall over the last three cropping season?

	1=Yes	**2= No**	
	Normal	**Too earl**	**Too late**
2006/7			
2005/6			
2004/5			

8.3. How was the distribution of rain fall in the last cropping season?

	2006/7	**2005/6**	**2004/5**
1.Excellent	_____	_____	_____
2.Good	_____	_____	_____
3.Poor	_____	_____	_____

8.4. Have you ever faced any crop damage since the last five cropping season? 1. Yes _____ 2. No _____

8.5. If yes, how often?

1. Most frequently_____
2. Some times_____
3. Rarely_____

8.6. What was the common cause of crop damage?

1. Wild animals (like monkey, age, crop, etc) _____
2. Frost/hail_____
3. Flood_____
4. Crop pest /disease_____
5. Shortage of rainfall_____
6. Others, specify_____

8.7. On which type of soil color did you plant the following crops?

Type of crop	**Black soil**	**Red soil**	**Others**
Wheat	_____	_____	_____
Barley	_____	_____	_____
Teff	_____	_____	_____

8.8. Does your farm have serious water logging problem?

1. Yes _____ 2. No _____

8.9. If yes, how did you solve the problem?

1_____

2_____

3_____

8.10. Does your farm have serious soil erosion?

1. Yes _____ 2. No _____

8.11. If yes, how did you solve the problem?

1_____

2_____

3_____

9. Irrigation facilities.

9.1. Did you use irrigation water? 1. Yes_____ 2. No_____

9.2. If yes,

Type of crop	Area irrigated in hector	Area fertilized in hector
1_____	_____	_____
2_____	_____	_____
3_____	_____	_____
4_____	_____	_____
5_____	_____	_____

9.3. If no, why?

1_____

2_____

3_____

10. Farm produce and annual income

10.1. What was the amount of produce obtained last crop season?

Type of Crop	**1 = Aybet 2 = Quintal 3 = Keretit**		
	2006/7	**2005/6**	**2004/5**
Wheat			
Barely			
Teff			
Maize			
Beans			
Chick peas			
Lentils			
Peas			

10.2. Did you sell crop last season? 1. Yes_____ 2. No_____

10.3. Did you purchase crops last season?

1. Yes_____ 2. No_____

10.4. If yes,

Type of crops sold or purchase	**Amount sold in quintal**	**Amount received in birr**	**Market center 1= Quiha 2= Aynalem 3= Mekelle 4=Mai-Mekeden**	**Purchase**	
				Amount purchased in kg	**Amount paid in birr**
Teff					
Wheat					
Barley					
Beans					
peas					

10.5. What do you suggest about the price received or paid?

1. Very high 3. Medium
2. High 4. Very low 5. Low

10.6. Which part of the year did you sell the largest portion of your produce or purchase food grains

1. Dec_____ Feb_____
2. March ____ May _____
3. Jun_____ Nov_____

10.7. Why did you sell farm produce?

a. To purchase fertilizer or to pay fertilizer debt

1. Yes_____ 2. No_____

2) To purchase improved seed 1. Yes_____ 2. No_____

3) To purchase oxen 1. Yes_____ 2. No _____

4) To repay input credit 1. Yes_____ 2. No_____

5) Others, specify_____

10.8. Did you/your family earn off-farm income during last crop season? 1. Yes_____ 2. No_____

10.9. If yes, what was the source of off-farm income and amount earned?

Source of income	**Amount earned in birr**
1._____	_____
2._____	_____
3. _____	_____
4._____	_____

11. Subsidy

11.1. Is their any subsidy to fertilizer marketed through your cooperative?

1. Yes. 2. No

11.2. If yes what type of subsidy do received?

1. ----------
2. ……
3. ……
4. ……

11.3. If no what is the reason?

1. B/c there is no problem in buying.
2. B/c the cooperative union is unable to do so.
3. B/c the regional Govn't do not consider to so.
4. To avoid the dependency syndrome.
5. Others, specify……

12. Perception of a bout risk.

12.1. A farmer should use fertilizer to make a huge profit than to be content with a smaller but less risky profits.

1. Strongly agree/AS/
2. Agree./A/
3. Undecided./UD
4. Disagree./DA/
5. Strongly disagree./SDA/

12.1. A farmer who is willing to take greater risks than average farmer usually does better financially.

1. SA
2. A
3. UD
4. DA.
5. SDA.

12.2. It is good for a farmer to take risk when he knows his chance of success is fairly high.

1. SA.
2. A.
3. UD.
4. DA.
5. SDA.

12.3. It is better for a farmer not to try new technologies unless most other farmers have used them.

1. SA.
2. A.
3. UD.
4. DA.
5. SDA.

12.4. Trying on entirely new technology in farming by a farmer involves risk but it is worth.

1. SA.
2. A.
3. UD.
4. DA.
5. SDA.

13. Perception of profitability of fertilizer use

13. 1. A farmer should use fertilizer to maximize crop yield.

1. SA.
2. A.
3. UD.
4. DA.
5. SDA.

13.2. A farmer who is willing to fertilizer as per the recommendation gets a huge profit.

1. SA.
2. A.
3. UD.
4. DA.
5. SDA.

13.3. Farmer who failed to use fertilizer as per the recommended rate do not get the desired yield per hactar.

1. SA.
2. A.
3. UA.
4. DA
5. SDA

14. Annual expenditure

14.1. What was the type of crops usually consumed by your household members? (Ask in order of importance)

1. Teff _____ 3. Wheat_____
2. Maize_____ 4. Barley_____ 5. Others, specify_____

14.2. Did you face food shortage during the last crop season?

1. Yes_____ 2. No _____

14.3. If yes, how did you meet your family's food requirement?

1. Through purchase_____
2. Through borrowing from relatives/friends_____
3. Through food aid by government/non-government_____
4. Through food for work program_____
5. Thorough others, specify_____

14.4. How often did you face food shortage during the last cropping season?

1. Most frequent_____ 3. Not at all _____
2. Less frequent_____

14.5. Would you tell me other details of your expenses?

1. Land tax _____birr
2. Clothing _____birr
3. Medication_____birr
4. Other, specify _____

15. Training undergone.

15.1 Have you undergone any training in fertilizer use?

1. yes 2. No

15.2 If yes, furnish the details.

S/n	Type of Training undergone	Duration of the Training	Agency who conducted the training.
1			
2			
3			
4			

16. General problems.

16.1What are your general problems with respect to fertilizer adoption?

S/N	Problems	Most impor.(3)	Important (2)	Less important(1)
1				
2				
3				
4				
5				
6				
7				
8				
9				
	Others, specify.			
10				
11				
12				

17. Recommendations.

17.1. What are the recommendations for improving the fertilizer marketing through cooperative?

S/n	Recommendations	Most impor.(3)	Import. (2)	Less Impor.(1)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
	Others, specify.			
11				
12				
13				

Annex II
መቐለ ዩኒቨርሲቲ
ቤት ትምህርቲ ድሕሪ ምረቓ

መፅናዕቲ ፀለውቲ ምክንያታት ምትእትታው ትርፋማነትን ማዳበርያ ምሻጥ ኣብ ወረዳ እንደርታ ሕብረት ስራሕ ማሕበራት ዩኔን፡-

ሕቶታት መቅረቢ ቅጥዒ

መተሓሳሰቢ፡- 1. ሕቶ ቅድሚ ምጅማርኩም ንተሓተቲ ብትሕትና ቅረብዎም

2. እርሳስ ይጠቐሙ

3. እዚ ምልከት ይጠቐሙ

ዕለት_____

ሽም ሓታታይ_____

ሽም ጣብያን መሰረታዊ ሕ/ማሕበር_____

1. ኩነታት ስድራ ዝምልከት

ተ/ቁ	ሽም	ፃታ	ዕድመ	ደረጃ ትምህርቲ	ስራሕ
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					

1. ማሕረስ 2. ንግዲ 3. ሽማንየ 4. መዓልታዊ ሰራሕተኛ 5. ተምሃራይ

6. ካልኦ ይገለፅ_____

1. ዝተምሃረ 2. ምንባብ ምፅሓፍ 3. ደረጃ ትምህርቲ_____

2. ናይ መሬት ትሕዝቶ

2.1. ኣብ ምህርቲ ዘመን 1999 ዓ/ም ትሕዝቶ መሬትኩም እንታይ ይመስል ነይሩ?

1. ናይ ምህርቲ መሬት_____ሄ/ር

2. መግሃጫ መሬት_____ሄ/ር

3. ሕዳር መሬት_____ሄ/ር

4. ካልኦት ይግለፁ_____ሄ/ር _____

2.2. ኩነታት ትሕዝቶ መሬትኩም እንታይ ይመስል

1. ብጣዕሚ ፅቡቅ 2. ፅቡ ቅ 3. ዳሕና

2.3. ኣብ ዝሓለፈ ናይ ምህርቲ ዘመን መሬት ኣካሪኹም ትፈልጡ'ዶ?

1. እወ 2. ኣይፋሉን

2.4. መልስኹም እወ እንተኾይኑ

1. ዝተካረየ ስፍሓት መሬት _____ሄ/ር

2. ዝተቐበልክምዎ ክፍሊት _____ብር /ሄር

2.5. መሬት ኣካሪኹም እንተኾይንኩም ልምንታይ?

	እወ	**ኣይፋሉን**
1. ናይ ባዕለይ ፀገም	_____	_____
2. ሕፅረት ገንዘብ መግዝኢ እታወታት	_____	_____
3. ናይ ሓይሊ ሰብ ሕፅረት	_____	_____

2.6. ኣብ ዝሓለፈ ናይ ምህርቲ ዘመን ብልፍንቲ ዶ ሓሪስኩም ነይርኹም?

1. እወ 2. ኣይፋሉን

2.7. መልስኹም እወ እንተኾይኑ ናይ ምህርቲ ክፍሊትኩም ከመይ ነይሩ?

1. ☐ ናተይ 2. 2/3 ናተይ 3. 1/3 ናተይ

2. ☐ ናተይ 5. ☐ ናተይ

2.8. ብእታወታት እንትረአ ልፍንትኩም እንታይ ይመስል ነይሩ?

	በዓል መሬት(%)	**ልፍንቲ(%)**
1. ብዕራይ	_____	_____
2. ማዳበርያ	_____	_____
3. ዘርኢ	_____	_____
4. ጉልበት	_____	_____
5. ካልኦት ይግለፁ	_____	_____

2.9. ልፍንቲ ልምንታይ ኢኹም ትጥቐሙ?

	እወ	**ኣይፋሉን**
1. ብዕራይ ስለዘይብለይ	_____	_____

2. ማዳበርያ _____ _____
3. ዘርኢ _____ _____
4. ጉልበት _____ _____
5. ካልኦት ይግለፁ _____ _____

3. ናይ እንስሳ ትሕዝቶ ዝምልከት

3.1. እንስሳ ኣለዉኹም ዶ? 1. እወ 2. ኣይፋሉን

3.2. መልስኹም እወ እንተኮይኑ ዓይነቶም ግለፁለይ

ዓይነት እንስሳ	**በዝሒ**
ብዕራይ	_____
ላሕሚ	_____
ምራኽ	_____
ዓርሒ	_____
ዝራቢዒ	_____
ፈረስ	_____
በቅሊ	_____
ኣድገ	_____
በገሰ	_____
ጤል	_____

3.3. ኣብ ዝሓለፈ ናይ ምህርቲ ዘመን ናይ ብዕራይ ፀገም ኣጋጢምኩም ዶ ነይሩ?

1. እወ 2. ኣይፋሉን

3.4. መልስኹም እወ እንተኾይኑ ብምንታይ ፈቲሕኽምዎ?

1. ምስካለኦት ብምትሕብባር_____

2. ብምክራይ _____

3. ካብ ቤተሰብ ብሓገዝ _____

4. ጉልበት ብምቅያር ወይ ብልዋጥ _____

5. ብጉልበተይ ጥራሕ ብምጥቃም _____

6. ብልፍንቲ _____

3.5. ብዕራይ ተኻርዮም እንተኾይኖም ዋጉኡ ክንደይ ነይሩ?

1. ብቕርሺ_____ 2. ብዓይነት _____

3.6. ኣብ ዝሓለፈ ናይ ምህርቲ ዘመን እንስሳ ሸይጥኩም ትፈልጡ ዶ?

1. እወ _____ 2. ኣይፋሉን _____

3.7. መልሶም እወ እንተኾይኑ ዝተሸጡ ዓይነት እንስሳን ዋጋኦም ይግለፁ

ተ/ቁ	ዝተሸጠ ዓይነት እንስሳ	በዝሒ ዝተሸጠ	ዝተቐበልክምዎ ዋጋ ብብር
1	ብዕራይ		
2	ኣሕሚ		
3	ዓርሒ		
4	ዝራቢዕ		
5	ጤል		
6	በገዕ		
7	ዓድገ		
8	ፈረስ		

3.8. እንስሳ ንምንታይ ትሸጡ?

1. ልቃሕ ልምክፋል ወይ ማዳበርያ ልምግዛእ

1. እወ _____ 2.ኣይፋሉን _____

2. ምሩፅ ዘርኢ ንምግዛእ

1. እወ _____ 2.ኣይፋሉን _____

3. ብዕራይ ንምግዛእ?

1. እወ _____ 2.ኣይፋልን _____

4. መሸመቲ ቀስብ

1. እወ _____ 2.ኣይፋሉን _____

3.9. ኣብ ዝሓለፈ ናይ ምሕርቲ ዘመን ኣብ ኣየኑ እዋን ኢኹም እንስሳ ትሸጡ?

1.ካብ ታሕሳስ-የካቲት 2. መጋቢት-ሚያዝያ

3. ካብ ሰነ-ሕዳር

3.10. ዋጋ መሸጣኩም እንታይ ይመስል?

1. ብጣዕሚ ክባር_____

2. ክባር_____

3. ማእከላይ_____

4. ብጣዕሚ ርካሽ_____

5. ርካሽ_____

4.ምትእትታው ማዳበርያ ዝምልከት

4.1. መዳበርያ ዘመናዊ ማዳበርያ ተጠቂምኩም ዶ ትፈልጡ?

1. እወ _____ 2.ላይፈሉን _____

4.2. እወ እንተኾይኑ መልስኩም ካብ መዓዝ ዓ/ም 19_____

4.3. ላየኑ ዓይነት ማዳባርያ ኢኩም ትጥቀሙ?

1. ዳፕ _____ 2. ዮርያ _____ 3. ክልቲኡ

4.4. ዓሚ ዝገዛእክምዎ ማዳበርያ በዝሒ ይግለፁ?

1. ዳፕ _____ኪሎ 2. ዮርያ _____ኪሎ

4.5. ብኩንታል ዋጋ ማዳበርያ ክንደይ ነይሩ?

1. ዳፕ _____ብር 2. ዮርያ _____ብር

4.6. ዓሚ ዝገዛክምዎ ማዳበርያ ኩሉ ዶ ተጠቂምኩሉ?

1. እወ 2. ላየፈሉን

4.7. ካብ ሕብረት ስራሕ ማሕበር ካብ ዝገዛእኩምዎ ብተወሳኪ ዝገዛእክምዎ ማዳበርያ ላሎዶ?

1. እወ 2. ላየፈሉን

4.8. መልስኩም እወ እንተኾይኑ ምክንያት_____

1. _____ 2._____

3. _____

4.9. ካብ ካሊእ ዝገዛእክምዎ ማሕበር ብዝሒ

1. ዳፕ _____ኪሎ 2. ዮርያ _____ኪሎ

4.10. ማዳበርያ ካብ መን ብክመይ ትገዝኡ?

ተ.ቁ	ፍልፍል	1.እወ 2.ላይፈሉን	ብምንታይ ተግንይዎ 1. ብገንዘብ 2. ብልቃሕ 3. ብክልቲኡ
1	ካብ እንደርታ ዮኔን		
2	ካብ ውልቐ ነጋዶ		
3	ካብ ካልኦት		

4.11. ዝገዛእክምዎ ማዳበርያ ብምንታይ ተንዓዕዝዎ?

1. ባዕለይ ተሸኪመ_____

2. ብጓድገ በቅሲ_____

3. ብመኪና_____

4.12. ብመኪና እንተኾይኑ መንዓዝያ ክንደይ ትኽፍሉ?

_____ብር/ልኩንታል

4.13. ብማዳበርያ ዝተዘርአ ግራት ስፋሓት ይግለፁ?

ዝርዝር መግለሚ	ስንዲይ		ስገም		ጣፍ		ካልኦት	
ጠቅላላ ዝተሓረሰ መሬት	1989	1999	1989	1999	1989	1999	1989	1999
ብዳፕ ዝተዘርአ								
ብዮርያ ዝተዘርአ								
ዝተጠቀምዎ ዳፕ.ኪ								
ዝተጠቀምዎ ዮርያ.ኪ								

4.14. ብሰብ ሞያ ዝተጓዘዘ መጠን ማዳበርያ ትጥቀሙ ዶ?

1. እወ 2. ጓይፋሉን

4.15. መልሰኩም ጓይፋሉን እንተኾይኑ ንምንታይ?

1. መክሰብ ስለዘይብሉ_____

2. ጓቅርቦት ስለዘየለ_____

3. ድኹሚ ተፈጥሮ ስለዝጥቐም_____

4. ካሊእ እንተኮይኑ ይግለፁ_____

4.16. ብናትኩም ግምት ቀፅሪ ተጠቐምቲ ማዳበርያ ንምንታይ ወሲኹ/ቐኒሱ?

<u>ወሲኹ</u>	<u>ቐኒሱ</u>
1. ናይ ጓጠቓቐማ ፍልጠት ምዓባይ	1. ናይ ማዳበርያ ዋጋ ምኽባር
2. መትረፋይ ስለዝኾነ	2. ጓብ ምቅራብ ዘሉ ምድንጓይ
3. ቅልጥፍ ኢሉ ብምቅራብ	3. ብዛዕባ ትርፉ ዝፍለጥ ነገር ስለዘየለ
4. ፅቡቅ ናይ ልቓሕ ጓቅርቦት	4. ናይ ገንዘብ ሕፅረት

4.17. ዝደለኽምዎ መጠን ማዳበርያ ዶ ጓብ ዝጓለፈ ናይ ምህርቲ ዘበን ገዚእኹም?

1. እወ 2. ጓይፋሉን

4.18. መልስኹም ኣይፋሱን እንተኾይኑ ንምንታይ?

	እወ	ኣይፋሱን
1. ናይ ኣቅርቦት ምውሓድ	_____	_____
2. ናይ ገንዘብ ሕፅረት	_____	_____
3. ብእዋን ብዘይምቅራቡ	_____	_____
4. ካልኦት	_____	_____

4.19. ዋጋ ማዳበርያ ከቢሩ ዶ ትብሱ?

1. እወ _____ 2. ኣይፋሱን_____

4.20. መልስኹም እወ እንተኾይኑ ክውሰድ ዝግበኦ ፍታሕ እንታይ ይኾን ትብሱ?

	እወ	ኣይፋሱን
1. ናይ ምህርቲ ዋጋ ክውስኽ ምግባር	_____	_____
2. ናይ ማዳበርያ ዋጋ ብድጎማ ምቅናስ	_____	_____
3. ናይ ልቃሕ ወስድ ምቅናስ	_____	_____
4. ምህርቲ ክጠፍእ እንከሎ ዕዳ ምስራዝ	_____	_____
5. ካሊእ እንተልዩ ደግስዑ	_____	_____

4.21. ዓኾር ወይ ፋንድያ ኣብ ግራትኩም ትድኩዑ ዶ?

1. እወ 2. ኣይፋሱን

4.22. ዘይትድኩዑ ተኾይንኩም ንምንታይ?

1. ልነዳዲ ስለንጥቐመሉ 2. ስለዘይብልና

3. ግራትና ርሑቅ ስለዝኾነ 4. ካልኦት ይግለፁ

4.23. ኣብ ግራት ቃሪም ትገድፉ ዶ?

1. እወ _____ 2.ኣይፋሱን_____

4.24. መሬት ኣሕዲርኩም ዶ ትፈልጡ?

1. እወ _____ 2.ኣይፋሱን_____

4.25. መልስኹም እወ እንተኾይኑ ንኽንደይ ግዜ?

1. ንሓደ ዓመት 2. ንክልተ ዓመት

3. ንሰለስተ ዓመት 4. ንዓሰርተ ዓመት 5. ንሓሙሽተ ዓመት

4.26. መልስኹም ኣይፈሉን ተኾይኑ ንምንታይ?

	እወ	**ኣይፈሉን**
1. ናይ ተሓራሳይ መሬት ፀገም	_____	_____
2. መሬት ልሙዕ ስለዝኾነ	_____	_____
3. ናይ ማዳበርያ ፀገም ስለዘየለ	_____	_____
4. ካልኦት ምክንያት ይግለፁ	_____	_____

4.27. ኣቀያይርካ ምዝራእ ትጥቐሙ ዶ?

1. እወ _____ 2.ኣይፈሉን_____

4.28. መልስኹም እወ እንተኾይኑ ዝራእቲ ከመይ ገይርኩም ትሰርዕዎም (ዝራእቱኩም ብቅደም ስዓብ ኣቐምጡ)

1ይ _____ 2ይ_____

3ይ_____ 4ይ_____

4.29. ሙሩፅ ዘርኢ ትጥቐሙ ዶ ? 1. እወ 2. ኣይፈሉን

4.30. መልስኹም እወ እንተኾይኑ ዝዘራእክምዎ መሬት ስፍሓት ክንደይ'ዩ?

ዓይነት ዝራእቲ	**መጠን ዝራእቲ ዝተዘርኣሉ ስፍሓት ቦታ**					
	1999		**1998**		**1997**	
	መጠን ዘርኢ ብኩንታል ኪሎ	**ዝተዘርኣሉ መሬት ስፍሓት**	**መጠን ዘርኢ ብኩንታል ወይ ኪሎ**	**ዝተዘረኣሉ መሬት**	**መጠን ዘርኢ ብኩንታል ወይ ኪሎ**	**ዝተዘርኣሉ መሬት ስፍሓት**
ስንዳይ						
ስገም						
ጣፍ						

4.31. ሙሩፅ ዘርኢ ካበይ ትረክቡ?

1. ካብ እንደርታ ሕ/ስ/ማሕበር ዩኔን_____

2. ካብ ቢሮ ገጠርን ሕርሻ ልምዓትን _____

3. ካብ ኢትዮጵያ ምርጥ ዘርኢ ድርጅት_____

4. ካብ ውልቐ ነጋዶ _____

5. ካብ ግራተይ_____

6. ካብ ቤተሰብ_____

7. ካሊእ ይግለፁ_____

4.32. ኣብ ዝሓለፈ ናይ ዘርኢ ዘመን ዝደለኽምዎ መጠን ዘርኢ ዶ ገዚእኩም

1. እወ 2. ኣይፋሉን

4.33. ሙሩፅ ዘርኢ ገዚእኩም እንተኔርኩም ዋጋኡ ክንደይ እዩ ነይሩ?

ዓይነት ዘርኢ	መጠን ብኩንታል/ኪሎ	ዋጋ
1. ስንዳይ	_____	_____
2. ስገም	_____	_____
3. ጣፍ	_____	_____

4.34. ሙሩፅ ዘርኢ እንድሕር ዘይረኺብኩም ኮይንኩም ንምንታይ?

	እወ	ኣይፋሉን
1. ስለዘይርከብ	_____	_____
2. ኣፍልጦ ስለዘይብለይ/ዘይነበረኒ	_____	_____
3. ብጣዕሚ ክባር ስለዝኾነ	_____	_____
4. ናይ ኣቅርቦት ፀገም ስለዘሉ	_____	_____
5. ካሊእ እንተሰዩ ይግለፁ	_____	_____

5. መትረፋይነት ዝምልከት

5.1. ማዳበርያ ብምጥቃምኩም ዝተረኽበ ናይ ምህርቲ ወሰኽ

ብምህርቲ ዘመን 1999 ዓ/ም

ተ/ቁ	መግለፂ	ስንዳይ	ስገም	ጣፍ
1	ወሰኽ ብምህርቲ (ኩንታል/ሄ/ር)			
2	ዓመታዊ ማእከላይ ዋጋ ብኩንታል			
3	ዝተጠቕምኩዎ ማዳበርያ ብኩንታል/ሄ/ር			
4	ዓመታዊ ማእከላይ ናይ ማዳበርያ ዋጋ			
5	ዝተረኽበ ዓመታዊ ትርፊ ብቕርሺ			

6. ናይ ኬክስቴንሽን ግልጋሎት ዝምልከት

6.1. ናይ ኬክስቴንሽን ኣገልግሎት ምርካብ ዝጀመርክምሉ ገዚ 19____

6.2. ኣብ ዝሓለፈ ናይ ዘርኢ ግዘ ናይ ኬክስቴንሽን ግልጋሎት ረኺብኩም ዶ?

1. እወ 2. ኣይፋሉን

6.3. መልስኩም እወ እንተኾይኑ እንታይ ዓይነት ግልጋሎት ረኺብኩም?

	እወ	ኣይፈሉን
1. ናይ መርኣያ ቦታ ምጉብናይ	_____	_____
2. ብግብርና ዝተዳለወ ማዓል ምጉብናይ ምርምር ማእከል	_____	_____
3. ሰሪሕካ ምርኣይ ብምክያድ	_____	_____
4. ናይ ስልጠና ፕሮግራም ብምስታፍ	_____	_____
5. ብቕጥታ ምስ ልምዓት ወኪል ብምርካብ	_____	_____

6.4. ምስ ናይ ልምዓት ወኪላት (DA) ኣብ ክንደይ ግዘ ትራኸቡ?

1. 1 ግዘ ኣብ ዓመት
2. 2ተ ግዘ ኣብ ዓመት
3. 3ተ ግዘ ኣብ ዓመት
4. ብዙሕ ግዘ

6.5. ቤት ፅሕፈት ሕርሻ ኤክስቴንሽን ንምብፃሕ ክንደይ ግዘ ደውደስኩም ____ ሰዓት

6.6. ካብ ኤክስቴንሽን ግልጋሎት ትረክብዎ ጥቅሚ ኣሎዶ?

1. እወ 2. ኣይፈሉን

7. ናይ ልቃሕ ኣገልግሎት

7.1. ናይ ሕርሻ እታወታት ንምግዛእ ልቃሕ ወሲድኩም ዶ ትፈልጡ?

1. እወ 2. ኣይፈሉን

7.2. ኣብ ዝሓለፈ ናይ ምህርቲ ዘመን ናይ ልቃሕ ፍልፍልኩም እንታይ ነይሩ?

1. እንደርታ ሕ/ስ/ማሕበር ዩኔን
2. ቤተሰብ ወይ ኣዝማድ
3. ናይ ውልቐ ትካላት
4. ት/ፋ/ልቃሕ ደደቢት

7.3. ኣብ ዝሓለፈ ናይ ምህርቲ ዘመን ንምሩፅ ዘርኢ ዝኽውን ልቓሕ ዶ ወሲድኩም?

1. እወ 2. ኣይፈሉን

7.4. ንካልኣ ጉዳያት ልቃሕ ወሲድኩም ዶ ትፈልጡ?

1. እወ 2. ኣይፈሉን

7.5 መልስኩም እወ እንተኾይኑ መኣዝ ? 19_____

7.6. መልስኩም ኣይፈሉን እንተኾይኑ

	እወ	ኣይፈሉን
1. ቅድመ ክፍሊት ናይ ምክፋል ፀገም	_____	_____

2. ወስዱ ብዙሕ ምኽኑ _____ _____
3. ናይ ልቃሕ ትካላት ኣብ ቐረባ ስለዘየለዉ _____ _____
4. መትሐኛ ስለዘይረክብ _____ _____
5. ናይ ኣሰራርሓ ፀገም ስለዘሉ _____ _____

8. ከባብያዊ ኩነታት

8.1. ኣብ እቱ ዝሓለፈ ናይ ምህርቲ ዘመን ብቑዕ ዝናብ ነይሩ ኢልኩም ዶ ትኣምኑ?

ተ/ቁ	1 = እወ		2 = ኣይፈሉን
	ፅቡቅ	ብጣዕሚ ፅቡቅ	ብጣዕሚ ውሑድ
1	1999		
2	1998		
3	1997		

8.2. ኣጀማምራ ዝናብ ኣብ እቶም ዝሓለፉ ናይ ዝናብ እዋን ከመይ ነይሩ/ትገልፅዎ?

ተ/ቁ	ዓመት	1 = እወ		2 = ኣይፈሉን
		ፅቡቅ	ብጣዕሚ ፅቡቅ	ብጣዕሚ ውሑድ
1	1999			
2	1998			
3	1997			

8.3. መጠን ዝርገሐ ዝናብ ኣብ እቱ ዝሓስፈ ናይ ምህርቲ ዘመን እንታይ ይመስል ነይሩ?

	1999	1998	1997
1. ብጣዕሚ ፅቡቅ	_____	_____	_____
2. ፅቡቅ	_____	_____	_____
3. ትሑት	_____	_____	_____

8.4. ኣብቶም ዝሓስፉ 5 ዓመታት ናይ ዝራእቲ ምብልሻው ኣጋጢምኩም ዶ ነይሩ?

1. እወ 2. ኣይፈሉን

8.5. መልስኹም እወ እንተኾይኑ ኣብ ክንደይ ግዘ?

1. ብዙሕ ግዘ _____
2. ሓደሓደ ግዘ_____
3. ሕልፍ ሕልፍ ኢሉ _____

8.6. ናይ ዝራእቲ ብርሰት ዝበዝሕ ግዜ ምክንያቱ እንታይ እዩ ነይሩ?

1. ብኣራዊት
2. ብበረድ
3. ውሕጅ
4. ብባሲፅ/ሕማም
5. ናይ ዝናብ ሕፀረት

8.7. ናይ ግራትኩም ሓመድ ዓይነቱ እንታይ ይመስል?

ዓይነት ዝራእቲ	ፀሲም ሓመድ	ቐይሕ ሓመድ	ካልኦት
1. ሰርናይ	_____	_____	_____
2. ስገም	_____	_____	_____
3. ጣፍ	_____	_____	_____

8.8. ግራትኩም ማይ ኣብ ምዕቋር ፀገም ኣለዎ ዶ?

1. እወ 2. ኣይፋሉን

8.9. መልስኩም እወ እንተኾይኑ ብምንታይ ትፈትሕዎ?

1. _____
2. _____
3. _____

8.10. ግራትኩም ብውሕጅ ናይ ምሸርሻር ፀገም ዶ ኣለዎ?

1. እወ 2. ኣይፈሉን

8.11. መልስኩም እወ እንተኾይኑ ብምንታይ ትፈትሕዎ?

1. _____
2. _____
3. _____

9. መስኖ ዝምልከት

9.1. ናይ መስኖ ማይ ትጥቐሙ ዶ?

1. እወ 2. ኣይፈሉን

9.2. መልስኩም እወ እንተኾይኑ

	ብመስኖ ዝለምዐ	ብማዳበርያ ዝለምዐ
ዓይነት ዝራእቲ	መሬት ሄ/ር	መሬት ሄ/ር
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____

9.3. መልስኩም ኣይፈሉን እንተኾይኑ ልምንታይ?

1. _____
2. _____
3. _____

10. ናይ ሕርሻ ምህርትን ዓመታዊ እቶቱን ዝምልከት

10.1. ኣብ ዝሓለፉ ናይ ምህርቲ ዘመን ናይ ዝራእቲ እቶትኩም እንታይ ይመስል ነይሩ?

ተ/ቁ	ዓይነት ዝራእቲ	ብኩንታል		
		1999 ዓ/ም	1998 ዓ/ም	1997 ዓ/ም
1	ስንዳይ			
2	ስገም			
3	ጣፍ			
4	መሸላባሕሪ			
5	ዓተር			
6	ሽምብራ			

7	ብርሽን			

10.2. ኣብ ዝሓለፈ ናይ ምህርቲ ዘመን እኽሊ ሸይጥኩም ዶ ነይርኩም?

1. እወ 2. ኣይፋሱን

10.3. ኣብ ዝሓለፈ ናይ ምህርቲ ዘመን እኽሊ ገዚእኩም ዶ ነይርኩም?

1. እወ 2. ኣይፋሱን

10.4. መልስኩም እወ እንተኾይኑ

ዓይነት ዝተሸጡ ወይ ዝተሸመቱ እኽልታት	ዝተሸጠ በዝሒ ብኩንታል	ዝተረኽበ ኣታዊ ብገንዘብ	ዕዳጋ 1. መቐለ 2. ኩሓ 3. ኣይናስም 4. ማይ መኽደን	ዝተሸመተ	
				መጠን ብኩንታል	ብቕርሺ
ጣፍ					
ስንዳይ					
ስገም					
ዓተር					
ብርሽን					
ሽምብራ					

10.5. ብዛዕባ ዋጋ ዝምልከት ሪኢቶኦም

1. ብጣዕሚ ክባር 3. ማእከላይ
2. ክባር 4. ብጣዕሚ ትሑት 5. ትሑት

10.6. እኽሊ ናብ ዕዳጋ ተውፅእሉ ገዚ ማኣዝ'ዩ?

1. ካብ ታሕሳስ - የካቲት
2. ካብ መጋቢት - ጉንቦት
3. ካብ ሰነ - ሕዳር

10.7. እኽሊ ተቅንዕሉ ዋና ምኽንያት እንታይ እዩ?

	እወ	ኣይፋሱን
1. ማዳበርያ ንምግዛእ ወይ ልቃሕ ንምኽፋል	_____	_____
2. ሙሩፅ ዘርኢ ንምግዛእ	_____	_____
3. ብዕራይ ንምግዛእ	_____	_____
4. ናይ እታወታት ልቃሕ ንምክፋል	_____	_____

5. ካሊአ እንተልዩ ደግስዑ _____ _____

10.8. ባዕልኹም ወይ ኣባላት ስድራኹም ካብ ሕርሻ ወፃኢ ዝረክብዎ ትረፈ ኣሎ ዶ?

1. እወ _____ 2. ኣይፋሉን_____

10.9.መልስኩም እወ እንተኮይኑ ካበይናይ ስራሕ እንታይ ደረኽቡ?

ፍልፍል ኣታዊ_____	ዝተረከበ ገንዘብ መጠን ብብር
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____

11. ድጎማ ዝምልከት

11.1. ብ ሕ/ስ/ማሕበር ዝሸየጥ ማዳበርያ ድጎማ ዶ ኣለዋ?

1. እወ _____ 2. ኣይፈሉን_____

11.2. መልስኩም እወ እንተኮይኑ እንታይ ዓይነት ድጎማ?

1. _____
2. _____
3. _____
4. _____

11.3. መልስኩም ኣይፈሉን እንተኮይኑ እንታይ'ዩ ምክንያቱ?

1. ምክንያቱ ናይ ምግዛእ ፀገም ስለዘለዎ
2. እቱ ሕ/ስ/ማሕበር ዓቅሚ ስለዘይቡሉ
3. ብክልል መንግስቲ ስለዘይተሓሰበ
4. ናይ ተፀባይነት መንፈስ ንምውጋድ
5. ካልኦት እንተልዩ ደግስፁ_____

12. ስገኣት ዝምልከት

12.1.ሓደ ሓረስታይ ካብ ብልሙድ ኣካይዳ ዘርኡ ብዘይ ስግኣት ቁሩብ ምህርቲ ካብ ሓፈሰ ማደበርያ ብምጥቃም ቡዙሕ ትርፊ ክረክብ ኣለዎ

1. ብጣዕሚ ይቅበሉ
2. ይቅበሉ
3. ኣይወሰንኩን
4. ይቃወም
5. ኣዐርየ ይቃወም

12.2. ተደሰግኤ ናብ ሓዱሽ ተመክሮ ዘኣቱው ሓረስተደ ካብ ሰጋኣደ ሓረስታደ ንሳዕሲ ናደ ገንዘብ እቶት ኣስዎ

1. ብጣዕሚ ደቅበሱ
2. ደቅበሱ
3. ኣደወሰንኩን
4. ደቃወም
5. ኣዓርየ ደቃወም

12.3. ሓደ ሓረስታደ ፅቡቅ ውሂኢት ክረክብየ ኢሱ ኣብ ዝሓሰበሱ እዋን በዘደስገኣት ናብ ሓዱሽ ነገር ካኣትው ኣስዎ

1. ብጣዕሚ ደቅበሱ
2. ደቅበሱ
3. ኣደወሰንኩን
4. ደቃወም
5. ኣዓርየ ደቃወም

13. ኣብ ትርፋማነት ማዳበርደ ዘሱ ኣተሓሳስባ

13.1. ሓደ ሓረስታደ ቡዙሕ ዘርኢ ንምርካብ ማዳበርደ ክጥቐም ኣስዎ

1. ኣፀቢቐ ደቅበሱ
2. ደቅበሱ
3. ኣደወሰንኩን
4. ደቃወም
5. ኣዓርየ ደቃወም

13.2. ክኢላታት ሕርሻ ብዝእዝዝዎ መሰረት ማዳበርደ ምጥቃም ብዙሕ ትርፊ ንክረክብ ደሕግዘና'የ

1. ኣፀቢቐ ደቅበሱ
2. ደቅበሱ
3. ኣደወሰንኩን
4. ደቃወም

5. ኣዓርየ ይቃወም

13.3. ብሕርሻ ኪሲላ ዝተፈቐደ መጠን ማዳበርያ ዘይምጥቃም ውፅኢት ምህርትና ክቅንስ ይገብሮ'ዩ

1. ኣፀቢቕ ይቅበሉ
2. ይቅበሉ
3. ኣይወሰንኩን
4. ይቃወም
5. ኣዓርየ ይቃወም

14. ዓመታዊ ወፃኢታት

14.1. ስድራ ቤትኩም መብዛሕቱ ጊዜ ዝበልዕዎም ዓይነት እኽሊ እንታይ እዮም? (ብቅደም ስዓብ ኣቕምጡ)

1. ጣፍ 2. ምሸላባሕሪ 3. ስንዳይ 4. ስገም 5. ካልኦት ይግለፁ

14.2. ኣብ ዝሓለፈ ናይ ምህርቲ ዘመን ናይ ምግቢ ፀገም ኣጋጢምኩም ዶ ይፈልጥ?

1. እወ 2. ኣይፋሉን

14.3. መልስኩም እወ እንተኾይኑ ከመይ ገይርኩም ናይ ስድራኩም ናይ ምግቢ ፀገም ትፈትሑ ነይርኩም?

1. ብምግዛእ
2. ካብ ቤተሰብ ብምልቓሕ
3. ብርዳእታ
4. ብምግቢ ንስራሕ
5. ብካልኦት ይግለፁ_____

14.4. ናይ ምግቢ ሕፅረት ኣብ ክንደይ እዋን ይገጥመኩም ነይሩ?

1. ኩሉ ግዜ 2. ሓዳ ሓደ ግዜ 3. ኣጋጢሙኒ ኣይፈልጥን

14.5. ብዛዕባ ካልኦት ወፃእታትኩም ክትሕብሩለይ ዶ ትክእሉ?

1. ናይ መሬት ግብሪ _____ብር
2. ናይ ጥኣዊንቲ ወፃኢ_____ብር
3. ናይ ሕክምና ወፃኢ ብር_____ብር
4. ካኢእ እንተልዩ ይግለፁ_____

15. ስልጠና ዝምልከት

15.1. ማዳበርያ ላጠቐቅማ ዝምልከት ስልጠና ወሲድኩም ዶ ትፈልጡ?

1. እወ 2. ላይፈሉን

15.2. መልስኩም እወ እንተኾይኑ ዝርዝሩ እንታይ ይመስል

ተ.ቁ.	ናይ ስልጠና ዓይነት	እቲ ስልጠና ዝወሰዶ ግዜ	ስልጠና ዘዳለወ ላካል
1			
2			
3			
4			

16. ሓፈሻዊ ችግራት ዝምልከት

16.1. ላብ ላጠቓቐማ ማዳበርያ ዘለዉ ችግራት

ተ/ቁ	ፀገማት	ብጣዕሚ ወሳኒ (3)	ጠቃሚ (2)	ብመጠኑ ጠቃሚ ዝኾነ (1)
1				
2				
3				
4				
5				
6				
7				
8				
	ካልኦት ተልዮም ይግለፁ			
9				
10				
11				

17. ክግበሩ ዝግበኾም ጉዳያት (ሓበሬታ)

17.1. ብሕ/ስ/ማሕበራት ዝሸየጡ ማዳበርያ ብኣሰራርሓ ደኹን ብኩስንተንኦም ንክመሓያሹ ክግበሩ ዝግበኾም ጉዳያት እንታይ ክኾኑ ኣለዎም ትብሉ?

ተ/ቁ	ክግበሩ ዝግቦኾም ነገራት	በጣዕሚ ጠቃሚ (3)	ጠቃሚ (2)	ብመጠኑ ጠቃሚ ወሳናይ ዘይኮነ (1)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
	ካልኦት እንተልዮም ይግለፁ			
11				
12				
13				