ADOPTION OF SMALL RUMINANTS' FATTENING PACKAGE IN AGROPASTORAL AREAS, MEISO WEREDA, EASTERN OROMIA

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ADOPTION OF SMALL RUMINANTS' FATTENING PACKAGE IN AGROPASTORAL AREAS, MEISO WEREDA, EASTERN OROMIA

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DEDICATION

I dedicate this thesis to my mother, **BIRKE SHIFERAW,** who has paid a lot of sacrifications to get me in the right track, with all her affection, love and dedication to bring me up to this point of success in my life.

STATEMENT OF AUTHOR

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

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BIOGRAPHY

The author was born in Haramaya Wereda, Eastern Hararghe Zone of Oromia Region at a place called *Bati,* in September 1979. He attended his elementary and junior school education at *Bati* elementary and junior secondary school, and Haramaya University Model Elementary School, respectively. Then, he joined *Harar* senior secondary high school and completed his secondary education in 1999. In 2000 the author joined the then Alemaya University and graduated with B.Sc. degree in Agricultural Extension in July 2003.

After his graduation, he was employed in *Kombolcha* (Eastern Oromia) ATVET College under the Ministry of Agriculture and Rural Development; as an instructor. Then, he joined the School of Graduate Studies of the Haramaya University in November 2006.

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LIST OF ABBREVIATION

ADLI	Agricultural Development Led Industrialization
AI	Artificial Insemination
As	Adopters
CADU	Chilalo Agricultural Development Unit
CC	Contingency Coefficient
CCPP	Contagieuses Caprine Psuedo-Pnuemonia
CPP	Complete Package Programme
CSA	Central Statistical Authority
DAs	Development Agents
E	East
E.C.	Ethiopian Calendar
EPID	Extension Package Input Development
FAO	Food and Agricultural Organization
FEEDADOPMAX	maximum score for feed practices for all sample
GDP	Gross Domestic Product
ha	Hectares
HHs	Households
HHHs	Household Heads
HIV/AIDS	Human Immuno Virus/ Anti Immuno Deficiency Sydrome
ILRI	International Livestock Research Institute
IPMS	Improving productivity and marketing successes
kg	Kilogram
Km	kilometer
LIMDEP	Limeted dependent varaible analiytical soft ware
lts	liters
m.a.s.l	Meters above sea level
MEDaC	Ministry of Economic Development and Cooperation
MGTPADOMAX	maximum score for feed practices for all sample
mgtpadoscore	the management practice adoption of ith farmer

LIST OF ABBREVIATION (CONTINUED)

ML	Maximum Likelihood
MOA	Ministry of Agriculture
MPP I	Minimum Package Programme I
MPP II	Minimum Package Programme II
MUB	Mollasus Urea Block
N	North
NA	Non Adopters
N	Numbers
NGOs	Non Governmental Organizations
ns	non significant
PADEP	Peasant Association Development Extension Programme
PADETES	Participartory Demonistration and Training Extension System
PAs	Peasant Administrations
PPR	Ovine Pastoroluesis
PRDO	Pastoral and Rural Development Office
RABs	Regional Agricultural Bureaus
RDAE	Rural Development and Agricultural Extension
SNNP	Southern Nations and Nationalities People
SORUDU	Somali Rural Development Unit
T&V	Training and Visit
TLU	Tropical Livestock Unit
VETADOMAX	the maximum score for veterinary practices for all sample
vetadoscore	the veterinary practice adoption score of ith farmer
VIF	Variable Inflation Factor
WADU	Wolayta Agricultural Development Unit
WBPRD	Wereda Bureau of Pastoral and Rural Development
WFP	World Food Programme

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ABSTRACT

Many studies were conducted to identify determinants of adoption of crop base technologies and practices and improved seeds, and while few studies concerned on evaluation of extension services in terms of the clients' need and interest or adoption of livestock technologies in agropastoral and pastoral context In fact, livestock extension services in general in developing countries are less prioritized and thus livestock based technology services are rarely extended Common livestock technologies which are promoted to livestock raisers are focused on feed, veterinary services, and improved management practices through the extension services of agricultural/pastoral offices and livestock development units. The case hereunder, is about agropastoralists extension services evaluative perception and small ruminant fattening package adoption. Hence, this study investigates agropastoralists' perception on the extension services, small ruminant fattening package and intensity of adoption small ruminants' fattening package. The study is undertaken in Meiso Wereda, Oromia Region,Ethiopia. The Wereda has agropastoral and pastoral production system. The data are collected from 151 randomly selected pastoralists and agropastoralists using structured interview schedule. Secondary data were collected from different sources to supplement the data obtained from the survey. In addition to quantitative data qualitative data also gathered. Prior to formal survey an informal survey was also undertaken by using group discussion and interview with key informants. Descriptive statistics such as frequency, percentage mean, standard deviation, Chi-square tests and t-test were employed. The Tobit model was also employed to determine factors influencing intensity of small ruminant fattening package adoption. This study identifies agropoastoralists and pastoralists are poorly addressed and their need and interests are not considered in any extension programmes The Tobit model output showed that, agropastoralists intensity of adoption of small ruminant fattening package is influenced by: perception on the availability of improved breed, perception on resources based conflicts, current management practices, total livestock holding of HHs and credit use and availability for veterinary purposes. Future extension activities and agencies,promoting fattening package in agropastoral and pastoral areas, should focus on targeting agropastoralists with low perception on the availability of better breed, information and demonstration on the improved management practices, revision of credit supply criteria, making awareness and demonstration of the significant importance of small ruminants in the agropastoral and pastoral income and livelihoods contribution is important.

1. INTRODUCTION

1.1. Background

Ethiopia has the largest livestock inventories in Africa, including more than 38 million cattle, 30 million small ruminants, approximately 1 million camels and 4.5 million equines and 40 million chickens (CSA, 2004), with livestock ownership currently contributing to the livelihoods of an estimated 80 percent of the rural population. The contributions of livestock include food production, input for crop production and soil fertility management, raw material for industry, power source, cash income, saving, fuel, social functions and employment. The contribution of livestock to total GDP and agricultural GDP of Ethiopia ranges from 12-16 % and from 30-35 %, respectively (MEDaC, 1998). The livestock sector contributes about 8 % of the total export earnings, and is the fourth major source of foreign currency through export of live animals, hides and skins. Livestock is an important sector in both highland mixed smallholder farming and low land agropastoral systems in Ethiopia. The development of both highland smallholder mixed farming and the lowland agro-pastoral/pastoral systems is paramount to the development of the economy of the country, contributing to food and livelihood security of the majority of the population of the country.

According to CSA survey, almost 99 percent of the cattle, sheep and goat population in the country are indigenous. Of the total livestock, 75 % are in the highland and the rest are in the lowlands. In the arid and semi-arid extensive grazing areas in the eastern, western and southern lowlands cattle, sheep, goats, and camels are managed in migratory pastoral production systems. Ethiopian goats fall into many breeds and types. There are 15 distinct indigenous goat types in the country. The trend in livestock production at national level, and the factors associated with or influencing productivity level has proven very difficult to obtain. Besides, the corresponding national level aggregate data on livestock number and production (collected from the FAO Year Books and from the Central Statistical Office Ethiopia) that were to be correlated with factors believed to have influence on livestock productivity were found to be problematic. Small ruminant production and management in the agropastoral and pastoral farming system is characterized by a low-output system based on open grazing and

the use of crop residues. Goats graze and browse a large area of land that are usually of marginal and unsuitable for other agricultural use. They roam freely either mixed with sheep or alone. The main feeds of goats include tree leaves, shrubs, grasses and related plant species. This system is marked by low productivity compared to many other countries in the world, due to recurrent drought, lacka of feed and fodder and poor management practices

Institutional support to promote and expand the production and productivity of this sub sector of agriculture had been and still is not comparable with cereal production extension in Ethiopia. Livestock development had been one of the major components of agricultural extension package since 1950s. First Five Year Plan (CADU, WADU etc.), EPID, CPP, MPP I, MPP II, PADETES all had livestock extension programs but the efforts made to improve livestock sector are not satisfactory. In fact, a clearly stated national livestock development strategy has not yet been formulated. Livestock development has generally been considered under agricultural development plans, and accordingly concerned institutions for agriculture (be it education, research and extension) are mandated to address livestock development within the agricultural context. Livestock education, research and extension institutions follow the traditional top down approach, and the technology transfer model prevails largely unchanged. The efforts have been towards promoting specialized livestock production systems such as beef, dairy, poultry, etc. through the introduction of exotic breeds of cattle and forage species, and to come up with cheaper animal feed combinations (Habtemariam, 2000).

Livestock extension in Ethiopia mainly focused on few aspects like AI (artificial inseminations for cattle), dairy cows and goats' distribution, forage and feed species seed distribution and, trainings and demonstrations in animal health management, feeding, herding, and general appropriate rearing practices. These are the common livestock extension services given to farmers all over the country through wereda experts. The recommended package components in Mieso wereda are improved feed, veterinary and health practices and services, and improved management practices of small ruminant rearing (feeding management, health caring, watering, market information and trainings related with these management practices

1.2. Statement of the problem

Small ruminants have multiple uses and importance in agropastoral and pastoral economy and social security. The northern, south-eastern and western low lands as well as the Rift Valley Region of Ethiopia have been dominated by migratory and transhumant pastoralists for whom livestock constitutes the sole means of livelihood. For pastoralists in other low land areas, the sale of livestock and livestock products constitutes their major cash income (Coppock, 1990; Sintayehu, 1993). Goats and sheep are the most widely reared livestock species by HHs living in Meiso.

Livestock production in Ethiopia is functioning under several constraining factors: diseases, feed shortage, institutional and policy related constraints (Wibaux, 1986; Tennasie, 1988; Dejene, 1995 as cited in Habtemriam). It is needless to say, the situation of Meiso wereda is characterized by many constraints of small ruminants' fattening practices and even faces worse production environments- severe feed shortage, chronic animal health problems, poor input supply and marketing issues, social problems, lack of training, lack of research and development support, lack of credit services, insufficient veterinary support, marketing constraints are: middlemen interference, lack of cooperative organizations at the pastoralist level, poor livestock extension packages promotion strategies and approaches, inappropriate content of extension packages, conflict hampering pastoralists from using market places like Bordode (ILRI- IPMS, 2004) and poor management practices. Besides, the resources used as input (natural pasture/ grazing land and water) and the rearing styles of these communities are so poor that the fattening activities have low output in terms of live weight gains of goats and sheep. Less productivity of small ruminant fattening production system make the agropastoralists to generate lower income from the sale of goats and sheep (WBPRD, 2006).

Efforts are being made by different agencies to improve the livelihood situation of agropastoralists through increasing small ruminants' production. WBPRD and NGOs have been striving to lessen the above fattening production problems for more than a decade. Forage and fodder species, animal health and vet services, demonstration and trainings on various livestock rearing practices and/or management techniques provisions were some of the

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specific efforts made by these agencies, to revert the decrease of small ruminants' productivity in the wereda (WBPRD, 2006). As to the evaluation of extension agencies' efforts made so far, there was no single systematic study that indicated the success and lessons that could be drawn. There were also no formal survey and study with regard to agricultural extension and communication and adoption of livestock packages in terms of agropastoralists' opinion and adoption characteristics in the study wereda.

Agropastoralists being exposed to extension and development interventions for more than a decade have two options. They have to decide either taking up of technologies and information needed or sticking to their own practices. These decisions of agropastoralists are determined by a number of factors: level of management skills, degree of current production problems, needs and interests of individual, attitude and perception of agropastoralists on extension services being promoted in the wereda on small ruminant fattening package. Since, these behavioral decision making factors were not studied before in the study area, there is a need to assess small ruminants' extension services perception and adoption behaviors of agropastoralists to fill the existing information gap in the fields of extension communication and adoption studies. The spread and transfer of technologies of fattening package was not studied before as well and there is clearly a research gap. Therefore, this study has been undertaken to initiate bridging the gap in information with regard to agropastoralists' technology adoption and extension service acceptance in the study wereda.

1.3. Research questions

The research was conducted to answer the following questions about Meiso wereda agropastoralists.

1. What is the perception of agropastoralists about the currently extended small   ruminants fattening package in the wereda?
2. What is the extent of small ruminant fattening package adoption in the wereda?
3. What are the determinant factors in adopting small ruminant fattening package at HHs level?

1.4. Objective of the study

The general objective of the research is to assess agropastoralists adoption decision behavior and their perception of the small ruminants' extension services. The specific objectives of the study are:

1. to assess extension coverage of fattening package contents for small ruminants in the wereda as perceived by agropastoralists.
2. to analyze the intensity of adoption of small ruminants fattening package in the Wereda and its determinants.

1.5. Significance of the study

Socially feasible development efforts need understanding of the social, cultural, institutional, economical, and environmental elements and their inter-relationship with human behavior. Thus, the study tries to address some of them by focusing on human and institutional elements of the system in adoption processes of agricultural innovations. If the aim of a development project is to raise the living standard of the poorer sections of the community, it is much more likely to do so if it concentrates on production from small ruminants. Documenting technology generation and extension efforts, in this development processes, is of paramount importance in order to learn for future improvement.

The economic role of goats and sheep has previously been described and some economic analysis of technological innovations and production prospects has been conducted. By focusing only technical and economic aspects of production, many studies created a gap in empirical evidences of assessing the adoption behavior of small ruminants' producers. There are no well documented and quantified findings that explain the adoption behavior of agropastoralists in the study area too. So, the information obtained in this regard is of paramount significance to evaluate the nationally proposed livestock development plan of extension package for small ruminants in Ethiopia in general and the study area in particular. This work is also typical in its contribution for academic purposes, as it analyses adoption and extension services in agropastoral and pastoral farming systems' context. Moreover it gives

site specific adoption characteristics of agropastoralists, who are not well addressed in depth so far by extension services and research developments in the country.

1.6. Scope and limitation of the study

This study mainly emphasis on socio-cultural, psychological, and institutional, economic and production factors determining household's adoption decisions. It did not undertake impact economic analysis as a result of adoption. This adoption study of animal feed, veterinary services and practices and improved production techniques in the wereda is the first kind of study in the wereda and hence agropastoralists were inevitably forced to recall many, fragmented and long time memories of extension services and animal technologies provision. This leads the study to focus on general agropastoralists' evaluation of livestock extension services. Therefore, this study provides empirical evidence to form the basis for further analysis of agropastoral and pastoral societies in livestock extension evaluation and adoption studies in Ethiopia.

2. LITERATURE REVIEW

2.1. Adoption of Agricultural Innovations and Technologies

Adoption of innovations refers to the decision to apply an innovation and to continue to use it (Rogers and Shoemaker, 1971). The decision to adopt an innovation is a behavioral response arising from a set of alternatives and constraints facing the decision maker. Literature provides different definitions and explanations about adoption. Getahun *et al* (2000) defined adoption as the degree of use of a new technology in a long-term equilibrium when a farmer has all of the information about the new technology and it's potential. Arnon (1989) stated that adoption of a new technology must be preceded by technology diffusion, for example, the act of making new technology known to the potential adopters, and stated that diffusion is therefore, the link between research and development and adoption. Different literatures indicated that the different agricultural technologies are developed and disseminated to the farming community in different parts of the region; however only small portion of the small-scale farmers adopt some of the technologies.

Rogers (1983) described the model of diffusion of a new technology within a farming community, where adopters were categorized with respect to earliness or lateness in adoption. He classified them innovators, early adopters, early and late majority and laggards. Some generalizations about innovations and their rate of adoption by Rogers and Shoemaker (1971) are:
❖ Innovations perceived as most economically rewarding and less risky were adopted most rapidly
❖ Innovations most compatible with farmers' values were adopted more rapidly,
❖ Small farmers were slower to adopt new ideas than larger farmers,
❖ Small farmers were quicker to adopt those innovations they perceived as decreasing discomfort where as large farmers rapidly adopted the new ideas they perceived to be economically profitable,
❖ It is important to identify the opinion leaders in the villages /farming community,
❖ There is a positive relationship between the relative advantage and rate of adoption of new

ideas however relative advantage can be in the form of degree of economic profitability, low initial cost, lower perceived risk, decrease in discomfort, saving in time and cost, immediacy of the reward etc

❖ Economic profitability may be less important for peasant farmers in less developed countries, if they are oriented to subsistence living. Other non economic dimensions of relative advantage like social prestige, social approval, etc my be more important,

❖ Relative economic advantage of the new idea must be at least 25-30 percent   higher than existing practice for economic factors to affect adoption (some would suggest that to induce farmers to change, the potential payoff must be high-not by 5-10 percent but 50-100percent). When an innovation promises only 5-10 percent advantage the peasant farmer probably cannot even distinguish that it is advantageous,

❖ An innovation should be compatible with farmers' existing values and beliefs, and needs,

❖ The complexity of an innovation as perceived by members of social system is negatively related to its rate of adoption. Special care should be taken when the innovation is a package where the farmer must adopt all practices at once to get the interaction effects of each.

2.2. Patterns of Adoption and Adoption Behavior

Adoption is not final event of change but rather a decision making process. Individuals pass through a number learning and experimenting stages from becoming aware of a problem and its potential solutions to finally adopting or rejecting the innovation under consideration (Enters, 1996). Adoption patterns from the larger body of empirical evidence have been identified for the most part farmers choose to adopt inputs sequentially, adopting initially one component of the package and subsequently adding other components over time, one at a time in some instances. Farmers may adopt a component and subsequently revert to traditional practices. Adoption patterns vary by agroecological zones, between farmers facing different markets and institutions (Leather and Smale, 1991).

A number of researches on adoption behavior pointed out that a host of explanatory factors influence adoption behavior of farmers. For instance, Hansel (1974) identified individual

characteristics like education, access to change agents, size of holding; regional characteristics of rural change agencies and population densities; innovation characteristics like accordance with local norms and economic advantage as influencing the adoption of technologies.

Giger *et al* (1999) stated that if the technology promoted is not profitable from the agropastoralists' point of view, it is highly doubtful that the use of direct incentives will lead to sustained adoption of a technology in the long run. The technology will almost be abandoned as soon as the project phases out, and no replication beyond the boundaries of the lifetime of project can be expected. They further explained that rapid economic benefit is a very important condition for success and it is most probably much more important than the use of incentives in terms of achieving genuine, durable adoption.

2.3. Attitude and Behavior

Attitude is a subjective or mental state of preparation for action and it may be defined as a state of mind of the individual toward a value. Social values are created by the attitudes that are common to many men, and these attitudes in time, depend upon pre-existing social values (Allport, 1967). Attitude is also defined as an implicit response which is anticipatory and mediating in reference to patterns of overt responses, which are evoked by a variety of stimulus patterns as a result of previous learning or of gradients of generalization and discrimination. It is cue- and drive- producing, and it is socially significant in the individuals' society (Chein, 1967). According to Tesfaye (2003) the relationship between attitude and behavior has been one of the crucial focal point in social science research. Attitude is the disposition to respond favorably or unfavorably to an object, person or institution. He adds that the characteristics of attribute are its evaluation that reflects a positive or negative evaluation of the attributed object. Attitude is non-overt and can only be inferred from verbal or non verbal responses.

In considering the relationship between attitudes and behavior, some other relationships are to be considered. There is fairly conclusive evidence that an individuals' attitude towards any object is a function of his or her beliefs about that object and the evaluative aspects of those

beliefs. There is also enough evidence that there is a stable and high correlation between attitude and behavioral intentions. Attitudes are a fundamental determinant of behavior, but not the only one. Theory identifies the basic determinants of behavior to be: a) attitudes toward the behavior; b) normative beliefs, both personal and social; and c) motivation to comply with the norms. Other variables are said to influence behavior, but they operate indirectly by influencing any of these three basic determinants. The weights of the three major determinants may vary with the type of behavior being considered and they may also vary across individuals. Outside variables may be related to the basic determinants of behavior, but they may be unrelated to the actual performance of a given behavior. An individuals' attitude toward a stimulus is related to his or her behavior with respect to that object. It may also be expected that an individuals' attitude toward a given stimulus would influence his motivation to comply with a given norm. And, finally, variations in the situation may influence one or more of the primary determinants of behavior (Fishbein, 1967).

Motivation is the basic drive for all of our actions. Motivation refers to the dynamics of our behavior, which involves our needs, desires, and ambitions in life. Achievement motivation is based on reaching success and achieving all of our aspirations in life. Achievement goals can affect the way a person performs a task and represent a desire to show competence (Harackiewicz, 1997). These basic physiological motivational drives affect our natural behavior in different environments. Our motives for achievement can range from biological needs to satisfying creative desires or realizing success in competitive ventures. All of our behaviors, actions, thoughts, and beliefs are influenced by our inner drive to succeed (Scott, 2006). Two motives are directly involved in the prediction of behavior, implicit and explicit. These two motives often work together to determine the behavior of the individual in direction and passion. Explicit and implicit motivations have a compelling impact on behavior. The primary agent for this type of motivation is perception or perceived ability.

2.4. Empirical Studies on Adoption of Goat and Sheep Husbandry Practices

In the study conducted in Victorian Mallee by Robertson and Wimalasuriya (2004) it was shown that the difficulty of integrating sheep into current short cropping systems was

considered to be the key limitation to the adoption of management practices including using superior breeds, reducing rams and introducing supplementary feeding. The same study found that the major factors restricting sheep number were climatic influences on pasture availability, the area of crop, the relative profitability of sheep when compared with cropping, and time-labor lifestyle issues. These were found to be the determinants in the sourcing of labor, making time for sheep husbandry or preference not to work with sheep. Producers' responses in answering the methods that would increase the profitability of sheep enterprises, only 55% responded all the required three answers for better methods of management. Better management included responses of timeliness of operations, weaning lambs, culling ewes, disease control, fox control and weed control. But goals other than profit may motivate producers (Fergusson, 1984).

Producers were more positive towards changes such as changing breeds or genetics of sheep, marketing methods, but climatic conditions are a factor in the reluctance of some producers to use any type of contract production or marketing system for sheep. Risk contributed to reluctance to have a later lambing time. Other constraints identified by some producers in the adoption of some management options include the capital cost of buying stock or upgrading facilities, the sizes or limited number of paddocks for grazing and traditional attitudes (Robertson and Wimalasuriya, 2004).

Constraints to adoption of technologies could be broadly divided as either inherent technology characteristics or as individual decision making behavior which in turn is affected by several other variables. As Guerin and Guerin (1994) listed, few constraints related with technology characteristics are: the technology is complex; the outcomes of adoption are not easily observable; financial cost; producer beliefs about the technology; level of motivation of the producer; relevance of the technology and producer's attitude towards risk and change.

The most serious constraint for small ruminant production in Africa in general and Cameroon in particular is the small size of the average farm. The key to intensification and increase in output of sheep and goat production is the application of improved production and marketing technologies (Tambi, 1985). These include significant increases in the use of purchased

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cereal/protein feeds (concentrates) including crop byproducts (Fomunyam and Meffeja, 1985) and conserved grasses (Tait, 1973), improvement of existing vegetation by upgrading soil fertility, improvement of seeding (Newbold, 1974), investments in improved stock breeds and the application of processing and marketing techniques. These measures of intensification are difficult to come by because of low income levels, inadequate resources and managerial skills as well as general socio-economic characteristics which, together, constitute production and marketing constraints in sheep and goat production. The testing of innovations and monitoring of sheep and goats on smallholder farms outside the station therefore requires an understanding of existing constraints relating to available resources, management practices, and ownership patterns as well as marketing conditions(Tambi, 1985). Economic constraints have a major effect on the extent to which some of the biological factors can be employed. It is, for example, technically possible to improve the nutrition and health of animals by concentrate supplementation and other management factors, but the relationships between input costs and product prices limit their use. Dry season supplementation of sheep and goat diets for example, offers an effective means of increasing output during periods of scarce pastures but the high concentrate and labour costs incurred render it uneconomic (ibid).

Land and pasture improvement for sheep and goat production is an expensive operation particularly in regions where there is dominance of native pastures (Newbold, 1974; Eadie and Maxwell, 1975). Adoption of recommended husbandry practices according to type of village and actual use of various recommended practices were assigned as indicators of adoption. It was found that adoption behaviors of farmers in both types' of villages were substantially similar. A low level of adoption (less than one-third) was observed in both types of villages in relation to provision of shelter, provision of slatted floors, use of feeding concentrates, use of improved pasture, use of internal and external parasite control, use of vaccinations, use of mineral supplements and use of goat breeding strategies. About one-half of the farmers in each type of village used legumes as feed for their goats and practiced goat selection strategies. About three-quarters of farmers in both types of villages used leaves as feed. Intensive training for farmers should be conducted to increase use of recommended practices and thereby, the potential profitability of raising goats (Kriengsak, 1996).

The results of study done by Lucila and Simeon (2003) indicated that in addition to the biological aspects being critical to the adoption of forage species, the socio-economic characteristics of the farmer and the farm are important factors in the adoption of forages among adopters of contour hedgerows. It was shown that when a farmer is facing a liquidity or capital constraint, there is less likelihood that adoption of forages will take place because of the accompanying costs of adoption. Likewise, the role of education in facilitating the uptake of technologies cannot be overemphasized, as implied by the results of this study. Education is not necessarily confined to formal education, but rather could encompass the whole range of training and extension activities that will promote information and knowledge dissemination concerning a new technology.

2.5. Livestock extension in Ethiopia

Agricultural extension in Ethiopia has a history of nearly 50 years. It began with assistance provided by the United States Government under an agreement signed between the two countries in 1952. The agreement was broad and included the following: training of high level manpower; promotion of agricultural research; and dissemination of research results and scientific information through a network of agricultural extension. The initiative taken so far by Ethiopian government to develop the livestock industry is less than what is to be desired (Habtemariam, 2000).

During the imperial era; livestock relatively received more emphasis in the extension program. All the development projects like CADU, WADU, and SORUDU had livestock improvement programs as their components. In 1970, the Extension and Project Implementation Department (EPID) was created in the Ministry of Agriculture. The idea was to formulate and implement minimum packages based on the experiences and lessons from the CADU project. By 1984 or so, two minimum package projects, namely, Minimum Package I and Minimum Package II were implemented and then instead of developing Minimum Package III a broader regional development approach was adopted and programmes known as "Peasant Agricultural Development Programme (PADEP)". This programme focused on specific regions of the country. PADEP used the Training and Visit (T&V) extension system.

In the "New" Extension System (PADETES), to complement the ADLI strategy, the government of Ethiopia has adopted Participatory Demonstration and Training Extension System (PADETES) as the National Agricultural Extension System since 1994/95. According to the new agricultural extension system, execution of extension programmes is the sole responsibility of the Regional Agricultural Bureaus (RABs) while the Federal Ministry of Agriculture (MoA) has the mandate of formulating agriculture related policies, coordinating inter-regional development programmes and/or projects, providing technical advice and training services to increase the technical competence of extension staff members of the Regional Agricultural Bureaus. This system gives special consideration to the package approach to agricultural development. On the other hand, the responsibility of the extension team is mainly the implementation of extension packages that are designed and channeled by regional authorities.

The term "package" is defined as a group of separate items packed together as a single unit. Extension package is therefore defined as a package consisting of different elements which, among others, include technical information (improved technology and agricultural practices) agricultural production inputs, credit for inputs and suitable extension methods. In addition, maintaining the relationship between research and extension and conducting practical-oriented training programs are essential components of the new extension system. Different extension packages have been developed. The major ones include cereals-based extension packages both for moisture reliable and moisture stress areas, extension packages for high economic value crops, livestock development, agro-forestry, soil and water conservation and development as well as post-harvest technology package. The livestock development extension package includes dairying for milk production, fattening for meat production, poultry for egg production and apiculture / bee-keeping for honey production (Dejene *et al*; 2000). The livestock development extension was initiated in 1997 and is being implemented since then with the objective of increasing income of the household and food security thereby contributing to national development.

The livestock extension package is implemented since 1997, in eight regions namely Amhara, Tigray, SNNP, Dire Dawa, Harari, Oromia, and Somali, except in pastoral areas. The meat extension packages focuses on the fattening of large and small ruminants. The strategy is to use farmers' own cattle, sheep, and goat and purchased animals (3 oxen, 5 sheep/goat) to fatten them for 90 days. Input component of the fattening package include animals to be fattened (owned or purchased), animal feed and feeding, animal health, paddock and other supportive services like selection of animals, fattening period and marketing. Credit is only provided for the purchase of sheep and goat and not for oxen. The oxen are expected to be supplied by the farmer himself or herself. One of the fattening extension components is the selection process of animals. This technology does not appear to be practiced by the farmers in reality as animals for fattening are not selected based on their body condition and frame, age and weight.

Shortages of land for grazing and insufficient feed supply are identified as the major constraints of fattening in the extension program. The other common constraints in the fattening package extension services Ethiopia were: management and feeding system practiced, market outlets (access), credit accessibility, and training and marketing of the finished animal, veterinary services, input supply, lack of focus, problem of designing extension fattening package, and approach. Technical constraints like breed, feeds and feeding system and weak follow up, training frequency, visits by DAs, non availability of inputs, market outlets are indicators for poor participation and follow ups (MoA, 1992 E.C.).

2.6. Importance and Role of Goat and Sheep in Pastoral and Agropastoral Livelihoods

Goats are kept in a wide range of agro-ecological zones and management systems in Africa (Peacock, 1996). Livestock production in Sub-Saharan Africa is dominated by pastoralism and agropastoralism. Pastoralism is practiced in areas not suitable for cultivation and agropastoralism in areas where the agroclimatic conditions favor crop production. Livestock are vital to the subsistence and economic development in Africa. They provide year-round flow of essential products, sustain the employment and income of millions of people and contribute draught power and manure for crop production. Pastoralists are increasingly

realizing that they need to rely on goats more and more. The increasing frequency of droughts, together with long-term environmental degradation, is causing many pastoralists to shift from keeping cattle to keeping camels and goats. There is a marked trend towards keeping more small ruminants as proportion of livestock holdings than large ruminants. There are many reasons for this; goats are relatively cheap to acquire and reproduce quickly, enabling pastoralists to use them as a means to acquire cattle or camels (Peacock, 2005).

The social and economic roles goats play in African rural societies are explained in terms of food security and income generation. Since crop yields plateau and the price of many cash crops stagnate or fall, the intensification of livestock production is a viable option to increase household income. They are considered as savings account, especially for women in rural areas. Small ruminants are much easier and quicker to sell than cattle, when cash is needed to meet households' requirements. Now, more specialized systems of goat production are developing in response to increased market opportunities. The growing demand for goat meat from city residents presents an opportunity for goat fattening systems, as well as improved marketing from pastoral flocks. The potential for goat meat export, particularly to Middle East markets, remains under-exploited. Droughts are common and even floods can devastate lives as can civil war. Frequently families have to face crises due to accident or illness, increasingly from HIV/AIDS, without the benefit of a formal welfare system. Goats can play a vital role in supporting families through all these situations (ibid).

Small ruminants are often slaughtered in honour of a special guest, a visiting friend or relative, for festivities and religious rituals. More importantly, small ruminants play a key role in stock association building (building social capital or harmonizing relationships) between non-household members in rural areas. Because of their small size, sheep and goats provide more convenient sources of meat than cattle. Small ruminant production in general, and sheep and goat production in particular, has in recent years gained increasing popularity in most of the developing countries. Apart from the social and economic functions small ruminants play in developing societies, they also provide most of the meat supply for human consumption. Increased demand for goat meat, for example, provides potential economic advantages to farmers of small ruminants over large ruminants (McDowell and Bove, 1977).

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2.7. Pastoral and agropastoral indigenous husbandry practice and its limitations

Transformation of small ruminant production systems in arid areas under present demographic pressures and economic changes lead to an increase in human settlements, sedentarisation, which is associated with more demand for cultivation land. As the population becomes more and more sedentary, the amount of agropastoralism increases. The environment is probably too variable to support an agro-pastoral system. All these factors related to the transformation of the pastoral systems make the systems heavily dependent on external feed resources and agricultural byproducts. These transformations concern also feeding and the choice of raised breeds. During periods of droughts, contributions of range lands might be even lower. Along by-products (straw, stubble) are offered, which make the system heavily dependent on with this reduction in the contribution of range lands, other external resources and agricultural agriculture. However, the environment is probably too variable to support an agro-pastoral system. The dynamics of the pastoral systems induces also changes in livestock composition, less goats and more sheep and cattle. Zero grazing system induces problems of pollution (A. El Aicha and A. Waterhouseb, 1999).

The goat production system as a part of the existing broad crop-livestock mixed farming system of the selected villages is further described as follows. Indiscriminate breeding is prevalent in the area. No efforts seem to have made to improve the stock through selective breeding or by introducing high potential breeds. Male goats are taken better care of than the female ones as these fetch good price to the owners. Many do not like goat milk; hence, less priority is attached to milk traits of the goats. Feeding seems to be the most neglected aspect in goat production in the area under study. Goats were maintained on grazing in harvested fields, along the roadside and on other uncultivated/ barren lands. Stall-feeding in goats was very limited. She goats are given kitchen waste and the males are given inferior quality grains and grams for fattening purposes. Children and old members take goats for grazing in nearby fields in the morning and also in the afternoon. Those households, which do not have children or aged members in their families, hardly keep goats. The farmers did not report disease in goats as problem. Since goat production is only a fringe activity for most of the farmers, the health problems of goats were hardly paid any attention. However, to find out the types of health problems in local goats, the information maintained in the register of Indian Veterinary

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Research Institute run weekly clinic at Rithora was also studied. This revealed that goats suffered mainly from worm load, mange, mineral deficiency, anorexia, contagious ecythyma, diarrhea, mastitis etc (H.P.S.Arya and Mahesh Chander, 2003).

Using their own indicators of pasture type and quality, livestock-keepers decide whether or not they will go (or send their animals) on transhumance or will bring in feed from elsewhere. Studies of "grassroots" indicators mention of how pastoralists recognise range degradation, in the day-to-day management of range resources, pastoralists' monitoring practices are reportedly much the same as in scientific range management: they monitor vegetation cover and yield, greenness of plants, vegetation composition, occurrence of wildlife, and indicator plants for degradation However, pastoralists do not monitor vegetation, water or soil because they are primarily interested in these resources but rather because they are interested in how their animals and their families fare from these resources. Therefore, changes in the state of natural resources are more likely to be monitored through changes in the condition (health, productivity, well-being) of their animals. For this reason, indicators associated with their animals (e.g. milk yield, energy levels, sleekness of skin) are likely to be more important to monitor than, e.g. vegetation (Wolfgang Bayer and Ann Waters-Bayer; 2002).

The incorporation of the pastoral production system into the market economy and the efforts of so called developmental policies to shift traditional resource tenure to state tenure have among other things, contributed to land degradation. It also contributed to the erosion of traditional social structures and the cohesion of nomadic pastoral societies. The widespread feeling is now that the spirit of cooperation and collective responsibility that was once central to traditional animal husbandry has been lost and is being replaced by individualism, greed, mistrust and competition. The mobility of households and herds is a distinctive adaptation to this risk prone environment. Restrictions on mobility affect livestock production, rangeland ecology and inter-group relations. Starting with Somalia's independence in 1960 and the creation of permanent water points in arid zones such as Haud, grazing patterns and cyclical migrations have been altered. As water points alleviated one problem, it created an even more serious one. Areas that previously could be grazed only during the wet season could now be grazed all year round Migrations became more localized and the range was given little time to

regenerate. The availability of water meant that animals could be watered more frequently, and did not need to move far from the water points. There is a dilemma; namely that more water points are a necessity for the short term, yet more water points will compound the problems of declining pasture and declining livestock production. Proper management of new water sources is therefore essential. One possibility would be to consider ways of restricting new berkeds to existing centres and thereby to conserve grazing areas (Hussein, 2005).

Herd mobility as crucial strategy: Since the functional distinction between different ecological zones was no longer valid, the rotational grazing was abandoned. Throughout the Borana lowlands the adjustment of stocking rates to forage availability necessarily decreased. Borana pastoralists differentiate breed types for cattle, small ruminants and camel in *Qorti* and *Ayuna*. They identified the scarcity of pasture and the increasing recurrence of droughts as the main causes for the genetic erosion. In response to ecological degradation and the declining competitiveness of the Ethiopian Boran cattle, pastoralists have increasingly started to complement cattle husbandry with that of camels. The pastoralists complained that all livestock species had reduced their reproductive performance. Indicators for low performance were said to be the insufficient supply of milk and a delayed conception (Sabine Homann et al 2004).

2.8. Empirical Studies on factors affecting Adoption and Intensity of Adoption

Intensity of adoption refers to the number of technologies practiced by the same farmer. The intensity of adoption of different technologies is measured by a variable that represents the breadth of technology use within a particular stage of production (Kenneth *et al*; 2005/6). Social scientists investigating farmers' adoption behaviour have accumulated considerable evidence showing that demographic variables, technology characteristics, information sources, knowledge, awareness, attitude, and group influence affect adoption behaviour.

A wide range of economic, social, physical, and technical aspects of farming influences adoption of agricultural production technology (Oladele, 2005). Different studies conducted on factors influencing adoption of agricultural technologies have underlined factors, such as characteristics of household (education, age, and family size), farm characteristics, technology

characteristics, wealth (economic status), contact with extension agents, farmers knowledge of specific technologies, price, access to credit, position of farmer in farmers organization as important determinants of adoption of new technologies (Legesse, 1992; Teressa, 1997; Walday, 1999; Mulugeta, 2000).

Farmers' adoption decision can be influenced by many economic, social, and physical factors, which vary from area to area, and their effect on adoption decision are often not uniform. Because of this, the reaction of farmers to new technology is often not necessarily the same (Chilot *et al*; 1996).

Demographic characteristics

The roles of age in farmers' decisions to adopt technology have been shown in previous studies. Berhanu (2002) has shown that years of farming experience has significant effect on the adoption of crossbred dairy cows. Some studies reported positive relationship between age and adoption behavior of farmers Haji (2003), Mesfin (2005) and Yenealem (2006) found age significant in explaining the adoption of new technology. However, a study conducted by Bulale (2000) on adoption of dairy production technologies in Arsi highlands indicates that age had no influence on adoption of dairy production technologies but formal education does have a positive and significant influence.

Farmers with more education should be aware of more sources of information, and be more efficient in evaluating and interpreting information about innovations than those with less education. Even though the relationship between education and technological change is complex, it is also expected that farmers with higher levels of education will be more likely to use improved technologies. Weir and Knight (2000) and Croppenstedt *et al* (1999) found that, in Ethiopia, household-level education determines whether a farmer is an early or late adopter, but is less important in determining whether or not the farmer ever uses fertilizer.

Another study in Tanzania confirmed that farmers' adoption of crossbred technology depends positively on his schooling (Abdulai and Huffman, 2005). Falusi (1974) found that fertiliser

adoption was influenced more by institutional and educational considerations than by economic factors. In Ethiopia, Tekle (1975), Admassie (1995), Mekuria (1995), Asfaw *et al* (1997) and Tadesse (2000) have attempted to investigate the factors that affect farmers' adoption of new technologies, such as improved crop varieties and fertilisers. Mekuria (1995) and Asfaw et al. (1997) all conclude that education has a positive and significant impact on the adoption of modern inputs.

Institutional and social participation

There is growing evidence that the major factor explaining low adoption of technology in Africa is lack of appropriate institutional and policy support (Kedir, 1998). As reported by van Den Ban and Hawkins (1998), adoption of improved technologies is strongly affected by the policy environment like input supply, market, credit, price policies and improved supply system. Poor linkage between research and extension, high cost, low return, inappropriateness of technologies, lack of credit facilities, the prevalence of animal diseases, absence of transport and marketing infrastructure are some of problems affecting diffusion of technologies The decision to adopt any single innovation depends on the availability of interrelated inputs. Input availability is the most important influencing factor the use of improved technologies (Chilot *et al,* 1996). Berhanu (2002) has reported that input availability had positive and significant influence on adoption decisions of farmers.

Distance from market has significant effect on the adoption of crossbred dairy cows in the area as indicated by Bulale (2000).and Yenealem (2006) had shown that market distance is negatively and significantly related to adoption decision.

A study in Tanzania confirmed that farmers' adoption of crossbred technology depends positively on his access to credit (Abdulai and Huffman, 2005). The findings of Legesse, (1992), Teressa, (1997), Sseguya *et al*, (1999), Walday, (1999), Mulugeta, (2000), Million and Belay, (2004), Pender *et al*, (2004), Ibrahim, (2006) and kebede, (2006) show that credit has positive and significant influence on agricultural technology adoption. However, Bulale (2000) has found in his studies of adoption of dairy production technologies in Arsi highlands

that credit had no influence on adoption dairy production technologies.

A study by Makokha *et al* (1999) confirmed that farmers' characteristics with respect to leadership positions have significant influence on perception and hence adoption decision of farmers. A study in Tanzania confirmed that farmers' adoption of crossbred technology depends positively on the proximity of his farm to other users (Abdulai and Huffman, 2005).

A study by Makokha et al, (1999) confirmed that farmers' characteristics such as participation in field days and demonstration, attendance at workshops and seminars and contact with extension have significant influence on perception and hence adoption decision of farmers. Communications is the essence of extension, which seeks to provide knowledge and information for rural people to modify behavior in ways that provide sustainable benefits to them and society in general (Alex et al, 2002). Indeed, Sim and Hilmi, (1987) considered that the main purpose of extension systems should be to assist potential participants to place adoption decision in context. The decision to participate, or to adopt an innovation, is considered to be an information-seeking-and–processing activity where individuals are motivated to reduce uncertainty about the advantages and disadvantages associated with a new practice (Rogers, 1983). The effectiveness of extension service and other communication media and efforts were most important influencing factors in the use of improved technologies (Chilot et al, 1996). Berhanu (2002) have shown that extension contact and bull service has significant effect on the adoption of crossbred dairy cows in his study area and a study in Tanzania confirmed that farmers' adoption of crossbred technology depends positively on the contact with extension agents (Abdulai and Huffman, 2005). Contrary to the above findings, Bulale (2000) in his study indicates that extension had no influence on adoption of dairy production technologies.

Socioeconomic factors

Wealth status is expected to affect technology use for a number of reasons, including that wealthier farmers have greater access to resources and may be more able to assume risk. Risk and uncertainty have been discussed in previous empirical studies as impeding technology

adoption. The degree of risk aversion was the cause of low adoption rates (Yohannes et al; 1990). Makokha et al (1999) found that technological attributes such as supply (availability), economic and yield benefit, convenience had significant influence on adoption decision. The risk-averse farmer selectively adopts technology that ensures positive net expected marginal benefits.

Berhanu (2002) has shown that total livestock holding and off-farm income has significant effect on the adoption of crossbred dairy cows in his study area. Itana (1985) and Yenealem (2006) found positive and significant influence of TLU on adoption decision.

Arene (1994) reported a positive and significant relationship between family size and adoption. On the other hand, Voh (1982) established that household size is not significantly related to adoption. Techane (2002) has found family labour was positively related with adoption and intensity of fertilizer use and his result agrees with the findings of Lelissa (1998) and Green and Ngongola H. (1993).

Findings by Nkonya et al. (1997) hinted that those with large farm are likely to be better informed, be able to take risk associated to experiment with new practices. Berhanu (2002) have also indicated that farm size of cropland exerts a positive influence on the adoption of improved technologies. But, Yenealem (2006) has shown that farm size has no significant influence on adoption decision of FHH.

Technological attributes and bio-physical factors

Makokha et al. (1999) found that technological attributes such as convenience had significant influence on adoption decision. Saha et al. (1994) recognized that producers' adoption intensity is conditional on their knowledge of the new technology and on their decision to adopt.

Plans that employ a wide range of advanced technologies - adoption intensity - having mastered a larger skill set are hypothesized to have shorter adoption lags than those using only

one or two technologies (Baldwin and Rafiqquzaman, 1998). Berhanu (2002) has shown that feed shortage and animal health problem have significant effect on the adoption of crossbred dairy cows.

2.9. Conceptual Framework

This adoption study bases the general livestock extension performance, especially the fattening package by taking adoption behaviour towards the strategies and technology promotion processes being undertaken in the wereda .To analyze these processes there is a need to frame the research into major areas where the researcher has to focus, to address the research questions:

Institutional-extension service, market, education and training providing agencies, social/community organizations etc.

Economic-: labor availability, employment opportunities, income, economic status in general

Socio-cultural and socio-psychological: elements that affect the interrelationship and norm, and social behaviors influencing members of the community to react according to their socio-cultural and psychological context. Ethnicity, group norms, leadership, social status, local participation, religious attribute (degree of conservativism in religious norms and ethics of groups and individuals).

Individual behavior and psychological patterns: response of each individual in even the same social and cultural setting is largely determined by his/her own attitude and perception to stimuli at a time. Achievement motivation of individuals, perception of personal achievement and, incentive patterns directing motivation and perception of individuals are some characterstics a person in the community is derived by, through which his behavior is observed.

Bio-physical factors: the present and changing conditions of the natural and physical environments that production of small ruminants require for example feed resources, water availability, biodiversity of the locality all could affect the adoption decision behaviour of agropastoralists.

This study assumes that the factors mentioned above have interplay with the agropastoralists' and pastoralists' decision on adoption of small ruminants' fattening package. Based on this assumption, the conceptual framework of the study is presented below.
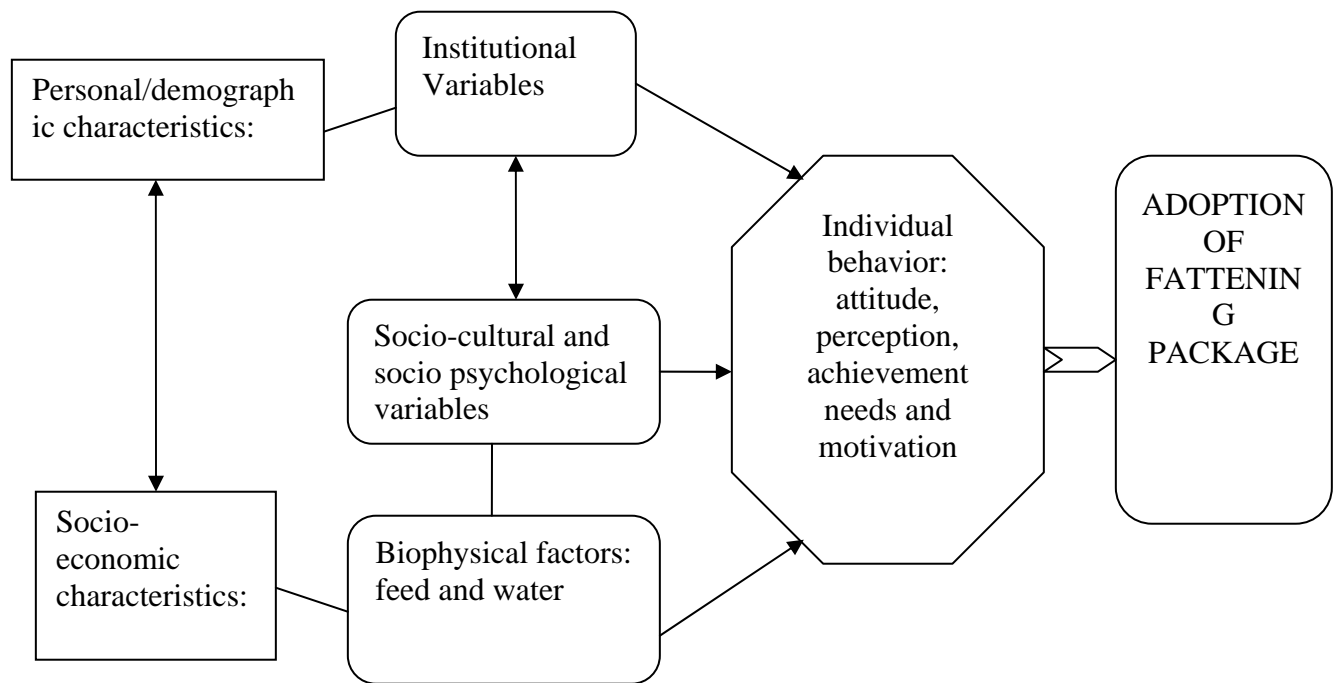
Figure 1. Diagrammatic presentation of conceptual framework of the study

3. RESEARCH METHODOLOGY

3.1. Description of the Study Area

Meiso is located 300 km east of Addis Ababa at about 200 km east of the Oromiya regional state capital of Nazreth. It is located west of Somali region and is one of weredas in Oromia where there are pastoralist farming system is practiced. Meiso is located east of Doba, north of Chiro & Guba Koricha, northeast of Anchara weredas; and northwest of Somali and south and southwest of Afar regions. The wereda has a total number of 37 Peasant Associations and 4 town dwellers associations.

According to the recent wereda population report, 143,228 is the total population of the wereda. The total number of agricultural households is 22, 012, while the urban households are 6,785. The town dwellers are scattered in four small towns including the wereda town. Of the total rural households, 17,495 are male and 4517 (20%) are female households. The total rural population is 115,568, out of which, 58,612 are male and 56,958 (49%) are female .Geographically, the wereda is located between $40^{o}9$"30.1' W and $40^{o}56$"44' E; and: $9^{o}19$"52'N and $8^{o}48$"12 N. Altitudinally, the wereda ranges from 1107 to 3106 m.a.s.l., but most of the wereda is found at about 1700 m.a.s.l.

The mean annual temperature is around 21°c, while average annual rainfall is between 635 and 945 mm. There are 5 zones in Meiso, which have between 4-11 PAs each. The 29 PAs belonging to this farming system are scattered in 4 zones. From within these 4 zones, some PAs are also classified into the other farming system. There are 8 PAs that belong to pastoral farming system. Twenty nine out of the 37 PAs belong to agropastoral farming system.

Farm households in this farming system are 18,336 (83%) with a total population of about 96,651 people. The total cultivated land (annual and perennial) in this farming system is estimated at 21,877 ha. The total area under this farming system is about 145,864 ha. The average land holding (cultivable land) in this farming system is 1.2 ha per household.

However, the proportion of average total land to total rural households in this farming system is, 1.5 ha. Due to population pressure, people are forced to convert natural grazing lands into crop lands and this is substantially affecting livestock productivity. Livestock products are generally limited and expensive. During the periods of high feed availability, which is mainly during crop harvest and crop weeding periods, the livestock body conditions become good and sale of livestock earns a reasonably good income.

Figure 2. Map of the study area

Legend

Miesso Wereda
Oromiya Region
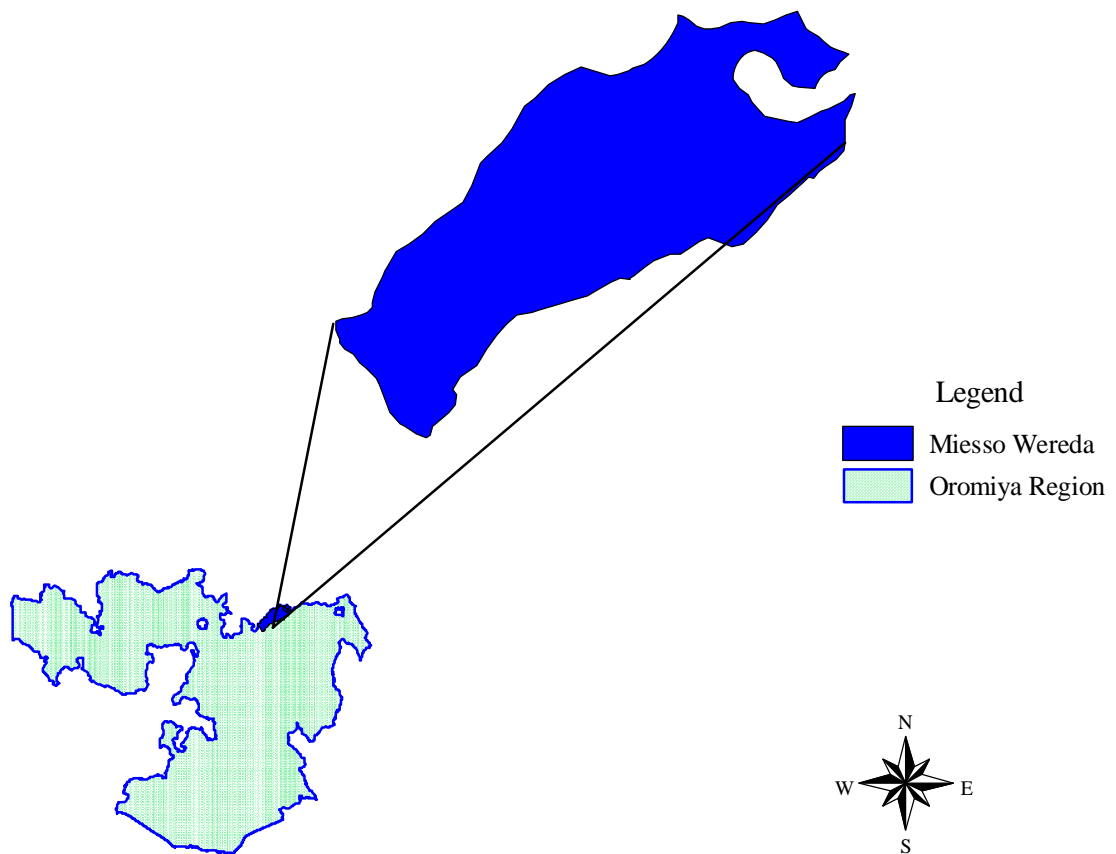
3.2. Sampling design techniques and procedures

A purposive sampling design was employed in selecting survey sites, to include both agropastoralists adoption behavior. The agropastoralists were assumed to use more of small ruminants fattening package than the pastoralists. Sample size was determined to be 160, of which 100 respondents were adopters and 60 respondents in the non adopters group. Meiso wereda is broadly divided into agropastoral and pastoral production system. Site selection was in accordance with the existing production system, four PAs were used in the primary data collection process. Among the PAs, three agropastoral and one pastoral PA were selected using relevant criteria. Three of these survey sites are agropastoral while one is pastoral PA so that samples would represent the whole wereda.

The sampling frame for the study was prepared for adopters and non adopters from WBRDP and NGOs record list of several years. Adopters were sampled from a list prepared independently from WBRDP records for five years in various activities specifically related with small ruminant rearing. A complete list of all kind of extension service participants was prepared by the researcher to capture the full package components users in the village (extension services-agricultural education, training, demonstration, farm visit participants list, fodder and forage plant seed distribution list, supplemental feeds distribution list, veterinary service records) from the office to proportionately sample the adopters. Non adopters list were also prepared from the PAs council office through DAs working in each PA. Non adopters were sampled again proportionately to their PAs household size excluding the adopters in each PA already sampled from the list. All the samples were taken using simple random sampling technique proportional to their size.

However, the final sample size was 151. Two out of 100 adopter respondents and seven out of 60 non adopter respondents could not respond due to imprisonment, relocation from the village and few also had already started to migrate with their flocks in search of feed to rangelands during the survey period. A replacement for these missing sample respondents was not done for unavoidable reasons such as insecurity, time shortage, and resource/transportation and facility constraints.

3.3. Data requirements, sources and methods of data collection

Both primary and secondary sources were used to obtain qualitative and quantitative data. Data that were generated from interview schedule and secondary sources covered households' demographic characteristics, institutional settings like extension system, market and prices, participations in informal and formal organizations, trainings delivered by GOs and NGOs, economic status, socio-psychological aspects like perception, attitude and knowledge of the respondents, the bio-physical resources such as feeds, range lands and water in connection with the fattening enterprise.

Qualitative data collection methods were also employed to supplement and elaborate on marketing and cooperative, gender and small ruminant practices' management and informal information source and communication sharing issues. The qualitative methods of data collection used in the study include focus group discussions among adopters and non adopters, informal discussions with females and village elders, transect walk and observation in the village.

Before administering actual interview schedule general observation of the wereda, informal discussions with the agropastoralists, transect walks in most of the PAs during three weeks of first survey period and pilot study were undertaken. The pilot study was done in 3 PAs which were not used for actual survey but these PAs were adjacent and have similar characteristics with PAs selected for the survey so that comparison of information obtained is reliable and informative. The number of samples used for pilot study was 20 and was selected randomly. The purpose of the pilot study was to refine the interview schedule, delete ambiguous questions and add more relevant items. Cross checking the survey interview schedule with secondary sources, personal observations and focus group discussion information were made. Data entry was done using SPSS version12 software, after coding, tabulation and cleaning the data collected through the survey.

3.4. Methods of Data Analysis and Econometric Model Used

The data was analysed using descriptive statistics and application of econometric model, to answer the research questions.

3.4.1 Descriptive Statistics

Descriptive statistical analysis methods were employed to discuss the result of survey using central measures and measure of dispersions, frequency, mean, average, variances, percentages, besides mean comparisons of independent samples and relation of sample category with variables in questions. The t-test and χ^2-tests help to see the presence of stastically significant differences or systematic association respectively, between those who adopt and those who do not in terms of some hypothesized variables. Descriptive statistics in such a way give some insight about the characteristics of sampled units for the survey study.

3.4.2. Perception and Attitude Analysis Method

Agropastoralists' liking or disliking of small ruminant fattening package is the result of their own evaluative perception. Perception was measured using a scale with items developed for the purpose of this study. Attitude responses of sample respondents on small ruminant fattening package were collected following five point Likert type attitude scale. Positive statements were rated 5 to 1 (strongly agree to strongly disagree) and scoring pattern was reversed for negative statements. Then the total attitude score was worked out for each respondent. A sum of all responses for a respondent becomes a total score which is suitable for analysis using t-test and measure of dispersion to characterize the sample respondents.

3.4.3. Tobit model

3.4.3.1. Data requirements and justification

The fattening package which has been extended in the wereda constituted three components for the last five or more years WBPRD (2006). This study focuses on cumulative adoption of the package contents, viz; feed components (lablab, cajanus cajan, pellete, MUB, cereals bran, salt) utilization of veterinary services and management practices of small ruminant rearing.

The cumulative score of feed adoption was computed by giving a value of 1-5 for frequency of using each feed item. Score 1 is if the response is 'not at all' and 5 for the response of 'using all the feed item regularly' and similarly 2, 3 and 4 are used to denote 'rarely', 'sometimes' and 'regularly some' respectively. When adoption score is computed using these values for all observations, a score value of 3 is the lowest and 15 is the highest. Accordingly the score values were used to determine the adopters and non adopters. A feed adoption score value of 3 indicates a non adopter and respondents with a feed adoption score value of 4 or more are classified as adopters. Adoption score of vet services and management practices were calculated employing the same procedure and the results of adoption scores finally used to compute adoption index for the whole package.

Thus, feed component of the package was used as a distinguishing point for adopter and non adopter categorization. Vet services utilization and management practices were difficult to use to clearly distinguish between users and non users, because every respondent used at least one of the recommended practices. Agropastoralists who necessarily used all the recommended package components were considered to be adopters and those who necessarily did not use all components of the package at a time were taken as non-adopters. Therefore, this reality led the study to base its focus on understanding the differences among the respondents in the intensity of adoption of fattening package and analyze its determinants.

In order to identify the intensity of adoption of new technology adoption index of individual agropastoralists was developed with the help of the following formula: modified from Naresh and Singh (1992) as follows:

$$AI_i = \sum_{j=1,i=1}^{m,n} \left(\frac{feedadoscore_{ji}}{FEEDADOMAX_j} + \frac{vetadoscore_{ji}}{VETADOMAX_j} + \frac{mgtpadoscore_{ji}}{MGTPADOMAX_j} \right)$$

Where:

i =1, 2, 3, …n, and n=total number of agropastoralists,

j=1, 2, 3,…m, and m=total number of major components of the fattening package

feedadoscoreji=the feed adoption score of ith farmer

FEEDADOPMAXj=the maximum score for feed practices for all sample

vetadoscore ji=the veterinary practice adoption score of ith farmer

VETADOMAXj= the maximum score for veterinary practices for all sample

mgtpadoscore ji=the management practice adoption of ith farmer

MGTPADOMAXj= the maximum score for feed practices for all sample

Using the above adoption index formula the following adopters groups were found to score an adoption index score value from 0.94 – 2.54 and therefore adopters' group were formed based on adoption index value (appendix Table 2)

3.4.3.2. Econometric Analysis

In principle, the decisions on whether to adopt and how much to adopt can be made jointly or separately. The Tobit model was used to analyse under the assumption that the two decisions are affected by the same set of factors (Greene, 1997).The standard tobit model assumes, among other things, that the dependent variable is censored at zero. The standard tobit specification is inappropriate if no censoring has occurred or if censoring has occurred both not at zero(Greene, 2005).There is a cluster of HHs with an index value below 1.47 adoption index which can be censored to zero level for tobit model analysis. The tobit model also called a censored regression model because it is possible to view the problem where observations of the latent variable at or below zero are censored (Johnston and Dinardo, 1997).

Tobit model was employed to see the intensity of adoption of the package in the village. According to Gujarati (1995) this model helps to examine the factors affecting adoption and intensity of use after the practice is adopted simultaneously. The Tobit model, therefore measures not only the probability that a farmer will adopt the new practice but also the intensity of use once it is adopted or of the introduced technology. Therefore a direct

application of the Tobit estimation sufficiently provides the needed information on the probability and intensity of adoption of fattening package.

Following Maddalla (1992), the Tobit model can be defined as

Yi =Yi*, if Yi>0, (Yi*= BiXi+Ui)-- (1)

Yi =0, otherwise i= (1, 2…)

Where: Yi is the observed dependent variable

   Yi* is the latent variable which is not observable

  Xi is a vector of factor or explanatory variable affecting use of fattening package

   Bi= a vector of unknown parameter KXi matrix of the parameter to be examined

   Ui, is an independently and normal distribution error term with mean zero and constant variable.

Note that the threshold value in the above model is zero. This is not a restrictive assumption, because the threshold value can be set to zero or assumed to be any known or unknown value (Amemiya, 1985).

The model parameter are estimated by maximizing the tobit likelihood function of the following Maddalla (1992)

$$L= \prod_{Y_i^*>0} \frac{1}{\delta} f\left(\frac{Y_i - \beta_i X_i}{\delta}\right) \prod_{Y_I^*\leq 0} F\left(\frac{-\beta_i X_i}{\delta}\right)$$ -------------------------------- (2)

Where : f and F are, the density function and cumulative distribution function of Yi*

respectively, $Y_i^* > 0$ means the product over those i for which $Y_i^* > 0$, and $Y_I^* \leq 0$ means the product over those i for which $Y_I^* \leq 0$

LIMDEP statistical software was employed to run the Tobit model. It may not be sensible to interpret the coefficients of a Tobit in the same way as one interprets coefficients in an uncensored linear model (Johnston and Dinardo, 1997) hence one has to compute the derivatives of the estimated Tobit model to predict the effects of changes in the exogenous

variables Maddalla (1992) , Johnston and Dinardo (1997) and Nkonya *et al* (1997) proposed the following methods to decompose the effects of explanatory variables into the decision to use and intensity effects.

Thus a change in X (explanatory variables) has two effects. It affects the conditional mean of Yi* in the positive part of the distribution, and it affects the probability that the observation will fall in the part of the distribution similar approach was used in this study. In the Tobit model, though, there are three different conditional means: those of the latent variable Y*, the observed dependent variable Y and the uncensored observed dependent variable Y\Y>0. Accordingly interpretation depends on whether one is concerned with the marginal effects of x on Y*, Y and Y\Y>0. The three marginal effect expressions are derived using standard results on moments of truncated /censored normal distributions

1. The Marginal effect of an explanatory variable on the expected value of (mean proportion) the dependent variable is

$$F(z)\beta_i = \frac{\partial \mathrm{E}(Y_i)}{\partial(X_i)}$$ --(2)

$$\frac{\partial \mathrm{E}(Y^*/x)}{\partial x} = \beta$$ --(3)

Where, $\dfrac{\beta_i X_i}{\delta}$ is denoted by z, following Maddalla, (1997)

The purpose of Tobit is to analyze, in the context of identifying the factors that explain variation in the use of technology. As Maddalla (1983) stated if the parameter estimates for entire population of agropastoralistsare required, it will be necessary to compute adjusted estimates that effectively scale the Tobit parameters by the probability of observation falling in the censored sample. The adjusted estimates are the margin effects of explanatory variables of the expected value of the dependent variable and given by

$$\frac{sE(Y_i)}{sX_i} = F(Z)B_I$$ --(4)

2. The Tobit specification allows us to analyze level use practice. The total elasticity in eq.4 can be decomposed into two effects

$$\frac{sE(Yi)}{sXi} = F(z)\left(\frac{sE(Yi^*)}{sXi}\right) + E(Yi^*)\frac{sF(z)}{sXi}$$ ---(5)

Multiplying by $n = \dfrac{Xi}{E(Yi)}$ and rearranging gives the following elasticity forms of whether or not the technology is adopted and the conditional level

$$\frac{n}{sE(Yi)/sXi)} = nf(z) + nE(Yi^*)$$ --(6)

The change in the probability of using fattening package as independent variable Xi changes (the probability of change among non adopters) is:

$$\frac{\partial F(z)}{\partial(X_i)} = f(z)\frac{\beta_i}{\delta}$$ --(7)

3. the expected value of adoption intensity use improved fattening package across all observations was estimated as

$$E(Y_i) = XBF(Z) + af(z)/$$ --(8)

Where : $Z = \dfrac{XB}{a}$,

Similarly the expected value of intensity of use is estimated by

$$E\left(\frac{Y_i}{Y_i} > 0\right) = \frac{XB + af(Z)}{F(Z)}$$ --(9)

Where:

Yi* the latent dependent variable which is not observable.

f(Z) is the cumulative distribution function

f(z)is the value of derivative of the normal curve at a given point

z is the Z-score for the area under normal curve

B is a vector of Tobit maximum likelihood estimates and

^{TM}, is the standard deviation.

Where as the change in the intensity of use with respect to a unit change in an explanatory variable among users is could be

$$\frac{\partial E\left(\frac{Y_i}{Y_i} > 0\right)}{\partial X_i} = \beta_i \left[1 - \frac{zf(z)}{F(z)} - \left(\frac{f(z)}{F(z)}\right)^2\right]$$ --(10)

Where:

$f(z)$ = is the value of the derivatives of the normal curve at a given point (unit normal density)

$F(z)$ = is the cumulative normal distribution of z

z= is the z score for the area under the normal curve,

β = is a vector of Tobit maximum likelihood estimates and

δ = is the standard error of the error term

Similarly the expected value of intensity of use is estimated by Variables selected from literature, and checked for the existence of multicollinearity among the continuous variables and verify the degree of associations among discrete variables. VIF were computed to detect multicollinearity for continous explanatory variables and contingency coefficient was also tested.

Explanatory variables that could significantly fit to the tobit model were selected after correlations, t-tests, multicollinaerity tests (VIF) for continous explanatory variables and χ^2 and contingency coefficients tests at different level of significance for dummy or categorical ones tested.

$$\text{VIF (Xi)} = \left(\frac{1}{1 - R_i^2}\right)$$

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R_i^2 i is multiple correlation coefficients between Xi and other explanatory variables

R_i^2 is constructed for each case. The larger the R_i^2 the higher the value of VIF (Xi) causing the higher collinearity in the variable (Xi). If VIF is 10 and above, the variables are said to be collinear. If R_i^2 is 1, it would result higher VIF and causes perfect multicollinearity between variables.

Where as for dummy variables, according to Heldy (1984), if the value of contingency coefficient (CC) greater than 0.75, the variable is said to be collinear

$$C.C = \sqrt{\frac{X^2}{n + X^2}}$$

Where: C.C is contingency coefficient

n is sample size

χ^2 is the chi-square value of a variable

The ML method is used to examine the parameter of the model and multicollinearity test is used to separate effect of independent variables on the dependent variable to measure independent variables the strength of their relationship.Using the stastical and econometric models described above the research will interpret the results.

3.4.4. Definitions of Variables

Dependent Variable

Adoption index of small ruminants fattening package is the dependent variable in this study. Adoption index as a continuous dependent variable is used to see the proportion or extent of fattening package adoption.

Independent variables: The observed adoption and extent of use choice of agricultural technology is hypothesized to be the end result of a complex set of inter-technology references and comparisons made by agropastoralists. The decision to adopt is derived from better physical yield, profitability, availability and riskiness of a technology component is a function of the agro climatic and socio economic and institutional environment. Based on the various studies of adoption, it is hypothesized that a farmer's decision to use a given technology is influenced by the demographic and personal characteristics of the household head, the household resource endowments and institutional support systems. The following are the independent variables assumed to determine adoption behavior of agropastoralists in the wereda.

Demographic characteristics and economic variables;

Age of household head

Age is assumed to relate with socio-cultural roles in the study area besides its relation with experience of small ruminant rearing. Age in a traditional society is an important indicator of one's position in his/her society. Older agropastoralists are deeply accustomed with the traditional ways of rearing than younger agropastoralists. In this study, age is measured in number of years and hence is a continuous variable. Age in this study is hypothesized to be negatively related with the extent of use of small ruminant fattening package.

Family size

Small ruminant rearing needs more time and labour for keeping goats and sheep in the grazing lands and watering points. Most small ruminant management practices are easily done by any family member irrespective of the assumption of economically active labour availability in a HH. Small children and oldest family members could equally contribute to household labor requirement in small ruminant management. The family size is therefore a very important factor that determines household's decision in the extent of use of the small ruminant fattening package. Family size takes a continuous value measured in number of family size in the households. Thus, it is hypothesized to have positive influence on the extent of use, decision regardless of the availability of economically active labour force in HHs.

Level of education

Level of education of HHs is assumed to increase the ability to obtain, process, and use information relevant to the adoption of fattening package. The educational level of the respondents ranges from zero to more than eighth grade and it is a continuous. Education is assumed to have direct and positive influence on intensity of adoption of the fattening package.

Farm size

The HHs total land size was measured in terms of productive land area in hectare (ha) and is continuous variable. Large land size will encourage growing of feed species given to agropastoralists and they have more grazing land of their own than the average grazing land shortly after crop harvest. The larger the farm land holding of the HHs, the more probable the household will be adopter and intensive user of the fattening packages in the area.

Number of livestock units (TLU)

Tropical livestock unit (TLU) takes a continuous value and is calculated as prescribed by strock et al (1991). Accordingly 1 TLU is equivalent to 1 camel, 1.43 cattle, 10 sheep/goats, 1.25 horse/mules and 2 donkeys. The number and kind of livestock species of HHs in the village is proxy indicator for their wealth status, and this TLU is an important decision factor for the HHs to take risk by accepting and continuing to use new innovations. Thus, it is expected that the higher TLU value of HHs, the more intensive user he will be of the fattening package extended.

HHs income (off and non farm income and on farm income)

The total income of the household was calculated from the sale value of crop and livestock produced and also income derived from non and off farm activities during the last production year, which was taken as a continuous variable measured in Birr. Income is one factor that make rural HHHs risk takers in extent of adoption decisions. HHHs seek to increase their income level in situations where demand and market for their produce is high. When a technology package which require high capital is extended, a higher income level HHHs could make use of this technology package. Thus, income is hypothesized to influence extent of adoption. The higher the income level the HHHs, the more probable to use the fattening package more intensively than HHHs with less income level.

Type of house owned

The type of a house owned by the agropastoralists' is another proxy indicator of the HHs wealth status. Corrugated iron roof with portioned room house type is a dummy variable and was measured 1, if the HHs owns it and 0, otherwise. Type of house owned is related with the housing management practice of small ruminant rearing in that if the HHs own house with partition, the HHHs may use part or one partition of the house may be used to shelter and keep the small ruminants separately. The type of house owned also shows the economic status that agropastoralists' capacity to invest in separate housing for their small ruminants. Therefore, the type of house owned is assumed to influence adoption and extent of use decision of the agropastoralists.

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Small ruminants rearing experience

This refers to the total number of years the respondent had spent in rearing goats and/or sheep in the wereda. The longer the goat and sheep rearing experiences s/he has, the more s/he would understand the efficiency and production problem for a number of years. Small ruminant rearing experience would then indirectly affect the decision of agropastoralists over the intensity of package use, and it might be positively related to their decisions. The longer the agropastoralist and pastoralist have experiences in rearing small ruminants the more they will be adopters of the fattening package.

Current Management practices score

How far the current small ruminant management practices of agropastoralists are in line with improved fattening package management practice recommendations need to be known. The current management practices of agropastoralists are taken into consideration and compared with recommendable small ruminants' management practices. The current management practices score is a continuous variable. Therefore, it is hypothesized that current management practices influence the decision to use intensively small ruminant fattening package.

Knowledge about the fattening package

Technological progress arises as a result of knowledge sharing and application. However, if a potential adopter faces uncertainty about the outcome, there is a trend not to adopt because of direct loss if the innovation fails as well as the loss of the adopter's network, since everyone else will continue to use the old technology. Knowledge score is calculated from all aspect of fattening package. By asking HHHs to name at least few critically important feed, health and management practices to be evaluated on student type of knowledge assessment, and the score is continuous variable. The presence of traditional fattening knowledge of the HHHs, awareness and knowledge of the improved technology with implementation skills would affect adoption and intensity use decision of the package. Knowledge on the fattening package is expected to positively affect adoption and use decision.

Frequency of radio use

Frequency of use of radio is assumed to help the farmer in getting upto date agricultural information and technologies, which influences the decision making processes in technology adoption and its extent of use. The frequency of listening to agricultural radio programs was measured categorically, 1= never listened, 2=rarely listen, 3=sometimes, 4=most of the time and 5=always/regularly listen agricultural programs. Frequency of agricultural radio listening is hypothesized to influence adoption and extent of use decision positively and significantly.

Contact with extension agents

This refers to frequency of contact between the extension agents and the farmer. The more frequent the contact between extension agent and farmer for dissemination of knowledge, the more the agropastoralists are exposed to information of fattening package and the more likely they are to be influenced in using the fattening package. It is an ordinal variable with values: 1 = never, 2 = once in three months time, 3 = once in a month, 4 = once in two weeks and 5 = once in a week. Frequency of contact with extension agent is assumed to increase the adoption and extent of use of fattening package positively and directly.

Training

Training is one of the most common extension methods used to transfer information, knowledge, and skills for improving the management practices of agropastoralists by the extension services. Training is a dummy variable and takes the value of 1 if the farmer has taken training and 0, otherwise. It is assumed that the more the training provided by the extension agent to the agropastoralists, the higher is the probability that agropastoralists adopt the technologies delivered to them.

Use of micro credit

Access to credit will increase agropastoralists' capacity to buy inputs and risk taking decisions. Agropastoralists' access to small ruminant fattening package credit is hypothesized

to influence adoption and use of fattening package decisions. It is a dummy variable having one if have access and zero, otherwise.

Market information of households

Market information of household heads implies agropastoralists' access to price information on both input and fattened goats and sheep in the near and big markets. Market information is accessible only if the farmer is closer to the market place physically, is capable to go to market frequently or he has other sources to provide market information. Thus having market information is hypothesized to influence adoption decision positively. Market information is measured as dummy variable, 1 if the HHHs have access to market information and 0, otherwise.

Distance to market

Physical access to market determines the frequency HHHs going to local markets. This physical access to market is affected by the distance of the market place, infrastructure available (all weather roads) and access to transportation facilities. Distance of a market place from the HHHs' home is measured in hours taken to reach the nearest market place and hence it is continuous variable. The distance to market of HHHs has negative and significant influence on adoption decisions. The longer the time taken to reach to local market, the lesser intensity of the HHHs adopt fattening package in the study area.

Distance to input market

Availability of input for fattening is very important in small ruminants rearing. However, required inputs may not be available in accessible local markets and therefore agropastoralists who are really interested in fattening small ruminants have to look for necessary inputs wherever they might be available. Distance to input market is a continuous variable measured in number of hours taken to reach input market for the HHHs from their home. The market accessibility of agropastoralists is determined by availability of all weather roads,

transportation access. Nearness and availability of input in the market facilitate the adoption rates and intensive use of fattening package and hence intensity of adoption decision would be significantly and positively related with input market.

Distance feed resources

Water and feed resources availability near to one's surroundings is the most important biophysical element. Agropastoralists' perception of their access and availability of resources needed for fattening small ruminants affect their adoption decision of the fattening package. The distance of the households from source of the resources is continuous variable measured in numbers of hours taken to reach the source. The longer the time taken to reach to the sources, the higher the probability the HHHs decide to let his or her small ruminants to graze by their own and thus, the lesser the probability the HHHs use stall management practices. Therefore, distance to feed resources influence extent of fattening package adoption.

Distance to water sources

The distance from the water sources to agropastoralists' home affect the frequency, and amount of water fetched to home for consumption and livestock use. Thus, the more the distance of water source from home, the less the frequency and amount of water used in the household and therefore, the less probable the HHs use water to small ruminant fattening. The distance of water source from the home is measured in number of hours taken to reach to these sources.

Risk orientation

Risk orientation of the household is influenced by the level of wealth and economic goal of the HHHs. Agropastoralists may have fear associated with either crop or livestock production technologies choice and the degree of risk aversion or risk taking decision between individual in choosing crop production or livestock specialization is not the same. Risk orientation of the HHHs in small ruminant rearing as compared to other livestock species rearing differs from

individual to individual. Risk orientation was measured as dummy variable having a value of one if the respondent is a ready to take a risk related with small ruminant rearing and zero, otherwise. The more risk avert the household is, the less adopter of the fattening package he would be and vice versa.

Perception

The perception of agropastoralists on each component of the package was taken to be continuous and measured in a range, from 1 to 5 scale values. Perception about a technology directly influences adoption of a technology at HHs level. HHs have different perception on the same technology and this might affect intensity of use of the small ruminants fattening package.

Attitude of small ruminant producers towards the fattening package

Attitude measures the degree of liking or disliking of individual towards an object, idea or practice. The level of attitude towards the fattening package was measured using total attitude score of the agropastoralists and thus it becomes continuous. The agropastoralists' attitude towards newly introduced technologies and improved practices is either positive or negative and it would have significant role in adoption decision of fattening package. It was hypothesized that the favourableness of the attitude of the respondents will have positive and significant influence on adoption decisions.

Perception of Technology attributes

Each innovation /technology has its own attributes about which agropastoralists have their own perception with regard to advantage, disadvantage, purpose, difficulty, cost and benefit. Suitability of improved management techniques, feed characteristics, and vet and health services evaluative perception of agropastoralists affect the intensity use of fattening package. Therefore, a perception on fattening package suitability to small ruminants' production by sample respondents is assumed to be associated with technology attributes influencing decision about fattening package adoption. Technology specific variables are measured using

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perception of agropastoralists on each package component based on scale level 1= very much true, 2= sometimes true, 3= undecided, 4= mostly incorrect and 5= not at all.

Social security

Agropastoral and pastoral areas are typical areas where conflicts arise because of competition for scarce resources. Instability and insecurity among villagers might be commonly encountered. Villagers could, therefore be influenced by these feelings in intensity of adoption decision of fattening package. Feeling of security in ones' surrounding directly influences his decision to invest on improved goats and sheep rearing practices and technologies. This insecurity can be captured through perception of individuals on their surrounding security. It is a dummy variable, if the agropastoralists feel secure is 1 and 0 otherwise. Therefore, it is hypothesized that feeling security about one's surrounding might positively or negatively influence the extent of fattening package adoption.

Social Participation

Social participation refers to the level of involvement of a farmer in the local formal and informal organizations. Participation in these social organizations could be at different levels (membership, committee membership and leadership) and frequency of participation in social organizations' activities. Social Participation at different levels is a dummy variable as one=participated or 0 =not participated while the frequency of social participation in these organizations is measured ordinally and the values are: 1= never, 2= sometimes, 3= participate when participation is needed. Generally, the more agropastoralists are involved in social organizations' meetings and activities, the more they will access new information and the more s/he will easily develop positive attitude towards the fattening package. As a result participation is hypothesized to positively affect the extent of adoption.

4. RESULTS AND DISCUSSION

The study was conducted in agropastoral and pastoral production system. Adoption behaviour of sample respondents and their evaluations of institutional support of extension services discussed in this chapter. Descriptive statistics, frequency, tables, mean comparisons of adopters and non-adopters for their differences in their characteristic explanatory variables and significance levels of the difference are discussed. Tobit model was the main econometric analysis tool employed to see the intensity of adoption among adopters.

4.1. Agropastoralists Assessments on Small Ruminants' Fattening Package Extension Services

4.1.1. Agricultural Extension Services

Awareness creation is very important in any adoption process. A villager who is merely being aware of presence of extension services does not necessarily mean s/he uses all information, knowledge and services from the extension agents. Rather the value given to the extension services or extension agents' information and knowledge about a small ruminant fattening package by the villager might be more important. Therefore, extension agents' influence through information about new techniques or innovations will have differential impact on individual farmer's adoption and effective use of information about technologies and extension package. Knowledge and communication are viewed as playing key roles in this participatory process. The basic premise of the "innovation diffusion model" is that access to information is the principal factor influencing the decision to participate or not (Rogers and Shoemaker, 1971). Table below presents agropastoralists awareness for the existence of small ruminants' extension services in their wereda.

Table 1. Sample respondents' distribution of awareness of small ruminant extension services

Responses for awareness of small ruminant extension services	Adopters		Non Adopters		χ^2
	N	%	N	%	
Yes	60	61.2	12	22.64	4.016**
No	38	38.8	41	77.36	

Source: own survey, 2007
** Significant at 5 % level

Among the respondents, 61.2 % of adopters and 22.64 % non adopters were aware of the existence of small ruminant extension package, while 38.8 % of adopters and 77.36% of non adopters confirmed that they were not aware of extension services. It was also seen in this study, there existed statically significant differences between adopters and non adopters in their being aware of small ruminant extension services in the wereda (Table 1) this finding is in line with (Marsh *et al.* 2000). During informal group discussion, agropastoralists asked the extensions services a lot of information related with small ruminants' production. Awareness level of small ruminants' extension services of adopters is better than non adopters. Adopters have better exposure to extension agents and services and thus, would give higher value and recognition to the extension services. Therefore adopters are far more ready to seek new knowledge and information on technologies from the extension services as they are aware of small ruminant extension services in the wereda.

4.1.2. Information Sources of Sample Respondents

Agropastoralists are expected to seek various sources of information on several matters for solving production problems and increasing productivity. Nowak (1987) has concluded that multiple sources of information with "credibility" are more likely to promote participation in new farming practices. A number of information sources are at agropastoralists' and pastoralists' disposal and choosing one or more of these sources is the farmer's decision, in consideration of pros and cons of his/her choice of information source. In this study, it was found that there was significant association between sources of information sought and intensity of adoption decision of sample respondents.

Table 2. Source of information about SR fattening package of sample respondents

source of information about SR fattening	Adopters		Non Adopters		χ^2
	%	N	N	%	
1. Extension agent	21.42	60	34	17	6.29 (ns)
2. Fellow farmer	15.31	22	20.72	11	
3. Researchers	1.02	15	0	0	
4. More than one source of information	62.33	1	45.28	24	
5. Total	100	98	100	53	

Source: from own survey, 2007
NS= non significant

Respondent were asked to rank the most frequent information sources they seek and the result of this study indicates that 62.33 % of adopters and 45.3 % of non adopters sought more than one information sources (extension agents, fellow farmers, or other sources) about 20.72% non adopters and 15.31% adopters were seeking their fellow agropastoralists as their information sources, extension agents are sought as single information source by 21.42 % of adopters and 34 % of non adopters and only 1.02 % of adopters are found to see researchers as their information sources. The same result shows there was no statistically significant difference between adopters and non adopters in seeking information sources. This is may be because of the suscipicious and/or reliable information seeking behaviour of rural people on information obtained from outside sources (Table 2).

4.1.3. Extension Messages

The wereda extension services cover many aspects of agricultural messages (Table 3) the office report. These services are structured under different departments of the bureau and agropastoralists receive these different types of messages through a single extension agent. Table 5 shows that adopters are more aware than non adopters about feed, health, home economics, land use practices, other agricultural technologies extension messages in percentage terms but it was found that these access to extension messages are not stastically significant (Table 3). These messages are prepared by experts as part of routine tasks without the consideration of the need and interest of agropastoralists. Sample respondents' focus group

discussion reveal that, agropastoralists have many recurrent problems especially in feed, health, and management practices of small ruminants and need to know and adopt improved management and technologies in small ruminant production . Contrantrary to the need and interest of sample respondents, messages are prepared by wereda experts to fulfill the quarter plans which are transferred to extension agents in top down manner. The messages are general in their contents and most of the time untimely delivery of information results as it is not in line with the context. Therefore even adopters could not use of these most of these messages significantly.

4.1.4. Communication problems and comments of sample respondents

The existence of communication problem between the extension agent and agropastoralists in the wereda was expected due to two main reasons- as it is discussed above messages contents are not contextual, timely and do not consider the need and interest of agropastoralists thus it can be said it is not well organized and the other problem is lack of basic extension and communication skills of development agents and officers at all levels.

About 27.6 % of adopters and 28.3 % of non adopters reported that they were facing problems (for example, sample respondents' needs and interests are not considered at all when extension messages are prepared. water is the most important resources they need but messages and information on water use is not considered well by the extension agents' and the same is true with feed, animal health technologies and services thereby extension communication problems arise as a result of mismatch between messages by extension agents and needs and interest of agropastoralists). While 72.4 % of adopters and 71.7 % non adopters said that they did not have any communication problem. This is may be because of the basic communication barriers between extension agents and sample respondents are reduced by language similarity between them and extension agents lives within the village. The differences between adopters and non adopters in experiencing communication problem with the extension agents were found to be stastically insignificant (Table 3).

In this study, it was found that 82.7 % of adopters and 66 % of non adopters were willing to

give comments on small ruminant extension services and 17.3 % of adopters and 34 % of non adopters were not ready to give any comment on the extension services (Table 3). The reason for the non responsiveness of few respondents could be evaluation of governmental agencies is seen as sensitive. There was significant difference between adopters and non adopters in commenting small ruminant extension services and this is due to the exposure of adopters to extension services more than the non adopters.

Table 3. Extension messages, communication problem experience and willingness to comment extension system

Types of messages, communication problem experience and willingness to com	Adopters		Non adopters		χ^2
	N	%	N	%	
Feeds:					
Yes	74	75.51	44	83	1.136
No	24	24.49	9	17	(ns)
Animal health:					
Yes	79	80.6	44	83	0.132
No	19	19.4	9	17	(ns)
Breeds:					
Yes	42	42.86	21	39.6	0.148
No	56	57.14	32	60.4	(ns)
Building shelter and shed:					
Yes	45	45.9	22	41.5	0.271
No	53	54.1	31	58.5	(ns)
Home economics:					
Yes	73	74.5	33	62.3	2.458
No	25	25.5	20	37.7	(ns)
Technology use in agricultural production:					
Yes	59	60.2	38	71.7	1.978
No	39	39.8	15	29.3	(ns)
Land use practices:					
Yes	53	54.1	28	52.8	0.022
No	45	46.9	25	74.2	(ns)
Problem in communicating with extension agents:					0.198
Yes	27	27.6	15	28.3	(ns)
No	71	72.4	38	71.7	
Willingess to comment on extension:					
Yes	81	82.7	35	66	5.33**
No	17	17.3	18	34	

Source: from own survey, 2007; ** Significant at 5% level, ns= non significant

4.1.5. Comment on current extension system in the wereda

It is becoming a more recognized fact that demand for extension services is to be more diversified than ever before. Alex *et al.* (2002) and Rivera (2001) were arguing that extension is being forced to embrace a broadened mandate or reaffirm a broad mandate that has long existed. Agropastoralists commented on the role of agricultural extension services with regard small ruminants production as it should be more problem focused and extension services need to facilitate the input delivery and strengthen linkage role with agribusinesses so that input deliveries and access of are accessible in each village. In this study, there is significant association between commenting on currently promoted small ruminant fattening package extension services and intensity of adoption decision (Table 4).

Table 4. Sample respondents' comment on small ruminant fattening extension package

Comments	Adopters		Non Adopters		
	N	%	N	%	χ^2
1. Widely distribute inputs like vet drugs and supplement feed	22	22.44	13	24.5	
2. Diverse service is needed such as credit ,increased number of input suppliers business each village	37	37.8	10	18.9	
3. They need Improved production techniques	3	3.06	4	7.5	16.874***
4. Demonstrate and transfer more crop technologies	33	33.68	16	30.14	
5. The extension services is good for fattening small ruminants	3	3.06	10	18.9	

Source: from own survey, 2007
*** Significant at 1% level

The distribution Table shows that 22.44 % of adopters and 24.5 % of non adopters need the extension system to deliver them more vet drugs and supplement feeds, 37.8 % of adopters and 18.9 % non adopters want the extension system to provide production credits and strengthen input suppliers in the wereda , 3.06 % of adopters and 7.5 % of non adopters desire that extension should give more of its efforts to information dissemination on improved

production techniques , a good number of both categories need the extension to transfer more crop technologies and demonstrations (33.68% of adopters and 30.14 % non adopters) and only 3.06 % of adopters were satisfied with the small ruminant fattening package extension in the wereda while 18.9 % of non adopters were saying that it is good for small ruminant production. The study shows that the existence of statistically significant differences between adopters and non adopters in terms of commenting the extension services (Table 4).

Box 1. Focus group discussion with five adopters and five non adopters on commenting extension services

During focus group discussion, non adopters gave explanation for their non adoption of fattening package. Most of them appreciate the fattening package but due to lack of labor in the HHs there is a problem- taking small ruminants to vet clinics and providing feed and water as required, and also lesser land holding forces them to focus on production of only high yielding cereals which has no good feed value (forage) to their small ruminants and some of the adopters explained the need to access more services than just small ruminant fattening packages. They reason out that they are already doing fattening practices; therefore they wish to know how to improve their production activities.

4.1.6. Extension Methods

Agropastoralists' opinion on the importance of extension methods were considered for evaluation. Importance of extension methods in terms of changing attitude, means of information transfer and improving social interaction being the criteria for evaluating the methods and approaches of extension services by sample respondents. The percentage distribution of adopters and non adopters, in Table 5 shows, distribution of different extension methods considered to be appropriate and important in their opinion.

The significance level associated with each type of extension method shows that the differences between adopters and non adopters in perceiving the importance of extension

methods for different purposes were not much significant, except demonstration methods which was considered to be important by a number of adopters than non adopters implying that adopters more strongly believe that demonstration is more important than the other types of extension methods because demonstration is practical teaching on different package components and also fits ones' context . The majority of sample respondents were found to be non responsive for the questions they were posed to evaluate the importance of different extension methods they had experienced. This is because the majority of sample respondents were having few numbers of experiences of participation in the different extension methods. Therefore, sample respondents can not make comparisons of advantages and disadvantages of among these different extension methods.

Table 5 Distribution of different extension methods importance as evaluated by sample respondents

S.No	Extension methods	No response				Changing attitude				Social development				Information about fattening package				Improved crop varieties and techniques				χ^2
		As		NAs		As		NAs		As		NAs		As		NAs		As		NA s		
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
1	Importance of training	59	60	36	68	8	8.2	2	4	9	9	9	17	19	19.4	4	7.5	3	3.1	2	3.8	6.300 (ns)
2	Importance of field days	82	84	47	88. 8	2	2	3	6	4	4	2	3.8	8	8.91	1	1.9	0	0	0	0	4.198 (ns)
3	Importance of demonstrations	85	87	49	92.5	2	2	3	6	3	3	0	0	6	6	0	0	0	0	1	1.9	8.129*
4	Importance of visit	84	86	49	92.5	0	0	1	2	3	3	1	1.9	4	4.1	1	1.9	5	5	0	0	7.167 (ns)
5	Importance of public meeting	51	52	20	38	9	9.2	1	2	23	23	5	9.4	8	8.2	6	11.3	4	4	2	3.8	8.806 (ns)

Source: from own survey, 2007 *Significant at 10 % level and ns=non significant

4.1.7. Response on the Kinds of Training Received

In contrary to findings from report review, sample respondents were found not to be involved much of in the reported training sessions. About 66.9 % of the total sample reported that they never participated in any kind of trainings. Crop production related trainings were actually received by 6.6 %, animal production related trainings were delivered to 19.9 %, natural resources related trainings received by 0.6 % while 6 %, of the total respondents got trainings related to social, political and institutional matters. There was no difference between adopters and non adopters in the kind of trainings they received so far (Table 6)

Table 6. Response on the kinds of training received

Adopters category	None		crop		Animal		Natural resources		Socio-institutional		x^2
	N	%	N	%	N	%	N	%	N	%	
Adopters	63	64.3	6	6	24	24.4	1	1.02	4	4.04	
Non adopters	38	71.7	4	7.5	6	11.3	0	0	5	9.4	6.212
Total	101	66.9	10	6.6	30	19.9	1	0.6	9	6	(ns)

Source: from own survey, 2007
NS= non significant

More over, trainings were not prepared based on training needs assessments and hence are less likely to meet the needs and interest of agropastoralists. Sample respondents, who received trainings, reported that the trainings were not compatible with their needs and production problems. Table 7 below shows that 75.5 % of adopters and 18.9 % of non adopters responded that the trainings were compatible with their needs and problems while, the majority of the respondents, 24.5% of adopters and 68.1% non adopters do confirm that their interest and needs were not addressed through the trainings delivered by extension services.

Statistical test shows that there were insignificant differences between adopters and non adopters in their response with regard to training compatibility. Some of the reasons for training incompatibility with agropastoralists needs and interests were found to revolve around

non agricultural training programs and only few sample respondents participate in trainings if they participate at all, this problem was earlier appreciated by Vanclay and Lawrence (1995), poor methods of training preparation and delivery and lack of trainers' adequate information and preparation on the training content (personal observations and reviewed documents).

Table 7. Evaluation of sample respondents' on training compatibility and trainers' preparation

S.No	Training evaluation	Adopters		Non Adopters		χ^2
		N	%	N	%	
1	Training compatibility					0.626
	Yes	75	75.5	10	18.9	(ns)
	No	23	24.5	43	81. 6	
	Total	98	100	53	100	
2	Trainers preparation adequacy					
	Yes	71	72.4	10	18.9	4.790*
	No	27	27.6	43	81.13	
	Total	98	100	53	100	

Source: own survey, 2007
* Significant at 10 % level and ns= non significant

4.1.8. Perception of Agropastoralists on Small Ruminant Fattening Package and Extension Services

Sample respondents were presented with number of issues in the small ruminant fattening package extension services to be evaluated based on agropastoralists' and pastoralists' perception. Some of the perception measurement attributes were: fattening package helps in increasing the body size if used properly, availability of fattening input, availability of health and veterinary service, availability of improved forage and fodder plant, perception of fattening package in terms of demands on dedication and attention, perception of fattening package in demanding huge investment and finally the availability of improved breed for fattening purpose.

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Responses	Never				Not true				Not sure/decisive				Sometimes true				Always true				χ^2
	As		NAs		As		NAs		As		NAs		As		NAs		As		NAs		
Attributes	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
Fattening package increases body weight	2	2	3	5.7	2	2	0	0	9	9.2	7	13.2	15	15.2	14	26.4	70	71.4	29	54.7	6.644 (ns)
Lack of input availability	2	2	1	1.9	8	8	5	9.4	13	13.3	6	11.3	47	48	20	37.8	28	28.6	21	40	2.277 (ns)
Shortage of Vet services availability	24	24.5	11	20.8	12	12.2	6	11.3	11	11.2	6	11.3	18	18.4	6	11.3	33	33.7	24	45.3	2.535 (ns)
Fattening package demands attention and dedication	5	5.1	1	1.9	3	3.1	6	11.3	13	13.3	11	20.8	40	40.8	9	17	37	37.8	26	49	0.013 (ns)
Lack of availability of improved feed	9	9.2	11	20.8	29	29.6	17	32.1	12	12.24	22	41.5	21	21.4	9	17	17	17.3	7	13.2	4.761 (ns)
Fattening package needs capital	5	5.1	4	7.5	8	8.08	3	5.7	14	14.3	8	15.1	42	42.9	18	34	29	29.6	20		2.044 (ns)
Difficulty in availability of Improved breed	7	7.1	9	17	17	17.3	19	35.8	32	32.7	12	22.5	26	26.5	10	18.9	16	16.3	3		13.221***

Source: own survey, 2007

Significant at 10 % level and ns= non significant

There is no significant difference between adopters and non adopters in perception of all of the above attributes of fattening package except the perception on availability of improved breed for fattening purposes. The non significant differences between adopters and non adopters in the six attributes of the Table 8 are due to the homogeneity of production system and similar context could influence sample respondents to experience almost similar problem. But the significant difference between adopters and non adopters in the perception of availability of improved animal breeds (Box 2) is may be due to interest of adopters who really want to fatten always look for the sources of better breeds at least locally available better breed.

Box 2. As one sample respondent witnessed during transect walk discussion that when he want to rear small ruminant particularly goats he goes to a local market as far as 50 kms only to select locally better breed, based on the body frame and condition. He called the name of the breed by "*menze*". When he plans to engage in fattening small ruminants he usually uses selection of better breed for fattening purpose from markets in the distant places from his home village.

4.1.9. Attitude of Agropastoralists towards Fattening Package

Attitude about extension system as well as package or part of the package determine the intensive use of a technology and innovation in any given social setting. Individual's attitude is the determinant factor in the intensity of adoption decision of agricultural technologies and innovations. The t- test of independent samples shows that there is insignificant difference between adopters and non adopters in their attitude towards the services delivered to them on small ruminant production aspects. The highest attitude score of adopters and non adopters are 39 each and the lowest score were 20 for adopters and 16 for non adopters respectively (Table 9).The mean attitude score of adopters and non adopters were 28.56 and 28.91 respectively out of an obtainable potential score of 40. In this study, the relation between intensity of adoption and attitude of sample respondents found to be insignificant (Table 9) and this is because of highly homogenous social setting (ethnicity, production pattern, religion and social

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networking and learning) and the closer interaction of these elements on ones' attitude, influence every community member to have the same attitude towards something externally induced.

Table 9. Sample respondents' attitude small ruminant fattening package

Attitude on Fattening Package	Adopters (N=(98)	Non Adopters (N=53)	t-value
Mean	28.56	28.91	0.405
Std. Deviation	4.421	5.278	(ns)
Maximum attitude score	39	39	
Minimum attitude score	20	16	

Source: own survey, 2007; ns= non significant

4.1.10. Sample Respondents Knowledge of fattening package contents

Knowledge of a particular agricultural activity determines one's perception of the technology as well as his/her immediate application of new knowledge of the same technology on currently perceived production problems. The result of this study also indicate that there is strong and positive relation between knowledge about small ruminant fattening package and extent of fattening package adoption in the study area. The knowledge level of sample respondents was scored. The score was calculated by giving values to all responses used as proxy indicators of the level of knowledge the respondents had. (Appendix interview schedule)

Table 10 Score of knowledge of small ruminant fattening package

knowledge of fattening package practices for better productivity	Adopters (N=(98)	Non Adopters (N=53)	t-value
Mean	7.67	6.157	0.405***
Std. Deviation	3.874	2.91	
Maximum knowledge score	22	16	
Minimum knowledge score	2	0	

Source: own survey, 2007
*** represents level of significance at 1%

In Table 10, the mean distribution score of adopters and non adopters in their level of knowledge of small ruminants fattening package was 7.67 and 6.157 out of an obtainable potential score of 30 with standard deviation of 3.874 and 2.91 respectively. There was significant difference between adopters and non adopters in their level of knowledge of fattening package. This implies that adopters in the study area are better than non adopters in their level of knowledge about improved practices and information on the fattening package contents in the wereda. Even then, the mean score compared to the potential score indicates the poor statuses in terms of knowledge for both categories of respondents.

4.1.11. Informal information source use and communication

Rogers (1995) argues that when people have better access to information about a new technology, the more extensive their social interactions would be and the greater the similarity amongst them. Knowledgeable sources of information may be defined as when the information obtained by an individual from his/her community group member is considered as valuable and has significant knowledge in small ruminant production. Table 11 below presents sample respondents knowledgeable sources of information.

Table 11. Knowledgeable Information Source of sample respondents in the Village

Knowledgeable Source of Information	Adopters		Non Adopters		χ^2
	N	%	N	%	
1. Friends	7	13.21	16	16.67	
2. Relatives	1	1.89	2	2.04	3.4748
3. Elderly community members	37	69.81	56	57.15	(ns)
4. Religious leaders	7	13.21	18	18.37	
5. Tale	1	1.89	3	3.06	
6. Youngsters	0	0	2	2.04	
7. Others	0	0	1	1.02	
Total	53	100	98	100	

Source: from own survey, 2007
ns= non significant

Knowledgeable source of information is positively associated with intensity of adoption decision but was not found to be stastically significant in the study (Table 11). The results of this study show that 16.67% adopters and 13.21% non adopters of the sample respondents assured that they get knowledgeable source of information from their friends. Few of both adopters (2.04%) and non adopters (1.89%) are getting their knowledgeable information from their relatives. Majority of adopters of (57.15%) and non adopters (69.81%) ensured that their main source of knowledgeable information is elderly community members and religious leaders were thought to be main sources of knowledgeable information about 18.37% of adopters and 13.21% of non adopters, few others 3.06% of adopters and 1.89% of non adopters group agree that their source is orally told information in the village while only 2.04% of adopters and none of the non adopters use the youngsters as their major sources of knowledgeable information. Finally only 1.02% of the adopters and none of the non adopters were seeking knowledgeable information from sources other than their communities. It is shown that there are no significant differences between adopters and non adopters in seeking information from different sources (Table 11).

Ties (social, religious, political, ethnicity) matters to the diffusion of knowledge. Rogers (1995) emphasizes that more effective communication occurs when individuals are homophilous – possessing similar attributes – and that effective communication leads to greater homophily. In this study reliable information sources are sources considered by an individual in choosing the most appropriate information among knowledgeable information sources he considered. It is found that the difference for reliability of information source between adopters and non adopters is statistically significant (Table 12).

Table 12. Reliable Sources of Information for Sample Respondents in the Village

Reliable source of information	Adopters		Non adopters		χ^2
	N	%	N	%	
1. Friends	14	14.29	0	0	
2. Relatives	6	6.12	2	3.8	
3. Elderly community members	52	53.06	28	52.83	
4. Religious leaders	20	20.41	20	7.74	
5. Tale	3	3.06	2	3.8	13.158**
6. Youngsters	2	2.04	0	0	
7. Women groups	1	1. 02	1	1. 89	
Total	98	100	53	100	

Source: from own survey, 2007;**   Significant at 5 % level

As the above Table shows that 14.29% of the adopters group and none of the non adopter category were found to have reliable information from their friends. Relatives seem to have low reliability by adopters and non adopters 6.12% and 3.8% respectively. When elderly community members' reliability is compared 53.06% of adopters and 52.83% of non adopters are said elderly community members are reliable. Religious leaders were taken as reliable source of information by 20.41% of adopters and 7.74% of non adopters and almost equal proportion of adopters and non adopters group 3.8% and 3.06 % respectively preferred to consider orally told information more reliable. Only 2.04% of adopters said to have reliable source from youngsters. Women groups were considered to be reliable information source by 1.02 % adopters and 1.89% of non adopters (Table 12). The result shows there was significant difference in the information reliabilities of the sources for adopters and non adopters groups. This study implies that adopters seek multiple sources of information even within their communities than non adopters so that the information they have at their disposal be more reliable (Table 12).

Innovation ought to occur more quickly and diffuse more broadly within relatively homophilous networks containing a few individuals whose multiple identities link them "weakly" to other networks, providing a bridge for information transmission between networks whose internal social structure – bonds or strong ties – then promotes rapid transmission of information Rogers (1995).

The manner and speed in which information is communicated among villagers can determine the time lag phenomenon of innovation adoption or diffusion of information about improved technologies and better management practices in a given social setting. The fastest method of communication about small ruminant production issue among respondents is positively related with the intensity of adoption decision of adopters and non adopters but stastically insignificant.

Table 13 shows the opinion of sample respondents about which kind of social communication method is fastest in transmitting information. It is found that the difference between adopters and non adopters was found to be highly significant in perceiving which method is best means of rapid communication.

Table 13. Opinion on fastest information flow\dissemination methods in the village

Fastest Information Flow methods in the Villages	Adopters		Non Adopters		χ^2
	N	%	N	%	
1. Discussion in families	15	15.31	5	9.43	
2. Informal discussion among villagers	10	10.2	16	30.19	
3. Formal discussions among villagers	55	56.12	27	50.94	13.657***
4. Information told by religious leaders	18	18.37	4	7.55	
5. Others	0	0	1	1.89	
Total	98	100	53	100	

Source: from own survey, 2007
*** Significant at 1 % level

The sampled respondents have reported that fastest methods of communication among villagers were through discussion among family members (15.31% of adopters and 9.43% of non adopters). About 10.2% of adopters and 30.19% of non adopters were in support of the informal discussion method of village communication as fastest method and almost half of both groups 56.12% and 50.94% of adopters and non adopters respectively said that formal

method of communication among villagers facilitate information flow in the fastest manner. The other groups (18.37% of adopters and 7.55% of non adopters) were still proposing information told by religious leaders is fastest method of communication in the village. Only 1.89% of non adopters suggested that other methods of communication are fastest. The study found that highly significant differences between adopters and non adopters in their choice on method of communication about new information (Table 13). The result indicates that communication and information flow methods chosen by adopters and non adopters were different which means a wide approaches of information communication and information media selection is important to effectively communicate agricultural information among such homogenous villagers.

Major discussion topics among the villagers could range from religion, politics, improved implements and methods of production that were newly introduced in the community to many other sensitive issues depending on their degree of homogeneity. Networks generate pecuniary externalities in the forms of club goods (e.g., for information that is non rival but excludable) and demand-side network effects for many sorts of goods and services. Early adoption and rapid diffusion are an equilibrium outcome in such networks (Rogers, 1995).

Table 14. Easily Communicated Issues among Villagers

Most communicated topic among villagers	Adopters		Non Adopters		χ^2
	N	%	N	%	
1. Religion	23	23.47	13	24.53	
2. Politics	5	5.1	6	11.32	
3. Agricultural information	53	54.08	30	56.6	7.298 (ns)
4. Modern improved technologies	7	7.14	4	7.55	
5. Market information	10	10.2	0	0	
Total	98	100	53	100	

Source: from own survey, 2007; ns= non significant

Table 14 shows that 23.47% and 24.53% adopters and non adopters respectively said that religion is their major discussion topic most of the time, while 5.1% of adopters and 11.32% non adopters were saying that politics is the major discussion topic but the majority two groups (61.22% of the adopters and 64.51% of the non adopters) discuss more about agricultural information and improved agricultural technologies and techniques and only 10.2% of the adopters devote their time discussing on market and marketing issues. The chi-square test results show that there is stastically insignificant difference between adopters and non adopters (Table 14). This insignificant difference may tell about the relative homogeneity of the villagers and hence similar issues equally impress all members of the community at a time.

4. 2. Determinants of Intensity of Small Ruminant Fattening Package Adoption

Sample respondents in this study were categorized into four groups based on their level of adoption index score. The minimum adoption index of the non adopters is less than 0.94. The low adopters group has adoption score of 1.48- 1.56, medium level adopters having a score o of adoption index between 1.57- 1.76 while the highest adopter group were having between 1.77-2.54 adoption index value (see appendix Table 2). The adoption extent of small ruminants fattening technologies feed (fodder and forage plants, feed supplements), veterinary and health services utilization and improved management practices used by the sample respondents are seen in relation to their personal characteristics under this section.

4.2.1. Demographic Characteristics

Household characteristics are very important factors that are used in explaining adoption decision behavior of people in adoption of agricultural technologies and innovations.. Depending on the strength of influence of these HHs characteristics, each variable has its own contribution in making adoption decision and extent of use the whole package or single component of the package extended to respondents within the same village or area.

Age, Family Size and educational Status of Sample respondents

Demographic characteristics like age, family size of the HHHs are very important proxy indicators for individual behaviors and commonly used as explanatory variables for adoption decisions in behavioral studies. The following section deals with these variables independently for each factor.

Age

Age influences adoption negatively. Older people are risk averters and more conservatism is thought to be their characteristic and therefore age would negatively contribute to the adoption of improved agricultural technologies. The following table provides age distribution of sample respondents by age category.

Table 15. Age category of sample respondents

Age category	NA	%	A	%	Total %
20-30	13	24.53	21	21.43	22.52
31-45	24	45.28	57	58.16	53.64
46-64	12	22.64	19	19.39	20.53
>64	4	7.54	1	1.02	3.31
Total	53	100	98	100	100

Source: own survey, 2007

As indicated in the above table the percentage distribution of age groups of the sample respondents is as follows the about 21.43 % and 24.53% of adopters and non adopters were in the youngest age group (20-30 years old) . While 58.16 % and 45.28% of the adopters and non adopters were in the adult group and 19.39% and 22.64% of adopters and non adopters were older than the preceding age groups while only 1.02% and 7.54% of adopters and non adopters were in the oldest age groups. The mean age was 41.11 and 38.45 years with standard deviation of 9.66 and 12.83 years for adopters and non adopters respectively (Table 15).The independent samples test for the two groups shows that there was no significant difference between adopters and non adopters by age.

Age was found to be negatively related and stastically non significant with adoption decision of sampled respondents (Table 16) in using animal production technologies and employing

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better production techniques continuously. This is because the majority of sample respondents were in the same older age categories including both adopters and non adopters.This result confirms the findings of Haji (2003), Mesfin (2005) and Yenealem (2006) and with respect to age and adoption of agricultural technologies and innovations.

Table 16. Personal characteristics of the sample households

Characteristics	Adopters(N=98)		Non adopters(N=53)		T- value
	Mean	St.dev	Mean	St.dev	
Age of HHHs (in years)	38.45	9.66	41.11	12.83	-1.03
Minimum	22		20		
Maximum	67		77		
Family Size (number)	6.07	1.801	5.13	1.787	3.068[***]

Source: survey result, 2007 , *** Significant at 1%level

Family Size

The total number of family members in a household is important for availability of economically active labour. The mean family sizes of household members were 6.07 % and 5.13 % for adopters and non adopters respectively. It was observed that the relation between intensity of adoption decision of respondents and their family size is strongly and positively related. The size of family with respect to the availability of total labor in the households and the difference between non adopters and adopters is significant (Table 16). The study result implies that adopters do have more labour availability than non adopters and more family size will encourage the intensive use decision of fattening package. The reason is that most small ruminant management practices of do not require more energetic labour which is normally considered by economically active labour. Still children and older family members can contribute to the labour requirements of the HH heads equally in the case of small ruminant rearing activities. This result is consistent with the findings of Arene (1994) and Dereje (2006).

Educational Status of Sample HHs

Education is the major demographic characteristic explanatory variable that differentiates adopters and non adopters in all adoption studies. Farmers who are more educated are generally more open to innovative ideas and new technologies that will promote technical change Weir and Knight (2000), and Abay and Assefa (2004) had cited many adoption studies that show education as one of explanatory variable and significantly affecting adoption decision of individuals.

The educational level of sample respondents presented in Table 17 shows that 70.86% are illiterate while 29.14% of the respondents are literate including those who are only functionally literate. Mean years of education of adopters and non adopters were 1.73 and 1.4 years with standard deviation of 0.862 and 1.099 years in the survey area. Adopters were found to be distributed in all educational levels (66.33% illiterate, 3.06 % functionally literate, 22.45 % as 1-4 graders, 7.14 % as 5-8th graders, and only 1.02 % were found to be as more than 8th graders).

Table 17 Educational level of sample respondents'

Educational level of the HHH	Adopters		Non Adopters		Total %	χ^2
	N	%	N	%		
Illiterate	65	66.33	42	79.24	70.86	
functionally literate	3	3.06	4	7.55	4.64	
1-4 grade	22	22.45	4	7.55	17.22	7.394
5-8 grade	7	7.14	3	5.66	6.62	(ns)
>8 grade	1	1.02	0	0	0.66	
Mean year of education	1.73		1.4			
Standard deviation of education	0.862		1.099			

Source: from own survey data, 2007; ns= non significant

Among the non adopters group 79.24 % are illiterate, 7.55% are functionally literate and another 7.55% are 1-4 grade while 5.66% are attended grade 5-8 and none of the NA are observed to attend more than 8th grade. Several adoption studies show evidences, which all concluded that education has a positive and significant impact on the adoption of modern

inputs Mekuria (1995), Asfaw et al., (1997), Croppenstedt et al. (1999). Consistent with Kebede (2005), this study found that there is no significant differences between adopters and non adopters (Table 17). This low level of educational achievement in the study area is attributed to less number of basic primary school coverage in the study area in general, their pattern of production in which herding animal flocks in grazing lands and pastures is the major responsibility of children at early age of schooling during which they herd the animal flocks in the grazing land or pasture. Adopters and non adopters had the same experience in educational access, i.e. when they were children; adopters as well as non adopters were denied of primary schooling as a result of lack of schools in their surrounding.

4.2.2. Socioeconomic Factors

Distribution by Land Holding and Land Use Patterns

Land ownership between non adopters and adopters is mainly gained through inheritance from their predecessors or distributed land by the government. Land holding was found to be stastically non significant in difference between adopters and non adopters, as there were no individuals who did not own land (Table 18).

All non adopters and 95.92% of adopters have their own land while only 1.02 % of the adopters group use rented land for agricultural production and 3.06 % of adopters have both rented and owned land ownership in the village. In the study it was found that there were insignificant differences between non adopters and adopters with respect to land ownership status in the study area as well as there is no association between intensity of adoption decision and land ownership (Table 18).

Farm sizes determine intensity of adoption decision of agropastoralists, particularly when the package component demands directly allocation of part of the land. Forage and fodder plant growing, for example, needs decision for allocation of part of the farm and most of the time implementing this decision goes with size of land holding. A land holding size of less than 1 ha was observed by 53.06 % of the adopters and 35.85 % non adopters. Land size holding of 1.1 ha -2.0 ha were owned by 38.78 % of adopters and 54.72 % of non adopters while only

9.43 % of adopters and 8.16 % non adopters have 2.1 ha -3.5 ha of land. It was found that there is no significant difference between adopters and non adopters in their land holding (Table 18).

Table 18. Sample respondents' land distribution and land use patterns

S.No	Land characterstics	Adopters		Non Adopters		χ^2 or t values
		N	%	N	%	
1	land ownership of the HHH					
	Owned	94	95.92	53	100	
	Rented	1	1.02	0	0	
	Have both owned and rented plots	3	3.06	0	0	χ^2 =1.835 (ns)
	Total	98	100	53	100	
2	Land Size Category in Ha					
	0.25 Ha-1Ha	52	53.06	19	35.85	
	1.1Ha -2 Ha	38	38.78	29	54.72	
	2.1 Ha- 3.5 Ha	8	8.16	5	9.43	t= 1.593(ns)
	Total	98	100	53	100	
	Mean	1.4102			1.4519	
	Standard deviations	0.599			0.5881	
3	Type of Crop Grown on the Land					
	Sorghum	98	100	52	98.11	
	Maize	0	0	1	1.89	χ^2=1.861(ns)
	Total	98	100	53	100	
4	Land Allocated for forage purpose during 2004-2006					
	No land allocation for such purpose	57	58.16	45	84.90	
	Cereals both as fodder and HH consumption	41	41.84	8	15.1	χ^2 = 11.222 ***
	Total	98	100	53	100	

Source: from own survey, 2007; *** Significant at 1 % level and NS= non significant

This study revealed that land size and intensity of adoption decision to be negatively related (Table 18) and statistically not significant consistent with the finding of Yenealem (2006). The land size owned by the sampled respondents ranges from 0.25 ha to 3.5 ha. The difference in

the size of land ownership arises from many interrelated factors in the community but the major ones are the number of potential heirs within ones family when s/he inherit the land, national land policy, resettlement within wereda and household economic status.

The respondents' commonly grown crops are maize and sorghum, where sorghum is dominantly grown almost equally by both adopters and non adopters in the study area. Sorghum is grown by 100 % of adopters and 98.11 % of non adopters and only 1.89 % of non adopters grow maize on their land (Table 18). Adopters and non adopters are not different by the type of crop they grow study area. But farm land crop coverage proportion during a season allocated with multipurpose crops (cereal and forage) or totally by other economic crop is different for adopters and non adopters.

Sorghum is a dual purpose crop in the area farming system where animal keeping is given equal or more emphasis than crop production. Therefore, agropastoralists in this wereda always prefer to sow a sorghum variety which has dual purpose as fodder and staple food (cereal). Allocation of land with this purpose thus depends on the agropastoralists' preference; it is found that 58.16 % of adopters and 84.90 % of non adopters said that they do not allocate their farm plot for such purposes. Table 18 shows that 41.84 % of adopters and 15.1% of non adopters them agreed that they do allocate their land at least with the aim of getting multiple benefits from sorghum and maize. It was found that there exist significant differences between adopters and non adopters in their land allocation purpose (Table 18). This implies that agropastoralist who aim to fatten their goats and sheep prefer more their land is allocated for dual purpose crop than those who do not.

Livestock Holding of HHs

The TLU holding of a HHH in the village is used as a proxy measure of household wealth status. The study area is characterized by mainly agropastoal and semi pastoral production system and hence higher TLU difference may not be significantly observed between adopters and non adopters. The mean and standard deviation of could explain the difference among and between adopters and non adopters.

The range of TLU holding among the sample respondents is 44.22, the minimum holding is zero and the maximum is 44.22 TLU. The t–test shows that there is a significant difference between adopters and non adopters in TLU holdings (Table 19). It was found that there were positive and stastically significant relationship between TLU holding of the sample respondents and intensity of adoption decision. This finding is consistent with similar studies of dairy technology adoption in Ethiopia by Haji (2005) and Ibrahim (2006).

Table 19. Sample respondents' TLU holding distribution

Total Livestock Unit Category	Adopters		Non Adopters		t– value
	N	%	N	%	
1. <7	56	57.14	43	81.13	-2.252 **
2. 7.1-14.1	34	34.69	10	18.87	
3. 14.2-21.2	6	6.12	0	0	
4. 21.3-28.3	1	1.02	0	0	
5. >35.4	1	1.02	0	0	
Total	98	100	53	100	
Mean	7.2663		5.3113		
Standard deviation	5.86		3.18		

Source: from own survey, 2007 , ** Significant at 5 % level

HHHs' Total Income Level of the 2006 Production Year

Household income sources in rural areas are as diverse as HHHs activities even within agricultural sector. HHHs income obtained in this study from all types of income sources during last year from (non farm and farm employment) sale and consumption value of crop produced, livestock sale and consumption, petty trading, pension. It was found that HHHs' total income and intensity of adoption were not related. The non relationship of HHHs' income and intensity of adoption is may be justified by, the area is food insecure and drought prone and agropastoralists save and use almost all their earnings for household food consumption and expenses without saving or leaving money for investments in their production activities.

It was found also that there were insignificant differences between adopters and non adopters in their total level of income in the study area (Table 20). This is because both adopters and non adopters have almost the same income options such as income from sale of livestock, similar crop production choices (all sample respondents grow sorghum as main crop production activity) and there were no or few non farm employment options for agropastoralists.

Table 20 Income distribution of HHHs from farm and non farm activity

Total Income of the HHHs in Last Year Production	Adopters	Non Adopters	t-value
Mean	7272.78	4249.71	
Std. Deviation	6326.33	3478.17	1.389 (ns)
Std. Error Mean	429.28	477.76	

Source: from own survey, 2007, and ns=non significant

In the Table it is shown that the mean annual total income of the HHHs from farm and non farm activities are 7272.78 and 4249.71 with the standard deviation of 6326.33 and 3478.17 for adopters and non adopters respectively.

Type of house owned

The type of house owned is used as a proxy indicator for the wealth status of HHHs in the study area. Houses constructed are different in the roofing material made of and number of partition the houses have. These differences are indicating the economic status of the owners in the study area. Distribution Table and explanations are given below.

Table 21. Distribution of HHHs by the type of house owned

Type of house owned	N=	Adopters	N=	Non	
Grass roof type	98	%	53	Adopters %	χ^2
Yes	87	88.8	47	88.7	0.000(ns)
No	11	11.3	6	11.2	
Corrugated iron roof house without partition					
Yes	11	11.2	5	9.4	
No	87	88.8	48	90.6	0.116(ns)
Corregated iron roof house with partition					
Yes	12	12.2	1	1.89	4.690*
No	86	87.8	52	98.1	

Source: own survey, 2007; ns= non significant and * Significant at 10 % level

In the above distribution table, about 12.2 % adopters and 1.89 % non adopters owned houses of corrugated iron roof with partitions and 87.8 % of adopters and 98.1 % of non adopters did not owned corrugated iron roof with partition. In Table 21 it has been shown that ownership of grass roof and corrugated iron roof without partition do not differ significantly between adopters and non adopters but corrugated iron roof with partition was found to be significantly different between adopters and non adopters and this difference could be explained in terms of adopters' behavior who could be said more implementers of the housing management practices than the non adopters in the study area.

4.2.3. Small ruminant rearing experience, current production patterns and management practices,

Small Ruminant Rearing Experience of Sample HHHs

Individuals' experience on economic activities helps and guides the current decision making abilities in solving problems and increasing their efficiencies in any particular enterprise. The finding in this study shows that there is strong relation between small ruminants rearing experience and adoption decision of sampled respondents and this result is stastically highly

significant (Table 22). The mean years of small ruminant rearing experience is 12.55 and 17.33 for adopters and non adopters respectively.

Table 22. HHHs' small ruminant rearing experience

Small ruminant rearing experience (in years)	Adopters	Non Adopters	t-value
Mean	12.55	17.33	3.064[***,]
Std. Deviation	10.99	8.014	

Source: own survey, 2007, *** Significant at 1 % level

The negative relationship found between intensity of adoption and small ruminant rearing experience in this study contrary to prior findings of Molla (2005), Senkondo *et al (*2004) and Tesfaye (2006) probably be explained with the reason that larger experience in traditional ways of animal rearing coupled with the inherent conservatism of older, who constitute the large majority of the respondents might have prevented them to go for new methods. Those who have lesser experience in traditional methods of animal rearing might have been more open to new management practices.

4.1.2.4. Livestock production

Livestock is the major means of livelihoods for agropastoralists in the study area. Livestock production in general in this wereda is undertaken mainly using traditional management practice. Agropastoralists differ in the total holding of livestock species where pastoralists having more of camel than agropastoralists and while agropastoralists are use crop production aspects besides keeping animals only. The following sub sections are about the different management practices' assessment of agropastoralists on their small ruminant production and other livestock species. Input in this case is particularly referring to vet drugs and improved feed

Input usage in the livestock production

The livestock production of the study area is mainly characterized by traditional animal production managements and techniques. Hence, very few sample respondents were (10.6% of N=151) seen to use animal production inputs in general. Besides this, much of this little input is employed, most of the time within a given household, for bigger or financially rewarding livestock species than small ruminants.

Table 23.Small ruminant input usage

Inputs used for sheep and goat rearing	Adopters		Non Adopters		
	A	%	NA	%	χ^2
Not used any input	84	85.71	51	96.22	4.086
Purchased feeds like cowpea, hay, MUB, grain	14	14.29	2	3.78	(ns)
Total	98	100	53	100	

Source: from own survey, 2007; ns= non significant

There is no significant difference using input for goats and sheep between adopters and non adopters due to diversion of investment priority in rearing financially rewarding cattle and camel. In the Table 25, it is shown that 84 % of adopters and 96.22%of non adopters are not using inputs for their sheep and goats while 14.29 % of adopters and 3.78 % of non adopters reported to use some of these inputs. The chi-square tests show that there is no significant difference between adopters and non adopters in using inputs for their sheep and goats (Table 23).

Breed Type and Sources of Animal Breed in the Study Area

The kind of animal breed reared in general is mostly of local origin and the agropastoralists and pastoralist do not have sufficient information on kind, source and blood level of their livestock. Sample respondents, when asked whether they could identify the type of breed of their livestock species, about 73.47 % and 92.46 % of adopters and non adopters respectively

confirmed that they are rearing totally local breed, and 25.51 % adopters and 7.54% non adopters do keep cross breed, while only 1.02 % of the adopters said that they have pure improved breed animal.

The chi-square of tests of the two groups show that there is no significant difference between adopters and non adopters in rearing/keeping improved breed type of animals. Similarly there was no significant difference between these groups in differentiating their animals blood level composition that each animal constitute by percentage of blood level of exotic, local, cross or pure blood percentage composition in the animals. Only 2.04% of the adopters responded that they knew the blood composition level of animals they rear while 97.96% of the adopters and 100% of non adopters have no information on the level of blood of their animals (Table24).

The sources of breed for the agropastoralist in the wereda are generally two. Almost all respondents have their breed source either from market or their own flock. There are few who use their own flock as the main breeding source. Local market as breed source is used by only 1.02 % of adopters and only 1.02 % of non adopters. None of the adopters use sheep and goats breed distributed by WBPRD Office and only 1.89 % of the non adopters use this center as their breed sources. Most sample respondents, 97.96 % of adopters and 98.11 % of non adopters use both local and surrounding markets and their own flocks alternatively as their breed source for their goats and sheep. There is no significant difference between adopters and non adopters in source of breed for goats and sheep (Table 24).

Table 24.Responses on type, source, blood level of small ruminants' breed of sample respondents

S.No	Breed characteristics	Adopters		Non Adopters		χ^2 –value
		N	%	N	%	
1	Type of Breed					
	local breed	72	73.5	49	92.5	
	cross breed	25	25.5	4	7.54	1 .096 (ns)
	pure improved breed	1	1.02	0	0	
	Total	98	100	53	100	
2	Percentage of improved breed blood level					
	I do not know	96	97.9	53	100	
	High	2	2.04	0	0	0.085(ns)
	Total	98	100	53	100	
3	Source of Breed for Sheep and Goats	1	1.02	0	0	
	own flock only market only	1	1.02	0	1.89	
	breed distribution centers	0	0	1	98.1	2.931 (ns)
	both own flock and market equally	96	97.9	52	1	
	Total	98	100	53	100	

Source: from own survey, 2007; ns= non significant

Feed and Feed Supplements Usage

The livestock owners in this wereda therefore use the potential of their surrounding resources in feeding their animals. When these pastoralists and agropastoralists seek continuous feed supply throughout the year, they need drought tolerant fodder and forage species, locally processed feed supplements from plant by- products and also industrial by-products sold in the market. There is a difference among adopters and non adopters in using only forage/fodder plants but there were not significant differences between adopters and non adopters in using Processed feed supplements and industrial by products (Table25).

Table 25. Sample respondents feed use by type of feed and frequency of use

| Frequency | Forage/Fodder | | | | Industrial by product | | | | Processed feed suppments | | | |
| | Adopters | | Non adopters | | Adopters | | Non adopters | | Adopters | | Non adopters | |
	N	%	N	%	N	%	N	%	N	%	N	%
Not at all	78	79.6	52	98.1	79	80.9	52	98.1	80	81.6	50	98.11
Rarely	9	9.2	0	0	9	9.2	1	1.9	7	7.1	1	1.89
Sometimes	6	6.12	1	1.9	1	1.0	0	0	4	4.1	0	0
Regularly some	0	0	0	0	4	4.1	0	0	4	4.1	0	0
Regularly all	5	5.1	0	0	5	5.1	0	0	3	3.06	0	0
χ^2 -value	10.273**				9.388				8.811			

Source: from own survey, ** Significant at 5 % level

Adopters use forage and fodder species because they understand the use of improved feed better than non adopters. The main reason that adopters did not use industrial by products and processed feed supplements because of unavailability of these feed in their locality

Animal health and veterinary services

Animal disease and animal health problems in the wereda are widely spread phenomenon. Agropastoralists, regardless of their status of being adopters or otherwise, face the same problem in animal health and disease problems. Some animal health problems are epidemic type or beyond the control of single HHs and management skills. The adopters and non adopters observed to be almost similar in experiencing frequently most problematic animal diseases. Table 26 below shows the percentage responses of adopters and non adopters for most problematic animal diseases. The result shows that there is significant difference between adopters and non adopters in facing dermatitis (*dhukuba gogaa*) disease problem while the difference between adopters and non adopters are not statiscally different in experiencing both parasitic and PPRR and CCPP type of diseases. This means the later two disease problems are due to uncontrolled vectors while dermatitis occurrence differs because most of the time it is caused, due to lack of sanitary and animal health management skills.

Thus adopters and non adopters are different in managing this problem, probably due to better management practices by adoption.

Table 26. Sample respondents' experience of frequently occurring animal diseases and health problems.

Frequency every month	PPR and CCPP				parasitic				Dermatitis (*dhukuba gogaa*)			
	Adopters		Non adopters		Adopters		Non adopters		Adopters		Non adopters	
	N	%	N	%	N	%	N	%	N	%	N	%
Every month	4	4.08	0	0	18	18.38	24	24.53	0	0	5	9.79
every six month	44	45.9	39	39.62	29	29.59	16	16.98	40	40.82	5	10.2
every year	43	43.9	54	54.72	42	42.86	49	49.05	53	53.06	37	69.81
Never	6	6.12	5	5.66	9	9.18	9	9.04	6	6.12	6	11.32
χ^2	3.335(NS)				3.1055(NS)				7.81**			

Source: from own survey, 2007; ** Significant at 5 % and ns=non significant

Therefore, from this experience agropastoralists have to use veterinary services and health management practices to protect their goats and sheep from most frequently occurring health problems. It is a wise decision for agropastoralists and pastoralist to look for treatments for their frequently infected goats and sheep from veterinary services in the surrounding. A chi-square test shows that there is statistically significant differences between adopters and non adopters in demanding veterinary services and seeking services for their goats and sheep be diagnosed in the animal health posts or not. It is shown in the table that 73 % of adopters and 47 % of non adopters are willing to use the available health and veterinary services while 27 % of adopters and 53 % of non adopters could not use the available health and veterinary services (Table 27).

Table 27. Sample respondents' distribution of willingness to use veterinary services and access

S.No	Willingness and Access of vet services	Adopters %	Non Adopters %	χ^2- value
1	Willingness to use vet services			10.356 ***
	Yes	73.47	47.17	
	No	26.53	52.83	
	Total	100	100	

S.No	Access and Use of Vet Services	CCPP Treatment		Ovine Pasturellosis Treat		CCPP, 15.017 *** And Ovine Pasturellosis , 11.877***
2		Adopters %	Non adopters %	Adopters %	Non adopters %	
	Never	17.34	37.74	17.34	35.85	
	every year	57.14	58.5	58.16	58.5	
	every six month	22.45	3.8	22.45	5.7	
	every month	3.06	0	2.04	0	
	Total	100	100	100	100	

Source: from own survey, 2007;   *** Significant at1 % level

In table 27 above those sample respondents who were willing to use vet services, were found to use the services for different animal disease problems and thus a significant difference was found in the frequency use for different problems. This result shows that adopters use more frequently vaccines and treatments than non adopters for small ruminants because of adoption of veterinary services in the study area.

Management Practices

The technique of animal production that a particular farmer employs, directly or indirectly is related with the sources of knowledge and information that individual accessed, experiences of the agropastoralist and availability of open access to new method of animal keeping. This difference is used to explain the efficiency and effectiveness of extension system in the wereda. Adopters and non adopters unanimously practiced the production techniques that optimize available HHs' labour, feeds and water resources including the time allocated to specific enterprises in which HHHs interested to invest resources to meet his/her objectives and priorities. Services and training are delivered by WBPRD and NGOs working in the

wereda. The management practices / production techniques include all aspects of livestock development except breed selection and development. Thus success of WBPRD extension effort is contingent mainly on the practical application of skills and knowledge the agropastoralists gained through the extension services currently.

Adopters and non adopters were asked whether or not they are practicing all, some, or all among a number of recommended management practices of small ruminant keeping. In the study, it was found that, among eight selected management practices, only the amount of water given to goats and sheep per day is not significantly different between adopters and non adopters (Table 28). The other seven management practices (methods of sheltering, shed type, feed amount, frequency feeding, duration of keeping before marketing, animal health and treatment is done by, frequency of watering) were found to exhibit highly significant differences between adopters and non adopters in using the recommended management practices of small ruminants' production. All the currently practiced management techniques are significantly related with the intensity of adoption decision as shown in Table 28.The significance differences in the various management practices of adopters could be accounted to the extension services demonstration, trainings and education efforts which the adopters used to change their management practices easily than the non adopters in the study area.

Table 28. Percentage distribution of sample respondents' Current management practices

S.No	Current management practices	Adopters %	NonAdopters %	χ^2–value
1.	Frequency of Stall feeding) Per Days:			9.126**
	Once every two day	8.16	13.21	
	Once every day	30.61	47.15	
	Twice every day	21.43	22.64	
	Three times a day	39.8	17.0	
	Total	100	100	
2.	Feed Amount:			31.307***
	Do not know	3979	50.94	
	Equal amount to all species	10.2	39.6	
	According to its weight	50	9.46	
	Total	100	100	
3.	Duration before the animal are taken to market:			13.57***
	Five or six months time	33.7	62.26	
	Four months	30.61	22.64	
	Three months	17.35	11.32	
	According to body weight gained	18.37	3.8	
	Total	100	100	
4.	shelter and shed type used:			19.434***
	Open type of housing	29.59	64.15	
	Housing different species together	15.31	15.1	
	Housing different species in separately	11.22	5.7	
	Closed type of housing	43.9	15.1	
	Total	100	100	
5.	Animal health and treatment is done:			15.292***
	I have no information	11.22	7.55	
	Individuals with traditional vet knowledge	39.8	71.7	
	Treatment by trained individuals	21.43	13.21	
	Taking to clinics for treatment	27.6	7.55	
	Total	100	100	
6.	Method of Keeping and Sheltering:			23.89***
	I have no information	2.04	3.8	
	Always keep with large ruminants	3.06	30.2	
	Keep goats and sheep in isolation at homestead	94.9	66.0	
	Total	100	100	
7.	Frequency of watering:			14.43**
	Once in a day	45.67	73.6	
	Two times a day	34.87	18.87	
	Depends on the intake type of goats and sheep	19.46	7.53	
	Total	100	100	

Source: from own survey, 2007 *** ** are significant at 1 %, 5 % level respectively

Box 3. An informal group discussion with some females and male respondents revealed that through out the study area, small ruminants are mostly managed by female household members and small children. Feeding, watering and marketing are equally done by females. Inputs availability is the most limiting factor found in management practices of small ruminants fattening activities by females. The household tasks and management practices done by females are mostly limited in the household surroundings and when purchased inputs are there females give it to stall fed goats and sheep as they feel important. When the animals are taken out for grazing generally male children and their mothers take care of feeding, watering, and animal health care. They emphasized that females need more focus in training of improved management practices to change their current management styles.

4.2.4. Institutional Characteristics

Frequency of extension agents' contact

A certain critical level of cumulative information must be attained before adoption takes place (Feder and Slade, 1984). Agropastoralists' awareness about the existence of agricultural services is an important step to increase the demand for information and advice. Amongst the significant factors that are involved in knowledge and communication process are, clearly, the innovation itself, information sources, as well as the change agent and early adopters (Rogers, 1962).

Table 29. Distribution of respondents on their contact with extension agent

Responses Contact With Extension Agent	Adopters %	Non Adopters %	χ^2
Yes	90.82	86.8	0.588 (ns)
No	9.18	13.21	
Total	100	100	

Source: from own survey, 2007 and ns: non significant

Although studies like Adhikari and Patel (1986); Falusi (1974); Hardt (1981) and Lowdermilk (1972) found that contact with an extension worker as change agents and participation decisions are positively and significantly correlated, this study however found that there was only weak and insignificant association between frequency of extension agents' contact and intensity of adoption decision of agropastoralists (Table 29). This finding is consistent with the finding of Ebrahim (2006). In the table, 90.82 % of adopters and 86.8% of non adopters were found to have frequent contact with extension agents in their village and only less than 10% of adopters and around 13.21 % of non adopters were having less frequent contact. The difference between adopters and non adopters was found to be insignificant, this is because the type of extension contact is not at personal level, which could have more influence on agropastoralists attitude and decisions making for adoption (Glendinning *et al*; 2001).

Various extension methods were used by the extension system in the wereda. Trainings, agropastoralists' field days, demonstrations, farm visits and public meetings were commonly used by extension agents as a means of influencing, transferring messages and skills. A study conducted by Harper et al. (1990) has shown the existence of significant and positive relation between adoption and different extension methods in their respective studies. However, in this study only field days and meeting as extension methods were found to be associated with intensity of adoption decision while training, farm visits and demonstrations were found to be insignificantly associated (Table30).

The mean number of training, demonstrations and farm visits participation of adopters and non adopters were 1.12 and 0.91, 0.10 and 0.06 and 0.13 and 0.09 respectively and the standard deviations of each extension methods were found to be 2.492 and 2.050, 0.366 and 0.233 and 0.370 and 0.405 for adopters and non adopters respectively. The distribution in the above Table 30 shows that there were not significant differences between adopters and non adopters in the numbers of participation in training, demonstrations and farm visits of the five extension methods while the result of the study shows the existence of significant differences between adopters and non adopters in the numbers of participation in field days and meetings. The mean number of participation for adopters and non adopters in field days and meetings were 0.24 and 0.08 and 1.65 and 0.87 respectively while the standard deviations of these groups

were, 0.575 and 0.267 and 2.130 and 1.532 for number of participation in field days and extension meetings for adopters and non adopters respectively. Extension institutions' analysis provides explanation of internal extension system problems for developing countries, choosing effective and affordable extension methods were one of many challenges, which the extension agents fail to implement extension methods appropriately for two main reasons: either not been taught the methods or that they are not given the resources to use them.

Table 30. Extension Methods participated by sample respondents

Statistics	Training		Field days		Demonstrations		Farm visits		Meetings	
	As	NAs	As	NAs	As	NAs	As	NAs	As	NAs
Mean	1.12	0.91	0.24	0.08	0.10	0.06	0.13	0.09	1.65	0.87
Standard Deviations	2.492	2.050	0.575	0.267	0.366	0.233	0.370	0.405	2.130	1.532
t-value	-0.542(ns)		-2.027**		-0.929(ns)		-0.572(ns)		-2.370**	

Source: from own survey, 2007; ** Significant at 5% level, ns= non significant

The wereda office of pastoral and rural development extension section gave a number of educational and awareness creation programs to its clients (WBPRD Annual Report, 2005). Reviews of WBPRD Annual Reports shows that much training were delivered for several years but most of the time these trainings focused only few commodities in number and part of the aspects of a particular commodity: sorghum production, animal health and improved cattle production management practices and much of the development agents efforts were non agricultural trainings. Adopters and non adopters were not found to be significantly different in their awareness on the existence of training given in the wereda (Table31).

Table 31. Sample respondents showing training awareness and training given

Responses	Trainaware		Traingiven	
	As%	NAs%	As%	NAs%
Yes	24.5	18.9	31.6	32.1
No	75.5	81.1	68.4	67.9
χ^2	0.623 (ns)		0.003 (ns)	

Source: own survey, 2007 ; ns= non significant

This study found that there was very weak association between intensity of adoption decision and training given, this finding supports the above conclusion, based on annual office report and document reviews. It was also found that there were insignificant differences between adopters and non adopters in trainings given, it was shown that 31.6% of adopters and 32.1% of non adopters had taken trainings delivered in the wereda in several aspects and 68.4 % of adopters and 67.9 % of non adopters did not get the chance to participate in trainings (Table31).

Frequency of radio use

Mass media exposure is very important agricultural information disseminating means among rural societies. Agropastoralists' awareness raised and their attitude is influenced easily when there is mass media exposure particularly radio, making an entry point for extension agent contact (Glendinning *et al* 2001). Radio ownership and public meetings are the most widely used mass communication means in rural Ethiopia. Radio ownership in the wereda is common and slightly more than half of total respondents own radio (52 %). This study has found out that 54.1% of adopters and 45.3 % of non adopters own radio while 45.9 % of adopters and 54.7 % non adopters do not own radio. Ownership of radio between adopters and non adopters is not significantly different.

Table 32. Distribution of sample respondents by mass media exposure

Frequency of radio use	Adopters%	Non adopters %	χ^2 -value
Never	21.4	37.74	15.885 ***
Rarely	20.4	13.21	
Most of the times	58.2	49.1	
Total	100	100	

Source: own survey, 2007; *** Significant at 1% level

Though ownership does not vary between adopters and non adopters, different individuals within sampled respondents are different in their responses for the frequency of radio use and importance given to radio. Adopters use radio more frequently for agricultural information than non adopters in the study area, most of the time 58.2% of adopters and 49.1% of non adopters use radio frequently, while 20.4 % adopters and 13.21 % of non adopters listen agricultural information through radio rarely, some of the adopters group (21.4 %) and non adopters (37.74 %) said they had never listened to radio at all (Table 32). This study found that the existence of significant differences between adopters and non adopters in the frequency of listening radio for agricultural information purpose. The finding of this study is consitent with Tesfaye and Alemu (2001), Ibrahim (2006), kebede (2006).

Use of micro Credit

Sources of credit for small ruminant production in the wereda were not available for pastoral and agropastoralists given by the office of PRDO. Nevertheless, other sources of credit for sample respondents were NGOs delivering credit every year for some of the respondents to help them purchase animal drugs and other purposes and hence agropastoralist considered this source as their major credit sources. These sources use the same credit system procedures like that of government credit services.

In Table 33 it is shown that 20.4 % of adopters and 9.4 % of non adopters had credit access for veterinary purposes from NGOs but 79.6 % of adopters and 90.6 % of non adopters did not get any credit for vet/animal drugs purposes. The results show that there is association between credit for veterinary purpose and intensity of adoption decision and it is found that there is a

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significant at 10 % level difference between adopters and non adopters in accessing and using credit services for veterinary purposes (Table 35). This finding is consistent with the findings of Sseguya *et al*; (1999), Million and Belay (2003), Tesfaye (2003), Pender *et al*., (2004) Abdulai and Huffman (2005), Ibrahim (2006), kebede (2006).

Table 33. Credit access and distribution of sample respondents

Access of credit services for veterinary	Adopters		Non Adopters		
	N	%	N	%	χ^2
Yes	20	20.4	5	9.4	2.999*
No	78	79.6	48	90.6	
Total	100	100	100	100	

Source: from own survey, 2007 ; * Significant at 10 % level

Market Accessibility and Prices

Access to local market of the HHs and availabilities of production input in the market are most important economic determinant of a household. The choice of production enterprises in farming decision is related to market incentives. Depending on the direction of incentives these economic institutions provide, agropastoralists decide either to use part or all of a package to intensify chosen among many alternatives of enterprises: whether to go for small ruminant fattening, cattle fattening, cash crop intensification, or vegetable production or a combination of one or more of any farm enterprises.

Sample respondents access, awareness, and price incentives and availabilities of input for a particular choice of enterprise are supposed to play a positive role in decision to intensify small ruminants rearing. This is so, if this enterprise has attractive market price for the producers and needed inputs are easily available within the reaches of the same. The study found that 88.78 % of adopters and 74.5 % of non adopters were found to have market access and 11.32 % of adopters and 25.5 % of non adopters had not access to the local market, the sample respondents were found to vary significantly in their access to market (Table34). However, market access, is contingent on HHs economic status, production volume and distance of local market from home area.

Table 34.Distribution of sample respondents by market and input availability responses

S.No	Market, input and price information	Adopters (N=98)	Non Adopters (N=53)	t-value	χ^2 Value
1.	Distance from the local market in Hrs			2.99***	
	Mean	1.53	1.95		
	Std. Deviation	0.78	0.81		
2	Distance of input market			3.03***	
	Mean	3.19	3.87		
	Std. Deviation	1.26	1.08		
3.	Price for fattened sheep and goats	190.1	163.9	-2.96***	
	Mean	56.58	49.39		
	Std. Deviation				
	Dummy responses				
4.	Responses for market access				4.55***
	Yes	88.78	74.5		
	No	11.32	25.5		
5.	Market price fairness				0.36 (ns)
	Yes	65.31	60.4		
	No	34.69	39.6		
6	Input availability				6.4**
	Yes	21.43	5.7		
	No	78.53	94.3		
7.	Awarenesses on marketing agencies involvement				1.79 (ns)
	Yes	29.6	37.74		
	No	69.4	62.26		

Source: from own survey, 2007;
***, **, * Significant at 1%, 5%, 10% level and ns= non significant

Distance from market in terms of hours taken to reach the local market point was found to be the major factor by the household heads. The sample respondents mean distance in hours is 1.5306 and 1.9245 for adopters and non adopters respectively and it was found that the adopters and non adopters groups were significantly different from each other in their distances from the local market in number of hours taken. It found that there is negative and significant relation between intensity of adoption decision and market distances of sample respondents (Table34). This result is supported by findings of Bulale (2000), Ebrahim (2006), and Yenealem (2006) in adoption studies.

Input availability is the other dimension in which adopters and non adopters seen to differ in their degree of agreement for the presences or absences of fattening inputs , 21.43 % of adopters and 5.7 % of non adopters said that there were fattening input in the market and 78.57 % of adopters and 94.3 % of non adopters were in disagreement with this responses, from the χ^2 test it was found that the adopters and non adopters groups to differ significantly (Table 34) this finding is consistent with the findings of Chilot *et al* (1996), Berhanu (2002) .

The most frequently available input type in the market is known differently by adopters and non adopters among the sample respondents.55.1% adopters and 71.69 % non adopters said that there was no fattening input in the local market, 24.49 % adopters and 5.7 % non adopters agreed that they knew supplement feeds exist in their local market and 20.4 of % adopters and 22.61 % of non adopters had information on the availabilities of animal drugs. Among the sample respondents there are significant differences in their level of knowledge and awareness for fattening input availabilities between adopters and non adopters.

It was found that the mean distance in hours of input market for adopters and non adopters are 3.19 and 3.87 hours respectively. The distance of input market for adopters and non adopters is negatively and significantly related with intensity of adoption decision and adopters and non adopters are found significantly in their distance to input market (Table 34).

Awareness of the sample respondents for agencies involvement in marketing of goats, sheep and inputs in the wereda affects, the decision to go to the market or not. Accordiningly 29.6 % of adopters and 37.74 % of non adopters were found to have awareness while 69.4 % of adopters and 62.26 % of non adopters were not aware of the existence of business agencies involved in goats and sheep marketing in the wereda and villages. Adopters and non adopters were not found to be significantly different in their awareness for the existences of goats and sheep marketing agencies (Table34).

Frequency of the households going to the market is one of the factors that determine use of market opportunities: fair price, new information, or new ideas as input in one's production

pattern. Adopters and non adopters were found to go to the market places in different frequencies, the result found that 46.94 % of adopters and 30.19 % of non adopters go two days in a week, and 25.51% of adopters and 32.1% of non adopters found to go once in fortnight, some others still go to market once every month (26.53% of adopters and 28.3 % of non adopters) where as 1.02 % of adopters and 9.43 % of non adopters do not go to market at all. The survey result shows that adopters and non adopters are significantly different in the frequency of going to market (Table 34). Reasons for not going to market at all vary from individual to individual. Distance of the market place/farness, old age, and low volume of household produce are some of the reasons for less or no frequent market going (Table 34).

Prices for both the fattened goats and sheep and fattening inputs is another factor that determine decision for intensive adoption of small ruminant fattening package. The minimum price for a fattened goat or sheep taken to market is 100 birr while the maximum price given for good goat or sheep is 350 birr. The mean price reward for fattened goats and sheep for adopters and non adopters are 190.10 and 56.578 birr. The study it is found that there is significant differences between adopters and non adopters in the price for fattened goats or sheep they got (Table 34). Access and nearness a market does not necessarily mean availability of all inputs and items the sample respondents want and / or it does not ensure the fairness of prices of inputs and fattened goats or sheep. Agropastoralists in the study area are confirming to these assumption, and 65.31% of adopters and 60.4 % of non adopters said that they get fair price for their fattened goats or sheep while 34.69 % of adopters and 39.6 % of non adopters did not agree in the fairness of the fattened goats and sheep price, and it was found that there were insignificant differences for market price fairness perception between adopters and non adopters (Table 34).

Agropastoralists' perception on price of fattened goats or sheep is one positive factor pulling the agropastoralists to small ruminant rearing decision. Adopters and non adopters were found to have different stances in their perception to the price of fattened small ruminants. Only 4.08 % of adopters found to agree with the opinion that fattened goat or sheep price is very low, and 9.12 % of the adopters and 11.32 % of the non adopters were saying the price is medium, while 53.14 % of the adopters and 24.54 % of the non adopters were saying the price is high,

about 32.7 % of adopters and 64.15 % of non adopters are completely agree with the price is very high.

The survey found that there is a significant difference between adopters and non adopters in their perception on fattened goats or sheep prices. This means that adopters perceiving the current prices of goats and sheep is good in the market they would adopt fattening package faster and more intensively than non adopters in the wereda. Perception on price of fattened goats or sheep by agropastoralists thus influence their decision to whether or not to adopt intensively by adopters, which means prices incentives to small ruminant growers through direct marketing, forming marketing cooperatives and providing market information thus paramount in this respect (Table 34).

Box 4. Informal discussion with farmers and pastoralists, and PA leaders revealed that in goats and sheep trade, the agropastoralists are not getting the good share of the profit obtained from small ruminant rearing. In Meiso, there are two market days, when two private enterprises are coming from Modjo and Debreziet to procure a large majority of goats and sheep from the market. These private interprises are exporters of meat to Middle East countries. The bulk procurement of goats and sheep is being done by them with the help of middle men, who purchase the animals from the farmers at a lower rate and sell to the private enterprises at higher rates based per Kg live weight rate. When they buy from farmers, it is based on their visual assessment only, making it to the lower side.

Agropastoralists opined that the middle men might get 30-50 Birr per animal in each deal. In addition to this, the middle men procure animals and sell it to other nearby towns as well. The farmers have a feeling that if there is some mechanism for a sale of these animals to the consumers directly, their profit would enhance considerably.
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Distance to Water and Feed Resources

Communities in rural areas always use their surrounding natural resources as input in to production activities. The distance of feed and water resource from home of is a very important consideration. As it affects the application of improved management practices such frequency of feeding and watering. If the distance of the resources is longer the frequency of feeding and watering the small ruminants will be lower, because the adopters will go less frequently to the sources of these resources to bring feed and water for their stall fed small ruminants Therefore, distance to resources directly influences ones' extent of adoption. In this study it was found that there was negative relation between time taken to reach to feed and water sources and extent of adoption. The negative relationship between intensity of adoption and distance to feed and water points could be explained as the lesser the time taken to reach to sources of feed and water points the more frequent the HHHs goes to these sources to use them for fattening purpose.

Table 35 shows that the mean hours taken to reach to feed and water points were 2.50 and 2.73 hrs and 2.55, and 2.89 respectively by adopters and non adopters respectively and the standard deviation of mean hours taken for feed and water by adopters were 0.911 and 1.011 respectively and the standard deviation of mean hours taken to reach to feed and water points by non adopters at the same time were by 1.011 and 0.954 respectively.

Table 35. Sample respondents' home distance from feed and water sources in Hrs

Feed and water resources Distance	Adopters	Non Adopters	t- value
Distance from the Feed Sources			
Mean	2.50	2.55	
Std. Deviation	0.911	1.011	-0.292(ns)
Std. Error Mean	0.092	0.139	
Distance from the Watering Points			
Mean	2.73	2.89	
Std. Deviation	1.011	0.954	-0.916(ns)
Std. Error Mean	0.102	0.131	

Source: from own survey, 2007; ns= non significant

Distances to feed and water points measured in number of hours and adopters and non adopters group were found to differ insignificantly (Table 37). This is because all sample respondents are dwelling in the same distance from the resources. Rural villages' houses are constructed in settlements patterns in almost all parts of Ethiopia. In the study wereda, villagers construct their house near to each other. Therefore all respondents found to be at equal distances from these resources.

Risk orientation

Agropastoralists' risk orientation and capacities to absorb the negative or a side effect of any adoption of innovation is different. These differences emanate from several characteristics of a single individual, and hence individuals are different in many ways. Risk orientation and perception of individuals are some of the individual behaviors in which people significantly differ even in the same context. The following Table provides information on different aspects of agropastoralists risk orientation related to small ruminant rearing.

Table 36. Agropastoralists risk orientation

S.No	Risk orientation and perception	Adopters%	Non Adopters%	χ^2
1.	Risk perception on new agricultural technologies and improved methods of production			8.477**
	(perntech)	(N=98)	(N=53)	
	new crop technologies only	15.31	17.0	
	new animal technologies only	31.63	50.94	
	both are equally risky	20.41	18.87	
	not sure	32.65	13.21	
2.	Risk Perception on rearing small ruminant	(N=98)	(N=53)	4.690**
	(perear)			
	Yes	12.25	1.89	
	No	87.75	98.11	
3.	Risk taking, if financial incentives is associated (riskting)	(N=98)	(N=53)	2.368(ns)
	Yes	60.2	47.17	
	No	39.8	52.83	

Source: from own survey, 2007;
**, * Significant at 1 %, 5 %, 10 % level and ns is non significant

Agropastoralists were asked which improvement they would be in favour, which category of agricultural activities crop production or animal husbandry improvements or new technologies would be of less risk, taking fear of failure as the reference points for comparison of favorableness. The response of interviewed sample respondents shows the existence of significant difference in risk orientation of this wereda between adopters and non adopters (Table 36) in favoring crop, animal or both are equally are risky.

General difference in risk orientation between adopters and non adopters is observed in the wereda. Further differences could still exist among agropastoralists in perceiving whether a specific enterprise is less risky, financially rewarding but is risky or totally risky activity. Even if an individual has diversified options for avoiding riskier activity, instead some individuals may go for doing the risky activity if its financial benefit outweighs the risk. In line with this, sample respondents are tested whether they perceive small ruminant rearing is risky or not.

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The chi-square test shows that there is a significant difference between adopters and non adopters in perceiving small ruminant rearing is risky (Table 36). On the other hands, 60.2 % of adopters and 47.17% of non adopters confirmed that they will take the risk if the decision has financial reward while 39.8% adopters and 52.83 % non adopters said they will not take any kind of risk whatever financial incentives they would loss for deciding against risk taking (Table 36). In the Table it is shown that there is no significance difference between adopters and non adopters in taking risk even if it has financial incentives.

Besides the above quantitative information, informal focus group discussion and PRA survey with the key informants reveal that the major need of agropastoralists' and pastoralists' and problems of the small ruminant fattening activities related to few but very much important issues namely feed, animal health problems, marketing information and price of fattened goats and sheep and finally selection and use of improved breed of goats and sheep. The focus group participant stated that marketing groups formation earlier were tried in some PAs but could not be sustainable which did not benefit the small ruminant raisers. Some of these groups are already practicing local breed selection from market sources located as far as 50 kms away from their village only to get appropriate breed type for meat production.

4.2.5. Security for Scarce Natural Resources (Grazing Land and Water Points)

Lack of scarce resources like common grazing land, demarcated range land, and pool of water points create social tension and conflicts within or between the same community and/or different communities. Every individual residing within vicinity these of scarce resources, raise the issue of equal and equitable demand over access, control and uses. Any thing which disturbs stable system of utilization of these resources ultimately gives rise to feeling of insecurity and conflict between and among communities. When it comes to specific feeling of insecurity due to lack or shortage of the most important input resources for their fattening enterprises the sample respondents showed clear difference in their perception of security (Table 37).

Table 37. Responses of the Adopters and Non adopters group for presence or absence of insecurity in their village

Insecurity due to lack or shortage of resource(grazing land, water and water points)	Adopters		Non adopters		χ^2
	N	%	N	%	
Yes	63	64.29	19	35.85	
No	35	35.71	34	64.15	11.226**
Total	98	100	53	100	

Source: from own survey, 2007;** Significant at 5% level

About 64.29% of the adopters and 35.85% of the non adopters group responded for the presence of insecurity use of resources in their village. While 35.71 %of the adopters and 64.15%of the non adopters said that there is no problem of security for the use resources. The chi-square test shows there is a significant difference between the two groups in feeling of their security due to lack or shortage of the scarce natural resources (Table 37).

Box 6. During focus group discussion sample respondents said that pasture and water points' shortage becomes critical during dry season and this creates tension and when tensions become more serious conflicts emerge. Water points and grazing lands are common goods in the wereda and face the problem of "the tragedies of the commons". Especially when other ethnic groups come to share these common goods ultimately conflicts emerge.

Thus, innovative adopters change their management practices to avoid their small ruminants being stolen or damaged. Such behavior is characteristic of adopters choosing to practice stall feeding management, shade and shelter recommended management practices.

Responses on the presence or absence of conflict and insecurity by a category of reasons are different for adopters and non adopters and between each group. The chi-square test value of the adopters and non adopters for their difference in responding to different reasons and the significance level of these responses are presented in (Table 38), where 21.43% of the adopters and 22.64% of the non adopters group seem to agree that lack of feed resources are

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major sources of insecurity, some of the sample respondents, about 10.2 % of the adopters and 22.64% of the non adopters group agreed that lack of water and watering points are the major sources of insecurity, while 1.02 % and 7.14% of the adopters and 1.89% and 16.98% of the non adopters group think that major sources of insecurity arises due to religious and ethnic differences respectively. Only 1.02% of the adopters group and none of the non adopters group think political differences are the major sources of insecurity. Both lack of water and feed resources equally contribute for villagers' insecurity as confirmed by 59.18% of the adopters group and 35.85% of the non adopters. Therefore it is evident that sample respondents feel insecure for lack of feed and water and hence conflicts are common due to pasture and water point's scarcity. Any interventions which enhance these resources like fodder and forage plant species, water harvesting technologies and locally processed feed supplements could be accepted readily by adopters more easily than non adopters.

Table 38. Reasons for major sources of insecurity

	Adopters		Non Adopters		
Major Source of Insecurity	A	(%)	NA	(%)	χ^2
1. Lack of feed resource	21	21.43	12	22.64	11.226**
2. Lack of watering points	10	10.2	12	22.64	
3. Religious differences	1	1.02	1	1.89	
4. Ethnic differences	7	7.14	9	16.98	
5. Political differences	1	1.02	0	0	
6. Feed and water shortage equally contribute	58	59.18	19	35.85	
Total	98	100	53	100	

Source: from own survey, 2007; ** Significant at 5 % level

4.2.6. Social participation

The social participation of rural people in local and formal institutions exposes them to information and better ideas than their practices. Especially, those who are in the leadership position and committees have more opportunities than ordinary members. But the chi-square of the test showed that there is no significant difference between adopters and non adopters for both committee membership and leadership in informal organizations (Table 39). The difference between adopters and non adopters in participating in the formal organization as

committee members and leadership is again not significantly different (Table 39).

Table 39. Sample respondents' participation in social organizations

Types of participation	Adopters(N=98)				Non Adopters(N=53)				
	Yes		No		Yes		No		
	N	%	N	%	N	%	N	%	χ^2
Informal leadership	4	4.08	94	95.92	4	7.5	49	92.5	0.82 (NS)
Informal committee	11	11.22	87	88.78	6	11.3	47	88.7	1.95 (NS)
Formal committee	14	14.28	84	85.72	10	18.9	43	81.1	0.40 (NS)
Formal leadership	2	2.04	96	97.96	2	3.8	51	96.2	1.69 (NS)

Source: from own survey, 2007; NS= non significant

The above observations show insignificant differences between adopters and non adopters by social participation types in adoption of small ruminant fattening package. Leadership and committee membership role of respondents in this study was found to be consistent with the findings of Kebede (2006), Pender *et al.* (2004), Abera (2003) in their adoption studies where they stated that there exist positive relationship between adoption and social participation, but stastically non significant in all types of social participation. These insignificance differences could be explained by precence of unorganized and weak forms of local organizations like *Afosha* and saving or credit organizations. These organizations mainly play sharing social burden role such as funeral and wedding celebrations (100 % of the sample respondents join this social organization with main purpose of sharing social burden and not to be excluded from the society) and these organizations also have no regular meeting and membership fee contribution to maintain and strengthen their organization, as a result information exchange and flow through these organization is restricted from both outside as well as within the members' group). The other reason could be the very limited number of formal organizations (schools, health posts and vet clinics, formally supported by traditional legal and judiciary organizations) which could have involved local people as committee members so that local people's capacity is enhanced and at the same time information exchange and communication about new practice and technologies could have been facilitated through these formal organizations.

4.3. Intensity of adoption of Fattening Package and Its Determinants in the Study Area

4.3.1. Results of the Econometric Model

Prior to running the Tobit model, the hypothesized explanatory variables were checked for the existence of multi-collinearity and heteroscedasticity. Very often data we use in regression analysis cannot give decisive answers to the questions we pose. This is because the standard errors are very high or the t-ratios are very low. This sort of situation occurs when the explanatory variables display little variation and/or high intercorrelations. The situation where the explanatory variables are highly intercorrelated is referred to as multicollinearity (Maddala, 1992).

Before running the model all the hypothesized explanatory variables were checked for the existence of multi-collinearity problem. There are two measures that are often suggested to test the existence of mulit-collineality. These are: Variance Inflation Factor (VIF) for association among the continuous explanatory variables and contingency coefficients for dummy variables.

According to Maddala (1992), VIF can be defined as: $\text{VIF}(x_i) = \dfrac{1}{1 - R_i^2}$

Where R_i^2 is the squared multiple correlation coefficient between X_i and the other explanatory variables. The statistical package known as SPSS was employed to compute the VIF values. Once VIF values were obtained the R^2 values can be computed using the formula. The VIF values displayed in appendix Table 5 have shown that all the continuous explanatory variables have no serious multi-collineartity problem. Similarly, contingency coefficients were computed for dummy variables. The values of the contingency coefficients were also low (appendix Table 6). Based on the above test both the hypothesized continuous and dummy variables were retained in the model.

One of the assumptions in regression analysis is that the errors u_i have a common variance σ^2. If the errors do not have a constant variance we say they are heteroscedastic (Maddala, 1992). In the general linear model, OLS estimates are consistent but not efficient when the

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disturbances are heteroscedastic. In the case of the limited dependent variable models (such as Tobit), the estimate of the corresponding regression coefficient is upward biased in the presence of heteroscedasticity. But nothing can be said about the other coefficients and the direction of the bias. It is more practicable to make some reasonable assumptions about the nature of heteroscedasticity and estimate the model than just to say that Maximum Likelihood estimates are inconsistent if heteroscedasticity is ignored (Maddala, 1997).

In this study, heteroscedasticity was tested for some suspected variables by running, heteroscedatic Tobit using econometric software (Limdep). Market distance, distance from input market, adoption score of current management fattening practices and knowledge of fattening package were assumed as the possible sources of heteroscedasticity. It was found that distance from input market and knowledge of fattening package statistically significant for heteoroscedasticity, while market distance and adoption score for current management practices were not significant. For the convenience of computing the marginal effects and intensity of adoption the Tobit model was estimated by excluding the variables which were found to be significant for hetroscedasticity (i.e. distance from input market and knowledge of fattening package).

4.3.2. Explanation of the Significant Variables Influencing Intensity of adoption of the fattening package

Among explanatory variables hypothesized to influence agropastoralists in the intensity of fattening package adoption, using descriptive statistics, about half of the variables were found to have significant effects on adoption decision during descriptive analysis. A further econometric analysis was done to see the degree of influence empirically of explanatory variables on the independent variable (intensity of adoption). Thus the following section will present and discuss empirical findings of the result of this study.

4.3.2.1. Determinants of Intensity of small ruminant fattening package

Estimates of the parameters of the variables expected to determine the intensity of adoption decision of fattening package are shown in Table 40. A total of 9 explanatory variables were considered in the econometric model out of which five variables were found to significantly influence the intensity of small ruminant fattening package use among farm households.

Table 40.Maximum estimates of Tobit model

S.No	Explanatory Variables	Estimated Coefficients	Standard Error	t-ratio	Change in probability $\frac{\partial F(z)}{\partial X_i}=f(z)\frac{\beta_i}{\sigma}$
1	Constant	.72910706	.13212872	5.518***	0.231468
2	FAMLSIZE	- .00981639	.00928573	-1.057	-0.003116
3	SRREXPER	- .00240434	.00172946	-1.390	-0.000763
4	TLU	.00527537	.00317143	1.663*	0.001675
5	CREVET	- .08522731	.04483951	-1.900*	-0.027057
6	MARLENGHT	- .02825610	.02031700	-1.391	-0.00897
7	ADOSCMGT	.04439778	.00596294	7.446**	0.014095
8	PEREAING	.07055195	.05859947	1.204	0.022398
9	PERFPIMB	.02519846	.01405698	1.793*	0.008
10	RESCONFL	.05176619	.02950038	1.754*	0.016434

***, **, * Represents level of significance at 1%, 5% and 10%, respectively

TLU holding of the household head is the major indicator of wealth as well as social status more over risk taking behavior. In the above table, it was shown that TLU holding is positively related to intensity of adoption decision (10 % significance level). A larger holding of TLU affects the sample respondents' probability to intensively adopt the fattening package practices in the wereda. This is may be TLU holding increases agropastoralists risk assumption in adopting new practices and also the goal of increasing income level of the households, HHHs may engage in small ruminant fattening which is relatively has immediate renumenration by shifting some of available small ruminants because of larger TLU holdings.

Farmers who have access to credit can over come their financial constraints and therefore buy inputs using the available credit. Farmers without cash and no access to credit will find it very difficult to attain and adopt new technologies. Access to credit for veterinary purpose (CREVET) was negatively influencing the probability of intensity of small ruminant fattening package (significant at 10% level).The change in the amount of access to credit for veterinary purpose of agropastoralists small to large decreases the probability of the credit used to keep their small ruminants health. This implies that very small proportion of adopters had access to veterinary credit and this credit access is also concentrated for only few socially active villagers (PA councilors and local group leaders). Hence credit given to agropastoralists could face diversion from its intended purpose, as the majority of credit users are having higher TLU, which implies that large ruminants are more in proportion than small ruminants.

The current management practices of agropastoralists are one of the most important factors that were assumed to affect intensity of adoption positively. If improved managements practices are convenient and fit to ones practices, the individual is likely to use the package more intensively. The result supports this assumption in that adoption score of management practices is positively and significantly influences extent of fattening package adoption in the study area (significant at 5 % level). In the results, it is shown that as higher adoption score of management practices increases the probability of intensity of adoption of the fattening package. The result confirms that the more the fattening package management practices nearer to the current management practices of agopastoralists and pastoralists management practices, the more convenient it would be. Management practices and agricultural technologies are very closely related factors in any production activity. There is an established theory that emphasize on technological convenience to farmers' management practices by shoemaker (1971) and then after many findings have shown that convenience of technologies and management practices positively affect adoption decision (Saha *et al;* 1994).

Perception on availability of a particular technology and improved methods and its profitability are another economic dimension of agropastoralists' perception that affects extent of use decision for specialization, for example, small ruminant fattening can be directly affected by individuals' selection of breed and other basic technologies for fattening. As

hypothesized in the variable definitions, perception on components of fattening package has positive and significant influence on intensity of adoption decision.

The empirical result of the study also found out that perception on the availability of improved breed is positive and significant at 10 % level. The stronger the perception of agropastoralists on the availability of the improved breed, the more he uses selection of breeds for fattening and the more extensive adopter of fattening package he would be and vice versa. The extent of fattening package adoption decision increases by 0.8% as the perception on availability of improved breeds of agropastoralist and pastoralist increases.

The low magnitude of change in probability of adoption decision may be explained by perception is the resultant effects of several other factors which determine ones perception currently on specific technology. Ones' perception is a cumulative experience, knowledge and attitude in evaluation of the importance, sources, means, and implementation techniques of this technology. Perception of farmers on technologies selection and use has been found to positively and significantly affecting farmer's decision in the studies of (Guerin and Guerin, 1994).

Lastly, the point which remained to be discussed is that of agropastoralists' feeling on security of their locality due to resource competition. Conflicts are common in areas where scarce resources (water points and grazing or pasture lands) are needed equally by all members of the community and where these resources are common goods ("tragedy of the commons" theory of resource economics applies in such cases). Moreover, adoption decisions is not merely dependent on, usual characteristics like economical, social, demographic or physical technologies and biological, it has also political and security aspects.

The result of this study found that as it was hypothesized, that security problems due to scarce resources will influence intensity of adoption decision positively and significantly (10 % significance level). As the agropastoralists' feeling towards insecurity increases their decision on the extent of fattening package particularly feed and watering components increases by 1.6 %. This implies that as insecurity feeling increases, which arises from local conflicts due to

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scarce resources competition, agropastoralsits and pastoralists decision to feed small ruminant under stall feeding, supplement and purchased feed would increase and also their management decisions could changed accordingly. Adoption decision are influenced significantly by political and insecurity than tenure security

4.3.2.2. Effects of Changes in the Significant Explanatory Variables on

Extent Adoption of fattening package

The results of the Tobit model can be used to identify the effects of changes in the explanatory variables on the extent of fattening package adoption. Table 41, presents the effect of marginal changes (derivatives) in explanatory variables on the extent of fattening package adoption among adopters and among the entire sample households.

Table 41. The Effects of Change in the Significant Explanatory Variables on the extent of fattening package adoption

S.No	Explanatory Variables	Change among adopters $\dfrac{\partial E(Y_i / Y_i^* > 0)}{\partial X_i}$	Change among the whole $\dfrac{\partial E(Y_i)}{\partial x_i}$
4	TLU	0.00235763	0.002317
5	CREVET	-0.03808912	-0.03926
6	ADOSCMGT	0.012628	0.01213
7	PERFIMB	0.1984191	0.019808
8	RESCONFL	0.0112615	0.011184

Log likelihood function = 35.28448 f (z) =0.3752
 Sigma (σ)   = 0.19154920   F(z)=0.637
   Z = 0.35

TLU holding of the household head increases intensity of adoption of fattening package by 0.235 among adopters and by 0.231 among the entire sample. An increase in the current score management practices by a unit, increases the extent of fattening package adoption status of the household heads by 0.1984 among adopters and by 0.0198 among the entire sample.

Except credit access for veterinary purpose (CREVET) a marginal change in other significant variables have positive influence on the extent of fattening package adoption. On the average, change in the credit access of the household head (from have no access to have access) decreases credit used for veterinary purposes among adopters by 3.81 % by adopters and 3.93 % among the entire sample.

Current management practice of agropasoralists and pastoralists (ADOSCMGT) experience with recommended management practices increases intensity of adoption of fattening package adoption by a unit increase of management practice score of adopters by 0.012628 unit and the whole sample by 0.01213 unit.

Similarly, unit change of the household heads perception on improved breed selection information may result in intensity of adoption of fattening package decision increases by 0.0231 among adopters and by 0.0228 among entire sample.

Resource conflicts is dummy variable used in the analysis, i.e. (RESCONFL) feeling of security has a positive influence. A change in the feeling/ perception of the households heads to security in their village increases intensity of adoption of fattening package by 0.0231 among adopters and by 0.0228 among the entire sample.

5. SUMMARY, CONCLUSION AND RECOMMENDATION

5.1. Summary and Conclusion of Major Findings

Livestock in Ethiopia is the major source of income and means of livelihoods for most of the rural people after crop production. The importance of livestock in general and small ruminants in particular, has high significance for agropastoral and pastoral communities whose means of livelihood is partially and totally dependent on livestock production respectively. Contributions of small ruminants to rural people in economic employment and the value addition to farm outputs, food security, socio-cultural, and environmental sustainability through increase use of marginal lands, manure and farm waste are few of the recognized importance of small ruminants in rural smallholders' economy in Ethiopia.

Small ruminant production is undertaken among Meiso wereda agropastoralists extensively after to large ruminants. The average holding of goats and sheep in household are 13.2 and 0.84 respectively. All sample households have more goats than sheep and there are few HH which do not own sheep. New market has emerged for livestock species especially small ruminants, cattle and camel both in the country and abroad (Middle East) in the last 10 years. These new opportunities have motivated impact on agropastoralists' to rear small ruminants for market purpose. Thus changing their management practices and ways of their livestock keeping becomes mandatory to be competent in the existing market. In addition, several governmental and non governmental organizations working for improvements of these communities have been making efforts to introduce, transfer and inform technologies and improved management practices in small ruminant production. This study tried to highlight agropastoralists evaluation of the extension services effort with respect to methods and contents of the small ruminant fattening package. Further more, the study focuses on identifying the factors that determine agropastoralists' decision on the intensity of adoption of fattening package in the wereda.

The sample sizes in each PAs sample units were determined proportional to the size randomly. Both primary and secondary sources were used to have qualitative and quantitative data. Descriptive statistical analysis methods were employed to measure central tendency and measure of dispersions, frequency, mean, average, variances, and percentages. Besides mean comparisons of independent samples, associations were analyzed using t-test and chi-square tests. Descriptive statistics in this way gave some insight about the characteristics of sampled units for the survey study. Perception was measured using a scale with items developed for the purpose of the study. Attitude responses of sample respondents were measured using five point Likert type attitude scales; total attitude score was worked out for each respondent and tested using t-test and measure of dispersion to characterize the sample respondents.

Finally, explanatory variable found to be significant in the descriptive analysis were screened to be further tested by Tobit model which is appropriate for analysis of censored and truncated dependent variables. Intensity of adoption (adoption index) in this case is a continuous limited dependent variable. Explanatory variables used to explain intensity of fattening package adoption were tested for multicollinearity and linear association using VIF techniques for continuous variables and contingency coefficients for dummies variables. More strong tests of simultaneous effects of variable were done using heteroscedascity among variable suspected of close associations but could not be screened by either VIF or CC analysis.

Descriptive results of the study show significant differences between adopters and non adopters and the presence of relation between extent of fattening package adoption decisions and explanatory variables such as family size, small ruminant rearing experiences, TLU, market distance, current management practices adoption score, use of credit for veterinary purpose, access to market information, importance of extension methods, frequency of radio use, perception of agropastoralists on the availability of improved breeds, feelings of security by sample respondents' for the existencnce of conflicts due to scarcity of range lands and water points, risk orientation, knowledge of fattening package components and distance to input market.

Agropastoralists knowledge and communication are crucial in participation and evaluation processes of extension services. Awareness of the existence of fattening package extension services was positively and significantly related with dependent variable. Rural clients seek information from multiple sources and often want to test the reliability of information before being applied. Agropastoralists are not exceptional to this behaviour but the findings showed adopters and non adopters were not significantly different in seeking multiple sources of information. Despite the expectations of the research, about the relation of extension services agents and sample respondents, the study found that there was no problem in communicating agropastoralists with extension agents. This is may be due to the extension agents are living in the villages also due to similarity of extension agents' background with the community could have lessened the degree of communication problem perceived by agropastoralists.

Focus area of extension services' message were feeds, breeds, building shelter and shed, land use practices, home economics and animal health services. It was found that there were no significant differences among adopters and non adopters in receiving this information from extension agents. Hence, while choosing different extension methods, it is better to give emphasis to the combinations of demonstration with other extension methods to influence large number of agropastoralists in the study area so that extent fattening package adoption is increased.

Agropastoralists, however, did not reserve themselves from commenting the currently undergoing extension services particularly fattening package extension services. Adopters and non adopter respondents were found to be significantly different in their need on what the extension services should do for them. The respondents were found to prioritize their expectations as extension services is expected to diversify its services and particularly crop production extension and animal health and veterinary information and services are critically needed. It also shown in the result of this study that none of extension methods number of participations were found to be significantly different between adopters and non adopters. Trainings were delivered in wide areas, in which the majority of the sample, 66.89 % of total respondents was not included in any of the training sessions of the extension programmes.

Perceptions of sample respondents on different attributes of fattening package contents were not found to be significantly different between adopters and non adopters except the perception on the availability of breed and breed information. This would imply that adopters were using breed information and selection of breed for fattening package than non adopters at least using the locally available better breeds. Attitude of sample respondents on fattening package was not significantly different between adopters and non adopters. Attitude was found to be positively related with the dependent variable.

The family size of the household (FAMLSIZE) is significantly different between adopters and non adopters. Small ruminant rearing requires less labor than large ruminant keeping. Small ruminant rearing requires herding and taking to water points which are mostly done by children and /or women in the household. Thus households with large family size tend to improve their small ruminant holding size and therefore will be more extensive adopters of fattening package than the non adopters group.

Small ruminant rearing experiences of the sample respondents was significant but negatively related with intensity of adoption decision, this negative relation may be as a result of large proportion of non adopters had more experiences than adopters group and at the same time they might have become rigid against changes influencing intensity of adoption decision negatively.

TLU is another significant variable that affected decision on extent of fattening package adoption. It was found in the result that TLU is negatively related with intensity of adoption decision which implies that importance of small ruminant decreases as the TLU holding of HHHs increases and this is may be higher TLU means more large ruminants and they get higher priority than small ruminants.

The result of this study has also shown that, as the distance to market increases (MARLENGHT) form the HHHs' home place, the intensity of adoption decision decreases, which implies negative relation between distance from market and intensity of adoption decision. Thus, the more the time taken to reach to market the lesser they would become

interested to fatten and sell small ruminants, therefore the lesser they are interested in extent of fattening package adoption.

The current management practices of agropastoralists is one of very important factors that influence evaluation of HHHs' on the suitability of the improved management practices with their own practices (technological attributes evaluation in terms of management practices convenience). ADOSCMGT, therefore it affects the intensity of adoption decision. The result of this study, it has shown that current management practices score and intensity of adoption were significantly and positively related and there were also significant differences between adopters and non adopters

Access to credit is important for HHHs decision to assume more risks and enhance their financial capacity to purchase inputs that complements package of technologies. In this study, however, credit meant for veterinary purpose (CREVET) may found to be significant but negatively related with extent of small ruminant fattening package adoption. The reason for this negative relation could be, as it is discussed before, when the TLU holding of HHHs increases accordingly the priority and interest of HHHs changes from small ruminants to large ruminants. And hence credit taken to purchase small ruminants' veterinary medicines will face problem of fungibility. A diversion of small ruminants' veterinary purpose credit to other purposes of the HHHs is a common problem. This implies that credits taken in the name of small ruminants veterinary purposes has lesser and lesser probability of being used to its actually intended purposes.

Access to market information (MARACCES) is very important economic factor for the extent of fattening package adoption. One's access to information of goats and sheep as well as input prices is thus determined by his/her access to market. The result of this study showed that adopters and non adopters are significantly different in their assessment that they had access to market information and market access of sample respondents is positively related with extent of fattening package adoption decision. Information access to market price is important in production decision of HHHs and the presence of attractive prices for their goats and sheep and less expensive input prices could only be known to agropastoralists who have access to

market. This access to market information, in turn, affected by physical distances, HHHs economic activities, infrastructural facilities and personal characteristics of individual HHHs' such as eagerness to look for new information and make use of this for his/her economic decisions.

Radio is the mass communication means in most developing rural societies. It is employed to create awareness about something new or that is already existed but negatively conceived. Nevertheless, radio ownership did not found to be significant and also could not explain the differences among adopters and non adopters. The reason might be the economic status of HHs in the wereda is nearly similar and /or information seeking behavior of the people is also similar or because owning a radio is considered to be important equally by all members. The other dimension of mass media exposure is frequency of radio use for agricultural news or programmes (FRERADIO) which was used in this study as one of important explanatory variable, and the result showed that the frequency of radio use is significantly different between adopters and non adopters. Adopters being interested more in agricultural news and programmes than non adopters and intensity of adoption decision is significantly and positively related with the frequency of radio listening of respondents.

Perceived technology attributes of fattening package influences the extent of individuals decision. Perception on the availability of improved breeds (PERFPIMB) is one among many attributes of fattening package found to be significantly and positively influencing level of adoption. Agropastoralists' perception on the availability of breeds and breeding information influences their decision significantly and positively to select goats and sheep breeds suitable for fattening. Adopters therefore perceived information on improved breeds available in the wereda than non adopters and hence adopters were using this information at least to select their fattening breed from locally available better breeds.

Agropastoral and pastoral agroecologies are more recently under pressure for resource degradation caused by world climatic change. Desertification is accelerating in sub Saharan Africa at a rate of more rapidly than before. Livestock population increase in these agroecologies aggravates desertification and natural resources degradation. Communities

dwelling in such natural setting do face problems in using these scarce resources. Such problems become harsher when grazing lands or pasture lands and water points are considered as common reserves and if these resources are shared either geographically or/and ethnically among different communities will result always problems of "the tragedies of the commons". Then conflicts become the day to day experiences of agropastoralists living in this environment.

The result of the study showed that feelings of respondents' for the presence of insecurity or conflicts (RESCONFL) due to scarcity of range lands and water points and intensity of adoption decision of fattening package found to be statistically and positively related and there were also found to be clear differences among adopters and non adopters. This result implies that adopters feel more insecure than non adopters in the villages and thus they keep their small ruminant animals more frequently under stall feeding or cut and carry system also use more of other types of feed such as supplements, industrial by-products, clean water supplies and finally keep sanitation of the small ruminants more than the non adopters do.

Risk taking is proxy indicator of financial and economic strength of HHHs. Risk orientation is then behavior of HHHs that is explained by the capability of HHHs to assume taking risk and to withstand failures associated with ones' decision. Risk orientation of HHHs towards small ruminant rearing (PEREAING) was shown to be positively and significantly associated with ones' extent of fattening package adoption. Moreover, the result showed that there were significant differences between adopters and non adopters in their orientation to risk by rearing small rumiants. This finding could be extrapolated, by saying that adopters had experience in price rewarding fattening businesses and got relatively higher income from similar production so that it would be easy to decide to rear small ruminants with associated risks being taken into consideration than non adopters.

Knowledge of fattening practices was used in the study in the sense that awareness and appropriate information is within HHHs understanding. The study evidence that adopters were exposed to suitable condition to have more knowledge of feed, animal health and sanitary keeping and other knowledge of management practices than non adopters. The study also

showed the existence of positive and significant relation between knowledge and extent of fattening package adoption. There were significant differences between adopters and non adopters in the level of knowledge on fattening package.

Identifying the availability of input in any technology adoption is very important step in adoption decision processes. Input may not be available in the same market where farm HHs' outputs are sold. Distance to input market (DISINPU) thus becomes another explanatory variable used to explain the decision of HHHs extent of decision on fattening package adoption. It was found in the study that extent of fattening package adoption and distance to input market were significantly but negatively related. And also there were significant differences between adopters and non adopters in their nearness to input market. Negative relation between intensity of adoption and input distance would mean that the far the input market, the lesser the intensity of adoption of fattening package.

Econometric results showed that among fourteen descriptively significant explanatory variables, only five have been found to be significantly affecting intensity of adoption of fattening package. Tobit model output showed that the most powerfully influencing explanatory variables that positively and significantly determine extent of fattening package adoption decision were perception on availability of improved breed (PERFIMB), current management practice score (ADOSCMGT) and total livestock holding (TLU) while access to credit for veterinary purpose (CREVET) and the distance of market from the households in terms of hours (RESCONFL) were negatively and significantly determining the extent of fattening package adoption by adopters in the wereda.

5.2. Recommendations

Extent of small ruminants fattening package adoption was shown to be influenced by a number of explanatory variables that have already been discussed in the previous sections. Characteristics found to be very important in defining agropastoralists behavioral decision making factors were thus identified in this research. Among a large number of explanatory variables hypothesized to have significant and positive or negative relationship and influence on the extent of fattening package adoption, only five were found to be significantly related and determining the extent of fattening package adoption. Therefore, the final step in this research processes is to indicate the identified problems and the way forward that is alternatively could be managed to increase the effectiveness of the extension system on one hand and increasing the productivity of agropastoralists by adopting more intensively small ruminants' fattening package on the other hand.

Thus following recommendations are made based on empirical findings that were discussed in the previous sections of the study:

Total livestock holding of HHHs (TLU) is very important for increasing HHs' food security, wealth status and income level etc. Small ruminants have proportionate share in the TLU holding of the HHHs and therefore agropastoralists need to be made aware of the economic, environmental, social values of small ruminants so that they give equal considerations in decisions of choosing in investments of adopting livestock technologies so that they prioritize small ruminants among the different livestock species.

Improved management practices should be considered for its fitness with the currently practiced management techniques of agropastoralists, before they are demonstrated and transferred. This implies the extension systems of the wereda need to have well identified and studied agropastoralists and pastoralist current management practices so that compatibility of improved management practices and also its fitness to the prevailing conditions and farming systems' context is optimized.

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Agropastoralists' and pastoralists' perception on the availability of better breeds need to be made improved by provisioning of information on breed selection techniques. The first step in making agropastoralist and pastoralists revise their perception in breed assessments is to start teaching and training how the locally available breeds could be identified for different purposes. Making extensive efforts in selection criteria for better breed information disseminations, breeding techniques demonstration and training are expected from extension agencies to increase agropastoralists perception on availability of improved breed.

Access to credit intended for small ruminants was observed to be diverted for other purposes than its intended goal. This credit fungibility could be corrected by taking appropriate measures such as selection criteria must be revised since, agropastoralists who had access to credit were those having very high TLU which could imply that large ruminants being favored more than small ruminants. The other criteria was that only those who were socially active had access and thus the core aim of improving health and veterinary services for small ruminant is lost. Therefore selection criteria need to be critically examined before extending credit services to small ruminants' holder. Extensive follow ups in the application of credit money to its intended purpose is another mandatory procedure that credit providers must undertake to facilitate intensive technology adoption of small ruminant fattening package.

Distance to market is very important determining factor that negatively influencing extent of fattening package adoption. One way forward to increase market access of rural people is to improve the physical infrastructure of the institutions to facilitate linkage and frequent visits. This would be possible by allowing niche markets and small businesses to flourish very close to or in the villages which ultimately could develop to local market or well developed market places where agropsatoralists and pastoralists can easily and with lower transaction costs exchange their outputs and inputs. The other possible way out, but capital intensive decision would be, to increase the number of dry and all weather roads in each PAs to close average distance gap and as a result transportation and vehicles could be easily accessible so that rural people visit to near by local market more frequently.

Qualitative information obtained from focus group discussion shows that marketing of small ruminants and market infrastructures, prices of small ruminants were low for the owners while the middlemen are making treasure from the agropastoralists' and pastoralists' small ruminants. Thus, any agency concerned in agropastoralists of the wereda and similar system needs to extend immediate support. Empowering them by organizing producers' or business oriented cooperatives is one possibility so that they can have upper hand in dealing the prices of their small ruminants and / or also in determining profit margins they could get. The other important insight to improve productivity of small ruminants and hence to increase income level would be, to encourage input dealers at local levels so that input demand be satisfied within PAs of the Wereda.

The poor performance in knowledge test on small ruminant fattening package by both categories of respondents (even adopters) indicates the deficiency of technology information dissemination among agropastoralists. Adopters show improvements in the small ruminants rearing by using some of the change messages in their traditional means of rearing This situation calls for extensive dissemination efforts on small ruminants fattening package to be designed and implemented by the agencies /institutions working for improving the life of pastoralists and agropastoralists .this can be through village based trainings to farmers ,trainings for kebele leaders and administrators, and organizing informal groups such attempts should be dovetailed with local availability of needed inputs.

The qualitative data revealed the important roles played by women in small ruminant rearing among pastoralists and agropastoralists. Their vital role in managing small ruminants at home points out to the need of recognizing them also as farmers and giving due attention by the extension agencies or institutions. Input availabilities, extension methods and approaches, training themes, small ruminant management practices such as feeding, watering, animal health caring (which are mainly women's role) should be critically evaluated for their adequacy, addressing women as important target, matching with real situation problems of small ruminant production associated with women management practices in the study area and similar context in Ethiopia

This study had found some hypothesized explanatory variables to be insignificant in study area. These insignificant explanatory variables were age, small ruminant rearing experience, family size, educational levels, frequency of extension contact, frequency of radio use, market information access, house type owned, training, total household income, knowledge, attitude, and distances to feed and water resources. Therefore the result of this study recommends more adoption and extension communication studies need to be further detail analysis of explanatory variables in such different context (agropastoral and pastoral) in fields of adoption, agricultural extension and communication areas.

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7. APPENDICES

Appendix Table.1. Sample HHHs by sex category

HHHs sex	adopters		non adopters		Total	
	N	%	N	%	N	%
Male	91	92.90%	46	86.80%	14	9.27
Female	7	7.10%	7	13.20%		

Source: own survey, 2007

Appendix Table.42. Categorization of samples respondents into four adopter groups

Adoption index	Adopters group				Total	
	Non Adopters	Low Adopters	Medium Adopters	High Adopters	N	%
0.94-1.47	51	0	0	0	51	33.77
1.48-1.56	0	27	0	0	27	17.88
1.57-1.76	0	0	37	0	37	24.5
1.77-2.54	0	0	0	36	36	23.84

Source: own survey, 2007

Appendix Table.3. Conversion factors used to calculate Tropical Livestock Units (TLU)

Animals	TLU-equivalent
Calf	0.25
Heifer & Bull	0.75
Cows & Oxen	1.00
Horse	1.10
Donkey	0.70
Ship & Goat	0.13
Chicken/poultry	0.013

Source: Strock et al., (1991)

Appendix Table 4. Selection criteria used and PAs that fulfill the criteria

criteria	Peasant associations
1.Peace and security	Chachole, Deineba hunde missoma,Oda kenini, Harmaro mete deima
2.Proximity and accessibility for main road and market	Chachole, Deineba hunde missoma,Oda kenini, Harmaro mete deima
3.Orientation to small	Chachole, Deineba hunde missoma,Oda kenini, Harmaro

ruminant fattening	mete deima	
4.Experience in small ruminant extension services	Chachole, Deineba hunde missoma,Oda kenini	
5.Availabilty of FTC in or around PA	Deineba hunde missoma,Oda kenini	
6.Proportion of villagers involved in small ruminant more than five years	Chachole, Deineba hunde missoma,Oda kenini, Harmaro mete deima	
7. One pastoral or semi pastoral PA	Harmaro mete deima	

Appendix Table 5. Variance inflation factor for continuous variables

Variable	R_i^2	Variance inflation factor (VIF)
FAMLSIZE	0.139	1.161
SRREXPER	0.052	1.055
TLU	0.076	1.082
MARLENGT	0.231	1.299
ADOSCMGT	0.299	1.462

Source: Own computation, 2007

Appendix Table 6. Contingency Coefficients for Dummy Variables

	CREVET	MARACCESS	COMMEXT	FREQRADIO	PERFPIMB	RESCONFL	PEREARING
CREVET	1	0.096	.158	0.308	0.177	0.102	0.135
MARACCESS		1	0.187	.314	.209	.221	0.132
COMMEXT			1	.104	.294	.253	0.001
FREQRADIO				1	.286	.238	0.107
PERFPIMB					1	.347	0.177
RESCONFL						1	0.228
PEREARING							1

Source: Own computation, 2007

Appendix: Interview schedule .Interview schedule for the research title "Adoption of Small Ruminants' Fattening Package in Agropastoral Areas, Meiso Wereda, Eastern Oromia " in Meiso Wereda, Ethiopia

1. Household Characteristics

Name_____

1. Age (Number of years) _____

2. Educational level

( ) Illiterate ( ) functionally literate   ( ) 1-4 grade   ( ) 5-8 grade   ( ) >8 grade

3. Sex   Male ( )   Female ( )

4. Marital status   Single   ( )   Widow ( )

Married ( )   Widower ( )

Divorced ( )

5. Religion of the farmer:

( ) Orthodox   ( ) Protestant   ( ) Catholic

( ) Muslim   ( ) Others (specify)

6. Ethnicity

 ( ) Afar   ( ) Oromo   ( ) Somali   ( ) Others

2. Household farming and small ruminants rearing status of households

2.1. Family size/labor supply

No	Name of family member	Relation to household head (circle one) W, S, D, R	Sex	Age	Education Level (years in school)
7					
8					
9					
10					
11					
12					

W=wife, S=son, D=daughter, R=relative

2.2. Labor availability and use

13. Did you experience labor shortage in small ruminants rearing/keeping?

( ) Yes   ( ) No

14. If yes, for which rearing practice? List down the lists of each practice ----------------------

----

15. What are the busiest times of year for you and your family in rearing small ruminants?

Period/Month   Activity

 ------------------------------------- --

16. Which season is the most relaxed period in the year and what activities take place then?

Period/Month   Activity

 --------------------------------- ---

17. Is hired labor readily available when you need it?

( ) Yes   ( ) No

18. If yes, how much do you pay hired labourers per month?

2.3. Labor division in the HHs

Who performs the following operation in the production of small ruminants? (Tick/fill, Appropriate).

Activities / Who performs	Barn cleaning	Feeding	Treating	Watering	Disinfecting	Milking	Marketing	Decision for HHs consumption or selling
19. Mostly men								
20. Mostly women								
21. Men, women & children								
22. Other (hired labor)								

2.4. Gender and division of labour

Who is responsible for the management of goat and sheep? Fill the following table

No	Activities	Who performs it (1=husband, 2=wife, 3=boys, 4=girls)	Distance from home in hours	Frequency/ week	Time taken to do the activities
23	Feeding (cut and carry system)				
24	Watering				
25	Herding				
26	Taking to clinic				
27	Caring for sick goats& sheep				
28	Cleaning barn				
29	Barn/ house building or repair				
30	Milking goats				
31	Churning				
32	Selling of goats' milk				
33	Selling of goats				
34	Selling of kids				
35	Selling of sheep				
36	Selling goat/sheep meat				

37. How much pay women labourer get for doing the same type of jobs done by fellow men labourer?

Less pay   ( )
Same pay   ( )
Higher pay   ( )

38. Small ruminants rearing experience (Number of years) _____

39. Resource Endowment and access
3.1. Land ownership and tenure status

Plot number	Size in Ha	Tenure type (own, rented)	Crop grown	Fertilizer/ chemical use
40.P1				
41.P2				

3.1.1. For fodder/grazing land 2005/6 (1997/8 E.C) indicate size of each plot.

Parcel NO./crop	Size Ha	Owned	Rented	Forage varieties (sorghum/stock and leaves as feed, cowpea, pigeon pea, sasbania, lucenia etc)	Years 2005	2006
42.						
43.						

* Method of acquiring: 1. Bought, 2. Inherited, 3. others (specify)
** Land tenure: 1. Owned by self 2.Share cropping 3. Family owned
  4. Rent 5. other (specify)

3.2. Livestock ownership

Livestock type	Breed type if any (local)	Number	Inputs used in keeping this animals Purchased Feed	Vet service	Labour
44. Milking cow					
45. Dry cow					
46. Oxen					
47. Bulls					
48. Heifers					
49. Calves					
50. Donkeys					
51. Goats (milking)					
52. Goats (meat)					
53. Sheep					
54. Camel					
55. Poultry					

3.3. What are the sources of water you mainly depend on?

Source type	Season	Purpose	Time taken to fetch water from the source	Responsible family member
56.				
57.				

3.4. Housing, Implements and Machineries ownership

No	House / implement type	Yes	No	Number
58	Grass roof			
59	Corrugated Iron roof without partition			
60	Corrugated iron roof with partition			
61	Radio			
62	Tape Recorder			
63	Donkey Cart			
64	Water pump			
65	Others(specify)			

3.5. The Farmers Total Income.

3.5.1. Income from Crop production last year (1998 E.C) **Crop grown**	Total harvest (Quintals)		Inputs used		
	Consumed	**Volume Sold**	**Fert.(Kg)**	**Improved seed Kg)**	**Pesticides (liters)**
66. Sorghum					
67. Maize					
68. cow pea					
69. Haricot bean					
70. Vegetables (if any)					

3.5.2. Income from Livestock Production (1998 E.C)

Animal products	Harvest per week or season /year (#/litters/cup/jog)	
	Consumed	**Sold**
71. Milk		
72. Butter sale		
73. Cheese		
74. Calves born		
75. Goats		
76. Poultry		
77. Egg		
78. Cows		
79. Oxen		
80. Donkey		

81. Off - farm activities and non-farm income e.g. employment, business (specify): --------------
----
----

4. Institutional
4.1. Social participation.
In which of the following organization are you member and leader?

Organization	Member	Committee member	Leader	Purpose of joining social groups	Frequency of participation		
					W/ever conducted	Sometimes	Never
82. Idir/Afosha							
83. Iqub							
84. Religious club							
85. Irrigation association							
86. Marketing cooperative							
87. Union							
88.PA council							
89. District council							
90. School council							
91. Women group							
92. Frequency of involvement in meeting							
93. Others							

4.2. Access to credit.
Credit

Items	Source	Duration in months	Amount in Birr	Rate of interest	Time taken in Hrs	Problems
94. Feed						
95. Vet drugs						

96. Housing
con for sheep
and goats
97. Other
purpose

Perception about the importance of and access to credit
98. What is your perception about the importance of credit in small ruminant rearing?

1	2	3	4	5

  1= least important, 2= less important, 3=important, 4=more important,=highly important

4.3. Market and Marketing Issues

99. Do you have access to local market for shoat?
    Yes (1)   No (2)

100. How long does it take you to reach to the nearest market in walking hours?
----

101. What price do you get for fattened shoat?
----

102. Do you think it is fair?
    Yes (1)   No (2)

103. Do you have fattening inputs available in the market? (**Inputs: feed supplements, hay, forages, fodder plants**)
    Yes (1)   No (2)

104. If yes which input type is most frequently available?
----

105. Can you really bargain over the price of fattened shoats with (put in rank order 1st, 2nd)?
(a) Shoat collecting enterprises
(b) Local merchants
(c) Intermediate merchants (suppliers)
(d) Town dwellers
(e) Butchery owners

106. Who is more influential in determining the price of fattened shoats?

107. What about for inputs /**Inputs: feed supplements, hay, forages, fodder plants/**
 (Similar to question **106 and 107** above)

108. Did you see any agency involved in the fattened market activities?
    Yes ( )   No ( )

4.4. Extension approaches and Extension methods

109. Are you aware of any extension service particularly in relation to SR fattening technologies?
    Yes ( )   No( )

4.3.2. Participation in small ruminants' extension events over the two years.

No	Extension Events	Frequency of participation	Usefulness /importance	Why is it very important
110	Training			
111	Field days			
112	Demonstration			
113	Visits			
114	Meetings			

4.5. Contact with extension agents

115. Did you have one- to– one extension contact in the last one year?

( ) Yes   No ( )

116. If yes, what is the frequency of contact?

( ) Once in a week   ( ) Once in two weeks

( ) Once a month   ( ) Once in three months

117. If no, why? --
----

118. Sex of the extension agent making usual visits:

( ) Male   ( ) Female

119. Type of visit usually used by the extension agent

( ) Individual   ( ) Group   ( ) Both

120. Preference of farmer on the sex of extension agents making usual visits:

Male (Why):--

Female (Why):--

No preference (Why):--

121. Do you have any communication problem with the extension agent?

( ) Yes   ( ) No

122. If yes, what is the reason? --
----

123. The sources of information about small ruminant fattening you get:

( ) Through the extension agent   ( ) Through your contact farmer

( ) Through researchers   ( ) Through brochures news letters, etc,

( ) Through mass media (radio, television)   ( ) Others (specify):----------------------------
----

4.5. Types of extension message given by the agents:

124. Feed use   ( ) Yes   ( ) No

125. Maintaining health of animal   ( ) Yes   ( ) No

126. Improved breed(s) use   ( ) Yes   ( ) No

127. Shed and shelter building   ( ) Yes   ( ) No

128. Land use practices   ( ) Yes   ( ) No
129. Home economics   ( ) Yes   ( ) No
130. The use of appropriate technologies   ( ) Yes   ( ) No
131. With whom do extension agents often talk on the above issues?
( ) Male household member only   ( ) Female household member only
( ) Both male and female members
4.4.8. How often do you see the following information sources per season (fattening period)?

Agent	Rank of the source in order of importance	Frequency of contact (tick one)				
		Never	Rarely	Occasionally	once/twice per month)	more than once in a month
132.DA						
133.Fellow farmers						
134.Researchers						
135.Wereda council members						
136.PA council members						
137.NGO officials						
138.Coop, Union						

139. Do you have any comment about the existing small ruminants' extension system?
   ( ) Yes   ( ) No
140. Give reasons for either answer---

4.4.10. Training
141. Do you know the type of training given in small ruminant fattening?
   (   ) Yes   (   ) No
142. Have you been given any training?
   (   ) Yes   (   ) No
143. If, yes how many trainings do you take for the last two years?
---**144.**
What kinds of training did you take? --
----
145. Do you think that the training given to you is relevant to your production problem and production needs?
   (   ) Yes   (   ) No
146. Explain for both responses

----
147. Did the trainers have adequate preparation about the content they tought to you?
   (   ) Yes   (   ) No
148. How do the trainers teach the content of small ruminant fattening package in the village?

149. How information about the training came to you?--

4.5. Media access

4.5.1 How often do you make use of the following media facilities?

Mass media	Rank of the source in order of importance	Frequency of listening/reading/attending					
		Never	Rarely	Occasionally	Once or twice a month	Once or twice a week	Daily
150. Radio							
151. Television							
152. Print media							
153. Public meeting, market place, religious place							

154. To which radio program you listen most?

Lists of programs		Rank
Agricultural news	(1)	1st
News	(2)	2nd
Drama	(3)	3rd
Music	(4)	4th
General Knowledge	(5)	5th

155. If not agricultural program, why not?

4.6. Input availability

4.6.1. Perception of farmers on input availability

156. What do you think is the price of fattening inputs?

5	4	3	2	1
Very high	**High**	**medium**	**low**	**very low**

4.6.2. Distance to input market,

157. How far is the nearest in put market from your homestead?

158. How frequent do you go to market?

(   ) every two days in a week   (   ) once in fortnight

(   ) once every month   (   ) not at all

159. If the answer for the above question is not at all, specify the reason?

5. Adoption of fattening package

5.1. Adoption of breeds

160. Which animal breed do you normally rear?

Not applicable ( ) why--

Local breed ( ) which one? --

Crossbred ( ) which one? --

Pure improved breed ( ) which one? ---

161. Do you know the blood level of shoats?

       Yes   ( )   No ( )

162. If your answer is yes to **161**. What is the blood level of your goat/sheep (% exotic blood

level?)

>75%	very high	(5)
62.5-75	high	(4)
50-62.5%	Medium	(3)
40<50%	low	(2)
<40%	Very low	(1)

163. What is your source of breeding for shoat? --
----

5. 2. Adoption of feeds and feed supplement

Which feed do you normally feed your sheep and goats as supplement?

Feed items	Not at all	Rarely	Sometimes	Regularly some	Regularly all
164.Industrial by products (nuge cake, wheat bran, linseed cake)					
165.Feed processing plant products(balanced feed MUB,Pellete)					
166.Foragelegume(sesbania spp,Lucenia spp,cowpea,pigeon pea)					
Total Adoption score (to be calculated)					

5.3. Adoption of vet practices
5.3.1. Frequency of occurrence animal health problems (diseases, pests, parasites etc)

Health problems	Frequency			
Diseases	Quite often (Every month)	Sometimes(up to 6 month)	Rare(once in a year)	Never
167.Gurgursaa, PPR, CCPP				
168.Skin diseases				
169.Worms and parasites				

5.3.2. Use of Vet services

Vaccination and drugs	Frequency			
	Quite often (Every month	Sometimes(up to 6 month)	Rare(once in a year)	Never
170.CCPP				
171.Ovine pasturellosis				

172. Treatment for different health problems (bacterial, endo and ecto parasites….) specify----
----

5.4. Adoption of management practices

173. Which feeding practice you normally use when fattening sheep and goats

( ) cut and carry system for whole fattening period

( ) grazing in range land and on farm remnants

( ) grazing plus feeding supplements like MUB

( ) feeding fodder and forge spp by cut and carry feeding method

174. How much feed composition you feed to sheep and goat you fatten

( ) Donot know

( ) use their body weight as reference to limit the amount of feed

( ) every sheep and goat is provided equal amount without age consideration

175. How many times sheep and goats you fatten feed the available feed if they are under cut and carry system

( ) once per day   ( ) twice per day

( ) trice per day   ( ) once every two day

176. How long sheep and goats is fed during fattening

( ) two month   ( ) three month

( ) four month   ( ) five or six month

177. How much water should be given to fattened sheep and goat?

( ) one liter per day   ( ) two liters per day

( ) I usually give water in relation to what they feed on.

178. Shelter and shedding to fattened sheep and goat should be

( )   ( )

( )   ( )

179. Fattened sheep and goats are always checked against diseases and parasites

( ) traditionally knowledgeable people   ( ) by para vets only

( ) diagnosis in vet clincs   ( )

180. Fattened sheep and goats always kept under

( ) isolated from other herds   ( ) with big livestock ruminants

( ) kept in and around homestead in the day times ( ) I donot have any information

6. Attitude, perception and Knowledge

6.1. Attitude towards package

S.No	Statements	Ratings				
		SA	A	N	D	SD
181	Fattening package is very expensive and not rewarding as per the costs					
182	Fattening package helps to increase the income of farmers					
183	It is easy to use the fattening package by the farmers					
184	Using the fattening package to make the animals grow quickly is not good.					
185	If I use the fattening package, my animals will have good market demand.					
186	Fattening package will spoil the health of animals.					
187	To use fattening package, it demand more labor and effort and hence difficult.					
188	Fattening package is promoted to protect the interest of input sellers and not for farmers.					

6.2. Perception: risk orientation
6.2. 1. Risk Orientation
189. Small ruminants rearing is more risky than any other agricultural activities
( ) Yes   ( ) No
190. New technologies are always beneficial than traditional farming practices
( ) for crop technologies only   ( ) for animal technologies only
( ) Both are equally risky   ( ) not sure
191. Whenever I adopt recommended new technologies with purpose of getting profit with risks I always become successful.
( ) Yes   ( ) No
192. In small ruminant rearing practices when I take risks for myself I get successes?
( ) Yes   ( ) No
6.2.2. Perception

Items	Responses				
	Always True	Someti mes True	Undeci ded	Mostly incorrec t	Not at all
193.The fattening package is useful to improve the body size of animals.					
194.SRFP needs more use of inputs					
195.SRFP needs more cash investments					
196.SRFP demands careful attention by the farmers					
197.No special improved breed is available for fattening					
198.Hidhly nutritious feeds for fattening are not available					
199.Access to vet services as a part of SRFP is not available in villages					

6.3. Knowledge about the fattening package
S.No   Practices   Scores
                                                      Answer boxes

200   Name feed items
_____
_____
_____
_____
_____

201   Name atleast one feed supplement for fattening   _____
               (MUB,Salt,Cereals bran)
_____

202   Should feed be given in cut and carry system only   Yes
                                                                     No
203   Should supplement feed be given in exactly   Yes

	measured weight	No
204	Name the frequently available vaccine type in your village	

205   What is recommended for ectoparasites
206   What is recommended for endoparasites
207   Name maximum amount of water provided per day

7. Socio-psychological and socio-cultural
7.1. Social security and peace:
208. Do you see conflicts among villagers for resources such as grazing land, water ponds?
(   ) Yes   (   ) No

209. What is your stand in regard to the stability of this village security?
(   ) not secured   (   ) some times insecured   (   ) indifferent   (   ) some times free
(   ) always secured   (   ) no response
210. What is the major source of insecurity in your opinion in the village?
()   lack of feed resources
()   lack of watering points
()   religious difference
()   ethnic   difference
()   political difference
() others
7.2. Social network/learning:
211. Which source of information do you think knowledgeable?
(   ) friends   (   )   relatives   (   ) elder community members
(   ) religious leaders (   ) tale   (   ) youngsters   (   ) women groups
(   )   others
212. From which source do you take the information more reliable?
(   ) friends   (   )   relatives   (   ) elder community members
(   ) religious leaders (   ) tale   (   ) youngsters   (   ) women groups
(   )   others
213. Whom do you think is more influential in your life?
(   ) friends   (   )   relatives   (   ) elder community members
(   ) religious leaders (   ) tale   (   ) youngsters   (   ) women groups
(   )   others
214. How do you think that information flow in your village is fastest?
(   ) Discussion in families   (   ) Informal discussions among villagers
(   ) Formal discussions among villagers   (   ) Information told by religious Leaders
(   ) others
7.3. Communication:
215. Villagers are easily communicate with each other about
(   ) religion   (   ) politics   (   ) agricultural information
(   ) modern technologies (   ) market information (   ) others