PRODUCTION AND MARKETING SYSTEMS OF SHEEP AND GOATS IN ALABA, SOUTHERN ETHIOPIA

MSc THESIS

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UNIVERSITY OF HAWASSA, AWASSA

APRIL, 2007

PRODUCTION AND MARKETING SYSTEMS OF SHEEP AND GOATS IN ALABA, SOUTHERN ETHIOPIA

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A THESIS SUBMITTED TO THE
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APRIL, 2007

APPROVAL SHEET 1 OF THE THESIS

SCHOOL OF GRADUATE STUDIES

HAWASSA UNIVERSITY

This is to certify that the thesis entitled *Production and Marketing Systems of Sheep and Goats in Alaba, Southern Ethiopia,* submitted in partial fulfillment of the requirements for the degree of masters of sciences in Animal Sciences with specialization in Animal Production of the graduate program of the Department of Animal and Range Sciences, Awassa college of Agriculture, and is a record of original research carried out by Tsedeke Kocho Ketema ID No AWR/3007/97 under my supervision, and no part of the thesis has been submitted for any other degree or diploma.

The assistance and help received during the course of this investigation have been duly acknowledged. Therefore I recommend that it be accepted as fulfilling the thesis requirements.

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APPROVAL SHEET 2 OF THE THESIS

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We, the undersigned members of the Board of Examiners of the final open defense, by Tsedeke Kocho Ketema have read and evaluated his thesis entitled "Production and Marketing Systems of Sheep and Goats in Alaba, Southern Ethiopia" and examined the candidate. This is therefore to certify that the thesis has been accepted in partial fulfillment of the requirements for the degree of: Master of Science in Animal Sciences with specialization in Animal Production, Awassa College of Agriculture.

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Final approval and acceptance of the thesis is contingent upon the submission of the final copy of the thesis to the Council of Graduate Studies (CGS) through the Department Graduate Committee (DGC) of the candidate's major department.

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DECLARATION

I declare that this thesis is my original work and that all sources of material that are used for this thesis have been duly acknowledged. This thesis have submitted in partial fulfillment of the requirements for an MSc degree at the University of Hawassa and is deposited at the 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 anywhere for the awards of any academic degree, diploma, or certificate.

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To my wholehearted uncle,

Paulos Dilbo

Whose incessant support, adore, care, schooling and fulfilling all my desires beyond his capability shaped my life and enabled me to contribute this to farmers akin our family.

LIST OF ACRONYMS/ABBREVATIONS

ATVET = Agricultural Technical, Vocational and Educational Training colleges
ANOVA = Analysis of Variances
CACC = Central Agricultural Census Commission
CCPP = Contagious Caprine Pleuropneumonia
Cm = Centimeter
CSA = Central Statistical Authority
DA = Development Agents
EARO = Ethiopian Agricultural Research Organization
FAO = Food and Agriculture Organization of the United Nations, Rome
GDP = Gross Domestic Product
GOs = Governmental Organizations
GIS = Geographical Information System
GPS = Geographical Positioning System
Ha = Hectare
Hrs = Hours
ILCA = International Livestock Center for Africa, Addis Ababa, Ethiopia
ILRI = International Livestock Research Institute, Nairobi, Kenya
IPMS = Improving Productivity and Market Success of Ethiopian Farmers
Kg = Kilogram
LW = Liveweight
M a.s.l. = Meters above sea level
MoA = Ministry of Agriculture of the Ethiopian Government
MT = Metric Tones (MT)
NGOs = Non Governmental Organizations
OoARD = Office of Agriculture and Rural Development (Alaba Special Woreda)
PLW = Pilot Learning Woreda
RMA = Rapid Market Appraisals
SARI = Southern Agricultural Research Institute
SNNPRS = Southern Nations Nationalities and Peoples Regional State
SPSS = Statistical Package for Social Sciences
TLU = Tropical Livestock Unit (an animal of 250 kg LW)
UNIDO = United Nations Industrial Development Organization
UH = University of Hawassa
US$ = United States (US) Dollar

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PRODUCTION AND MARKETING SYSTEMS OF SHEEP AND GOATS IN ALABA, SOUTHERN ETHIOPIA

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ABSTRACT

This study has undertaken to describe the sheep and goat production and marketing systems and identify constraints to and improvement options for smallholder farms of Alaba, southern Ethiopia. Results are based on survey of 150 sample households and rapid appraisal of major sheep and goat markets. Flock distribution and holdings in different parts of the woreda vary and thus the study sites were stratified into mixed sheep-goat flock, goat dominating and sheep dominating sites. Average family size of the study area was 6.7. Literacy of household heads accounts 30%. Across the sites, mean holdings of total land, grazing land, cattle, sheep, goat and equine numbers varied significantly ($P<0.05$) with the goat dominating site having higher values) than the others. With respect to livestock holdings above half of the total TLU was recorded in goat dominant site. The mean holding of 7.4 sheep ($P<0.05$) and 11.5 goats ($P<0.05$), respectively are higher in sheep and goat dominating sites. Sheep and goats are primarily kept for sale to generate cash and majorities (98.9%) of goat owners extensively milk their flock for household consumption. Sucking young (22.8% lambs; 26.7% kids) and breeding female (39.3% ewes; 39.4% does) dominate the flock. Respondents reported that grazing on crop stubble (13.4%), private pastures (13.3%) and road sides (13.2%), weeds (11.6%), tillers and fillers (8.9%) from crop fields, cut-and-carry of browse species and grasses (9.1%) and communal pastures (9.4%) are major feedstuffs of sheep and goats. Flock water are largely comes from rivers (Bilate and Dijo) (55.2%), artificial ponds (21.9%), trough and harvested water. Diseases and parasites cause significant ($P<0.05$) losses of flocks (34.6%). Rate of loss is higher in young (35.0% lambs; 35.5% in kids) and mothers (42.9% in ewes; 30.6% in does). Losses by predators is noticeably higher ($P<0.05$) in goat dominating site. Body conformation, physical characteristics (coat color, horn and tail), known local ecotypes and age are the major criteria household considers in selecting sheep and goats for castration and fattening. Smallholder farmers make fattening management targeting the seasonal holiday markets. Major destination of fattened flocks is the Addis Ababa market while young flocks to the export abattoirs. Addis Ababa consumers demonstrated high preferences to animals from study areas and evidently pay higher prices. This is largely exploitable opportunity for development of smallholder sheep and goat production. Flock production is constrained by outbreaks of disease and parasite, predators, feed and water shortage, lack of production technology and seasonality of markets. Interventions covering flock health, feed production and managements, water development, marketing, credits to build flock holdings, and extension supports delivering the necessary training and production technologies/inputs could help farmers to built their flock and improve productivity.

KEY WORDS: Sheep, Goats, Smallholder farmers, Production systems, Marketing systems, Constraints, Improvement options, Alaba, Southern Ethiopia

1. INTRODUCTION

Ethiopia's vast sheep and goat population, estimated at 24 million and 22.3 million heads, respectively (CSA, 2004) is found widely distributed across the different agro-ecological zones of the country (EARO, 2000; Kassahun, 2004). Sheep and goats are owned by smallholder farmers as an integral part of the livestock sub-sector (Tekelye and Kasali, 1992; Workneh, 2000), and contribute to both subsistence and cash income generation (Shapiro, 1991; EARO, 2000; Ehui *et al.,* 2000).

The human population density of SNNPR ranges from 4 to 9000 persons per km^2 and is often cited as the most densely populated area of the country. Half of the total population is confined in the mid-and high-altitudes which comprise only 2.82% of the total regional land area. Diverse and huge numbers of livestock with density up to 420 TLU/Km^2 are also confined in mid-and high-altitudes. Areas with high human and livestock population density practiced intensive cultivation in which land for livestock is scarce (Regional Atlas, 2004). As a result, grazing land occupies only about 13.3 percent of total land area (CACC, 2003).

As population pressure increases further and farm sizes decrease, the role of large ruminants reduces and small ruminants that constitute less competition for arable land predominate (Jahnke, 1982). Sheep and goats, kept in the vast geographical locations, diverse socio-economic and cultural settings and a range of farming practices in the SNNPR play immense role in the livelihoods of rural farms.

The lack of up-to-date and location-specific information on production and marketing systems is often a major limitation to productivity and production improvement endeavors in sheep and

goats (Peters and Horpew, 1989; Ayele *et al.*, 2003). To design improvement measures relevant to specific systems and thereby properly respond to the growing domestic and foreign sheep and goats requirements, systematic description of the production and marketing systems is indispensable.

Alaba Special Woreda is one of the PLWs (Pilot Learning Woreda) of the IPMS (Improving Productivity and Market Success) project (IPMS, 2005). The woreda has immense sheep and goat population potential which is considerably higher than flocks in adjacent woredas (Appendix 12) (CACC, 2003). The adjacent Badawacho and Kedida Gemila woredas are remarkably known in sheep fattening and marketing. In Alaba, sheep and goats production is an integral part of the farming systems and provides enormous contribution to the livelihood of the smallholder farmers. Next to chicken, sheep and goats are the most important marketable livestock. Thus, IPMS and the woreda OoARD have identified sheep and goats as potential and priority commodity for improvement. However, information on the smallholder sheep and goat production situations, marketing systems, production constraints, opportunities and improvement options which are required for appropriate intervention are not available.

The main objective of this study was, therefore, to investigate the prevailing smallholder sheep and goat production and marketing systems with the specific objectives:-

- To assess the smallholder sheep and goat production system
- To describe the sheep and goats and their skin marketing system
- To identify sheep and goat production and marketing constraints and improvement options

2. REVIEW OF LITERATURE

2.1 Population and genetic diversity of sheep and goats in Ethiopia

Domestic sheep (*Ovis aries*) and goats (*Capra hiricus*) are the first ruminants to be domesticated between 10,000 and 6,000 BC in Southwestern Asia (Iran and Iraq). Ethiopia has long been recognized as a gateway of genetic material from Asia to Africa, and its diverse ecology served to further diversify and develop the genotypes it received (IBC, 2004). The sheep and goat population of Ethiopia estimated at 24 million and 22.3 million, respectively (CSA, 2004) is one of the largest and most diverse in Africa (EARO, 2000; Workneh *et al.,* 2004; Getinet *et al.,* 2005). Sheep and goats, maintained virtually under the traditional subsistence oriented management systems, constitute an important livestock component in all ecological zones and agricultural systems in the country (EARO 2000; CACC, 2003).

In a national systematic breed survey, 11 phenotypically distinct indigenous goats (FARM Africa, 1996) and 14 sheep (IBC, 2004; Workneh *et al*., 2004) populations have been identified based on a combination of their morphological appearance and management systems. Molecular characterization based on the traditionally recognized populations using microsatellite reported eight goats (Tesfaye *et al.,* 2006) and nine sheep (Solomon, 2006) separate genetic entities or breeds in the country.

Indigenous sheep and goat genetic resources have developed specific adaptations to survive and produce under adverse local environmental conditions (climatic stresses, poor quality feed, seasonal feed and water shortage, endemic disease and parasite challenge) that make them suitable for use in the traditional, low-external-input production system (IBC, 2004).

2.2 Importance of sheep and goat in smallholder systems

Sheep and goats are widely distributed and adapted to a wide range of environmental diversity (EARO, 2000; Ibrahim, 1998). They are of great importance as major sources of livelihood (Tembely, 1998) and contribute to the sustenance of landless, smallholder and marginal farmers (Adugna, 1998) especially to the poor in the rural areas throughout the developing countries (Devendra and Burns, 1983). Sheep and goats are very important for resource-poor smallholder systems of rural Ethiopia due to their ease of management and significant role in provision of food (protein, essential micro-nutrients: vitamin A, iodine, and iron) and generation of cash income (Zelalem and Fletcher, 1993; Baars, 1998; Workneh, 1999; EARO 2000; Ewnetu *et al.*, 2006). They serve as a living bank for many farmers, closely linked to the social and cultural life of resource poor farmers (Workneh, 2000) and provide security in bad crop years (Ehui *et al.* 2000).

2.2.1 Special features of sheep and goats

Sheep and goats are highly adaptable to a broad range of environments. Certain breeds of sheep and goats are tolerant to diseases and parasites such as helminthosis (Rege, 1993). Sheep and goats have short generation cycles and high reproductive rates which lead to high production efficiency. Goats are more effective at grazing selectively and the efficiency of converting feed into milk is higher than in other dairy animals (Winrock International, 1976 cited in Rege, 1993).

In smallholder production systems, sheep and goats are important as they require low initial capital and maintenance costs, are able to use marginal land, produce milk and meat in readily

usable quantities, and easily cared for by most family members including women and children (Ibrahim, 1998; Sinn *et al*., 1999). Small ruminants are prolific and need only short periods to increase flock sizes after catastrophes or in periods of high prices and thus off-take rate can respond to price increases (Ngategize, 1989).

The small size of sheep and goats has distinct economic, managerial, and biological advantages. Low individual values mean a small initial investment and correspondingly small risk of loss by individual deaths. They occupy little housing space, lower feed requirements, and supply both meat and milk in quantities suitable for immediate family consumption, which is important in view of lack of means of preservation (Ibrahim, 1998). For similar reasons, Dinksew and Girma (2000) reported that sheep production is becoming a viable alternative for urban production considered as a means to fulfill parts of home consumption and income needs during severe shortage of cash.

2.2.2 Contribution of sheep and goats to food security and household economy

In terms of Tropical Ruminant Livestock Unit, sheep and goats represent only 13% of the estimated total Ethiopian ruminant livestock population but contribute highly significant product (EARO, 2000). Sheep and goats provide about 12% of the value of livestock products consumed and 48% of the cash income generated at farm level, 46% of the value of national meat production, 25% of the domestic meat consumption with production surplus, 58% of the value of hide and skin production, 40% of fresh skins and hides production and 92% of the value of semi-processed skins and hides (ILCA 1993; Zelalem and Fletcher, 1993).

The annual national mutton and goat meat production is 78 and 62 thousand MT, respectively, largely because of the high average off take rates estimated to be about 35% for sheep and 38% for goats (Workneh, 2006). Sheep and goats, respectively, contribute some 20.9% and 16.8% of the total ruminant livestock meat output or about 13.9% and 11.2% of the total domestic meat production, with a live animal and chilled meat export surpluses. Per capita consumption of sheep and goat meat (kg/person per year) in Ethiopia is 2.1 kg (EARO, 2000). The share of small ruminants to the total milk output is estimated at 16.7% with the major production coming from goats (ILCA, 1991).

From the total 14 million sheep and 13 million goat skins produced annually, 95% of the sheep and 70% of the goatskin is recovered at the market (Zewdu, 1998; Ahmed, 2000). Sheep and goats skin together make about 40% of the total fresh skin and hides production and 92% of the value of semi-processed skins and hides export trade (Zewdu, 1998; Ahmed, 2000). The export value of sheep/lamb skins during 1995-1996 amounted to be about 82 million US$ (EARO, 2000). The total export value from small ruminants in the form of meat and live animals during a 2 years period (1995-1996) is estimated to be about 4.6 million US$. Manure of sheep and goats is mostly dried and used primarily for household fuel or sold for cash on the market and to a lesser extent to fertilize cropland (EARO, 2000).

Farmers use sheep and goats as savings that generate cash when the environment is harsh, e.g. during drought years and are sold to raise money to replace large ruminants lost during droughts (spreading risk). Sheep and goats also meet social and cultural needs (e.g. payment of dowry, celebrations and gifts to family members) (Ibrahim, 1998). Sheep and goats are considered as investment and insurance to provide income to meet seasonal purchases of food,

improved seed, fertilizer and medicine during seasons of crop failure and drastic drop of crop prices for rural households (Berhanu, 1998). Given these advantages sheep and goats are found in many smallholder settings as an integral component of the farming system (Ngategize, 1989) enhancing the sustainability of the system (Ibrahim, 1998).

2.3 Performances of smallholder sheep and goat production

Collecting and analyzing data on economically important performance traits and management practices under defined production conditions makes it possible to identify production prospects, as well as different management variables and their effects on the production process (Peters and Horpew, 1989). The testing of innovation and monitoring on farms requires the description of existing management practices, ownership patterns and estimation, in general terms, of flock structure, reproductive and productive parameters (Agyemang *et al*., 1985; Woubshet and Anderson, 1990).

2.3.1 Small ruminant production system

Livestock production system and the relative importance and potential for increased production by livestock species in varied areas differ markedly due to differences in resource endowment, climate, population, disease incidence, level of economic development, research support and government economic policies (Beets *et al.*, 1990). In Ethiopia, sheep and goats are maintained under two broad production systems (Tembely, 1998; EARO, 2000).

2.3.1.2 Mixed crop-livestock farming system

In the central highlands of Ethiopia small ruminants depend mostly on grazing fallow lands, overgrazed natural pasture and crop residues usually with no extra-supplement and receive minimum health care. Farmers maintain one to three rams (depending on the size of the flock) for year round breeding (Tembely, 1998). Productivity is low and is under nutritional stress for much of the year due to cropping intensity. Sheep carry heavy internal and external parasite burdens (EARO, 2000).

2.3.1.2 Agro pastoral and pastoral system

Small ruminant production is associated with the purely livestock based nomadic and transhumance pastoral production systems based largely on range, primarily using natural vegetation. In the lowlands of Ethiopia, livestock is comprised of large flocks and herds of sheep and goats, cattle and camels mainly transhumants, where only surplus are sold at local markets or trekked to major consumption centers. Extensive livestock keeping is the backbone of the economies of the lowlands (Tembely, 1998; EARO, 2000).

2.3.2 Flock productivity

Livestock production system in Ethiopia is generally subsistence-oriented and productivity of small ruminants is very low. Reproductive performance is generally low with annual lambing and kidding rates of 1.2 for ewes and 1.5 for does. Growth rate in indigenous sheep and goats is low and drops dramatically from about 100g/day at the earlier stage of growth to less than 50g/day after weaning (EARO, 2000). Caracas weight of small ruminants is on average 10 kg with annual meat production barely more than 3-3.5 kg/year/animal (EARO, 2000). The major

cause for the low meat yield is the slaughter of immature animals with low body weights; estimated at about 18-20 kg for sheep and 16-18 kg for goats. The average annual growth rate in the population and meat yield of small ruminants has remained stagnant over the years. Annual milk production from indigenous goats is 149 thousand tones (ILRI, 2000) with less than 0.5 kg/day/animal during early lactations (EARO, 2000). Per capita consumption of sheep and goat meat is 2.8 kg/person per year with annual growth rates with declining rates of -2.77 (ILRI, 2000).

2.4 Description of smallholder sheep and goat production system

The performance of the livestock sector in Africa has been poor due to failure to design projects and technologies widely applicable to the problems commonly confronted (ILCA, 1990). This basically stemmed from failure to understand the situation of the small farmer/pastoralist. The knowledge of the factors which influence production decisions at the farm level has been inadequate. Description of the production systems is useful in the design of development strategies, in particular for identifying target populations and priorities and opportunities for development (Fernandez-Rivera *et al.,* 2004).

Attempts to improve the prevailing animal husbandry systems in the rural settings necessitate a better understanding of the components of the production systems and its operations, the present limitation, potentially feasible improvements and the opportunities to develop more productive system (Adugna, 1998). A detailed comprehensive database on traditional smallholder animal enterprises, aspects of the household, animal management and husbandry practices, the constraints to production and the interaction of animal farming with other

farming activities would help to identify the major gap to be filled by research, extension and other animal development projects (Woubshet and Anderson, 1990; Berhanu, 1998).

Development strategies should be geared to address farmers' real problems and constraints to help them expand their production and attain self-sufficiency. This, in turn, requires careful and detailed analysis and understanding of farmers' circumstances and practices before carrying out development activity (Berhanu, 1998; Abebe *et al.,* 2000). This, unlike the *one-size-fits-all* strategy (Ehui *et al.,* 2002), provides information on location-specific production conditions and improvement options appropriate to particular systems (Peters and Horpew, 1989; Abebe *et al.,* 2000).

2.5 Sheep and goat marketing system

Marketing includes moving products from producers to consumers and comprises exchange activities of buying and selling, the physical activities designed to give the product increased time, place and form utility, and the associated functions of financing, risk bearing and dissemination of information to participants in the marketing process (Jabbar *et al*., 1997). Livestock marketing involves the sale, purchase or exchange of products such as live animals, and livestock products of milk, meat, skins, wool and hides for cash or goods in kind (ILCA, 1990).

The ultimate goal of interventions aimed at enhancing productivity of sheep and goats needs to consider the market aspect simultaneously (Andargachew and Ray, 1992). Farmers need to be aware of the preferred characteristics of animals as well as price patterns so that they can plan breeding and fattening programmes and breed selection consistent with the best seasonal prices

and consumers' preferences (Peters and Horpew, 1989; Ehui *et al.,* 2000). Alleviating constraints to the export market and domestic trade and market structure increases the welfare of smallholder producers, urban consumers and improves the national balance of payments (Ayele *et al*., 2003).

Population growth, urbanization and income growth fuel increases in meat and milk consumption and create a veritable *Livestock Revolution* (Delgado *et al.,* 1999). This revolution presents new and expanding market opportunities for smallholder livestock producers (Lapar *et al.,* 2002). On the other hand, whether smallholders are able to participate and compete in the domestic and global markets is a critical question (Lapar *et al*., 2002).

Potential production and market opportunities for small ruminant meat have not been exploited because of scant knowledge of small ruminant demand patterns (Ehui *et al.,* 2000). An important aspect of production and its response to demand and supply is knowledge of markets and marketing systems. To shift production from subsistence to a more commercial outlook is especially important to describe and intervening aspects of marketing infrastructure and facilities, market channels and outlets, buyer preferences for live animals and their meats, major market players, government intervention and role of the private sector (Devendra, 2007).

2.5.1 Structure and performance of small ruminant markets

According to Ayele *et al.* (2003) the livestock marketing structure of Ethiopia follows a four-tier system (Figure 1). The main actors of the 1st tier are local farmers and rural traders/rural assemblers who transact at farm level. Those small traders from different corners bring their

animals to the local market (2nd tier). Traders/wholesalers purchase a few large animals or a fairly large number of small animals for selling to the secondary markets. In the secondary market (3rd tier), both smaller and larger traders operate and traders (wholesalers or retailers) and butchers from terminal markets come to buy animals. In the terminal markets (4th tier), big traders and butcher (wholesalers or retailers) transact larger number of mainly slaughter type animals. Consumers get meat through purchase of the animals from terminal markets and slaughters at home or they may get meat from markets or they may access from butchers who process the meat via abattoirs.

Livestock markets are generally under the control of local authorities. Market locations in primary and secondary markets are usually not fenced; there are no permanent animal routes and no feed and watering infrastructures. Yet buyers and sellers are subjected to various service charges by the local authorities as well as other bodies (Ayele *et al*., 2003).

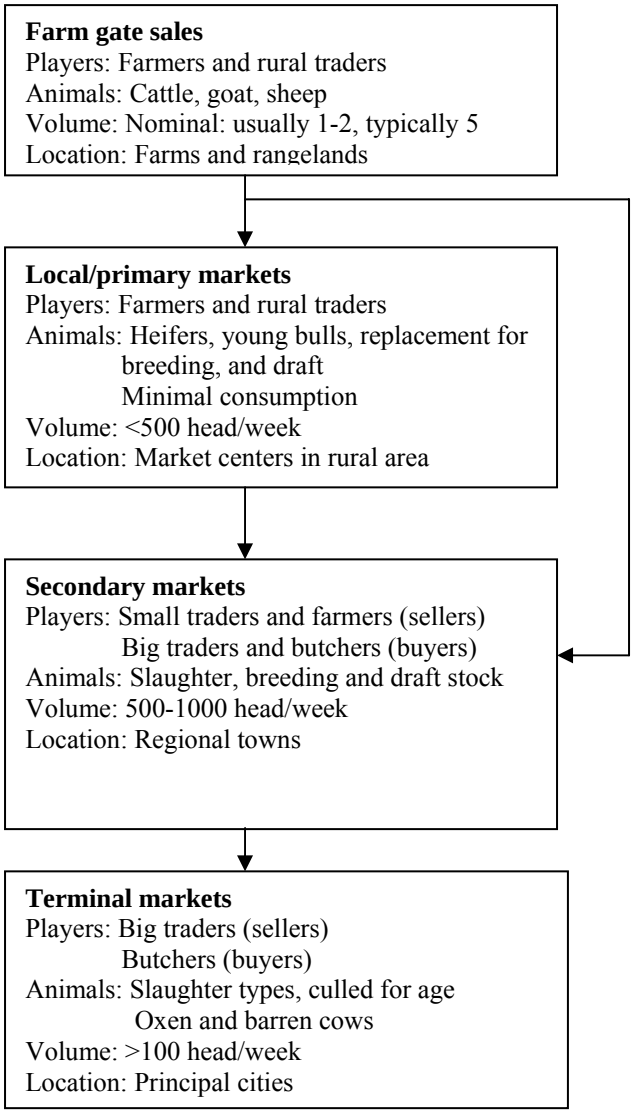
Market information is crucial to producers, wholesalers and consumers to help them make decisions on what and whether to buy and sell. In general, information is required on prices, traded or available quantities, forecasts of future supplies and demand, and general market conditions. Information must be relevant, accurate and timely and reflect all sectors of the market, especially consumer demand (ILRI, 1995). Nearly in all parts of the country, there is no regular market information on prices and supplies, nor formalized grades and standards of sheep and goats and other livestock (Kebede and Ray, 1992; Ayele *et al*., 2003). Markets are dispersed with remote markets lacking price information. Generally, there is excess supply of animals beyond demands which effectively suppresses producer prices since the more mobile

trader is better informed on market prices, while better information combined with excess supply places the trader in a better position during price negotiation.

Livestock are generally traded by ‘eye-ball’ pricing, and weighing livestock is uncommon. Animals are sold on a per-head basis and price agreement reached by a long one-on-one bargaining between a seller and a buyer. Under such circumstances, prices paid will reflect buyers' preference for various animal characteristics (weight, sex, age, condition, breed, color), the purpose of animals purchased (for resale, slaughter, fattening or reproduction), the season of the year (occurrence of religious and cultural festivals) and the bargaining skills of buyers and sellers (Kebede and Ray, 1992; Jabbar, 1998; EARO, 2000; Ehui *et al.,* 2000; Ayele *et al*., 2003).

Marketing of sheep and goats is characterized by strong seasonality and subject to fluctuation. Demand and price increases during festival periods. Factors affecting market supply, as measured by the number offered, include high demand during religious festivals, lambing season, quality and quantity of grazing, as well as cash needs for crop inputs and, later, for food purchase before harvesting (EARO, 2000).

It is essential to consider linking production, products and by-products to markets in the context of the production to consumption systems in the 'food or commodity system framework' or commodity production and marketing chain (Schaffer, 1973 and 1980 cited in Jabbar *et al*., 1997; Devendra, 2007). Recognition of this chain ensures promotion of the interdependence between the production resources, producer, processor and consumer (Jabbar *et al*., 1997; Devendra, 2007). Associated with the production to consumption markets is the need for a proactive agribusiness orientation (Devendra, 2007).



Source: Ayele *et al.* (2003)

Figure 1: *Typical Ethiopian livestock market structure.*

2.5.2 Marketing of small ruminant skins

In a production to consumption chain, attention also needs to be given to by-products (skins) from meat production that have considerable economic value, but their collection, processing and use are underestimated (Devendra, 2007). The livestock sub sector in Ethiopia makes a significant contribution to export earnings-second only to coffee largely earned from hides and skins, and leather (Steele, 1998; Zewdu, 1998) with the current development scenario in the country. However, this trend might have changed and up-to-date statistics is not available.

Based on annual off-take rates of 30% for sheep and 36% for goats the potential of sheepskins and goatskins production in 1998/99 is estimated to be 14 and 13 million US$, respectively (ILRI, 2000). With the existing extensive network of traders and sub-agents of hides and skins marketing system in Ethiopia (Zewdu, 1998), the amount of skins actually reaching the central market and, eventually the tanneries, is reduced by about 5-10% for sheepskins and about 30-40% for goatskin (Zewdu, 1998; Ahmed, 2000).

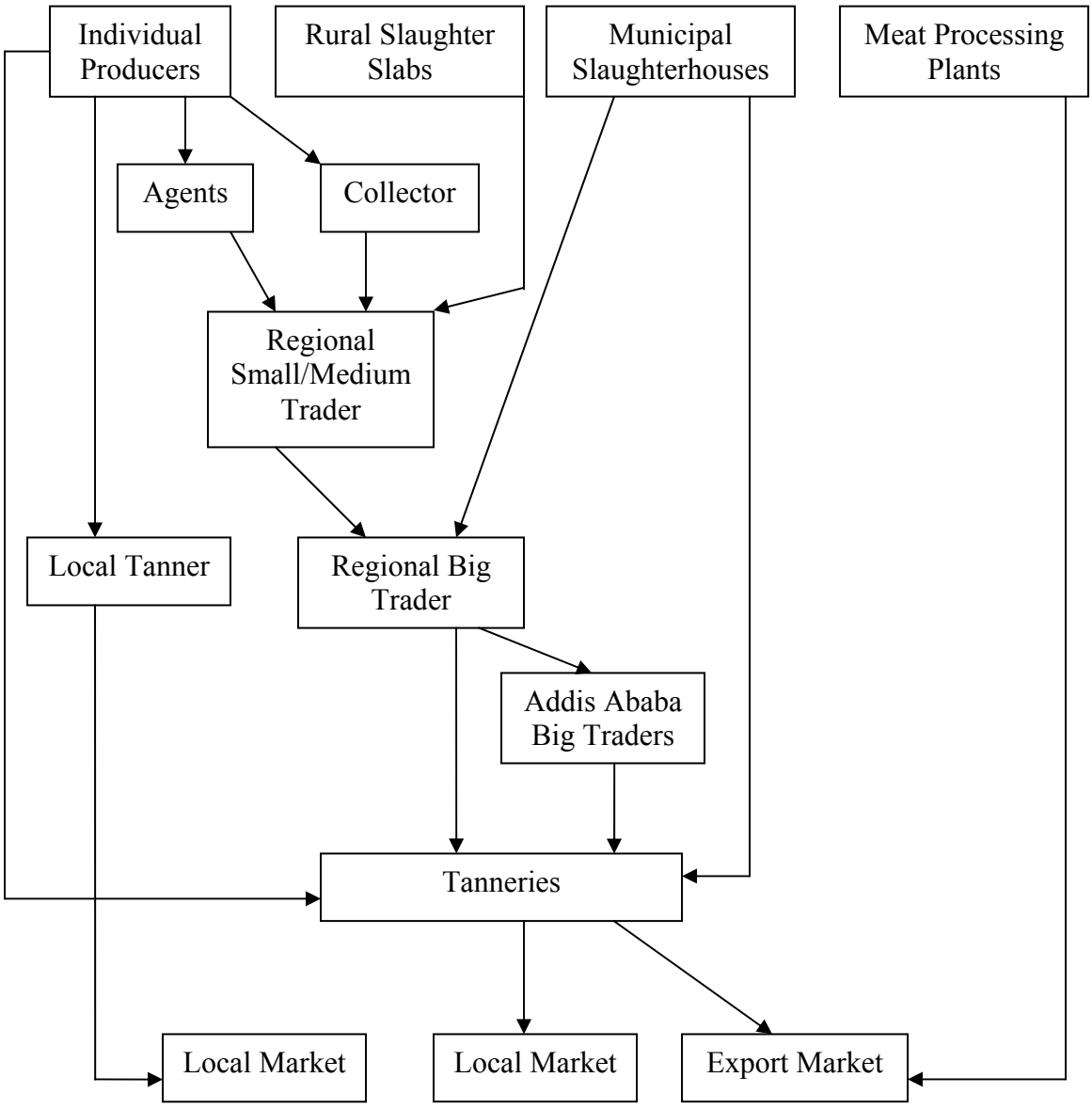
The raw material for the leather industry is mainly derived from local areas of the country where basic amenities for slaughtering (slaughtering, ripping and flaying procedures) and subsequent marketing are either non-existent or limited. Additional sources include slaughter slabs, municipal slaughterhouse, the limited number of export abattoirs, and meat product processing plants (Zewdu, 1998; Ahmed, 2000).

The lacks of price incentive to the primary producer, illegal cross-border trade, and competition from rural tanners are impediments to the improvement of hides and skins collection and quality. Defects including flay-cuts, putrification, improper shape, branding,

scratches, diseases and parasites, as well as storage and transport conditions, down-grade the quality of the raw material. Subsequently, the leather and leather products are also affected with the ultimate depressing effect on prices obtained locally as well as on the export market (Zewdu, 1998; Ahmed, 2000).

The marketing of skins starts at the producer/consumer level and passes through a chain of middlemen until it reaches the tanneries (Ahmed, 2000) (Figure 2). The marketing chain is principal from primary producer (rural farmer and pastoralist) to rural markets; to small dealers and agents/collectors; to town traders and shed owners (where the hides and skins are frame-dried and/or wet-salted); to the big traders in Addis Ababa and finally to tanneries (Zewdu, 1998; Ahmed, 2000).

The tanneries can be supplied directly from the slaughter premises, regional big traders or Addis Ababa big traders as well. The tanneries process the skin received from their suppliers either in the green (fresh), air-dried or wet salted states to semi-finished or finished stages for both local and exports markets (Ahmed, 2000).



Source: Ahmed (2000).

Figure 2: *Market channel of hides and skin in Ethiopia.*

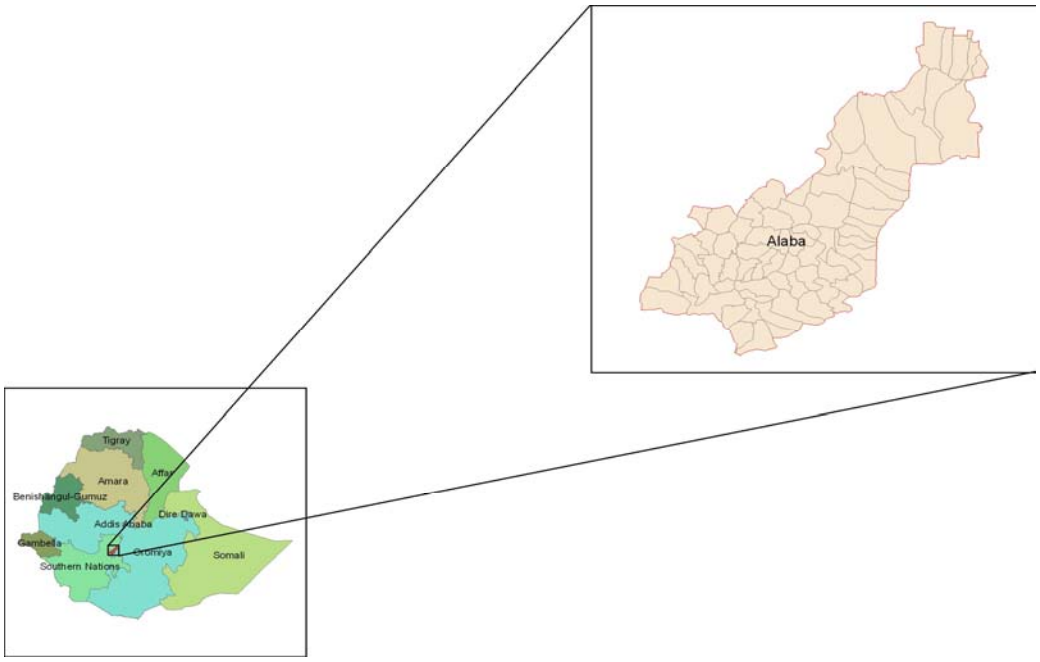
3. MATERIALS AND METHODS

3.1 Description of the study area

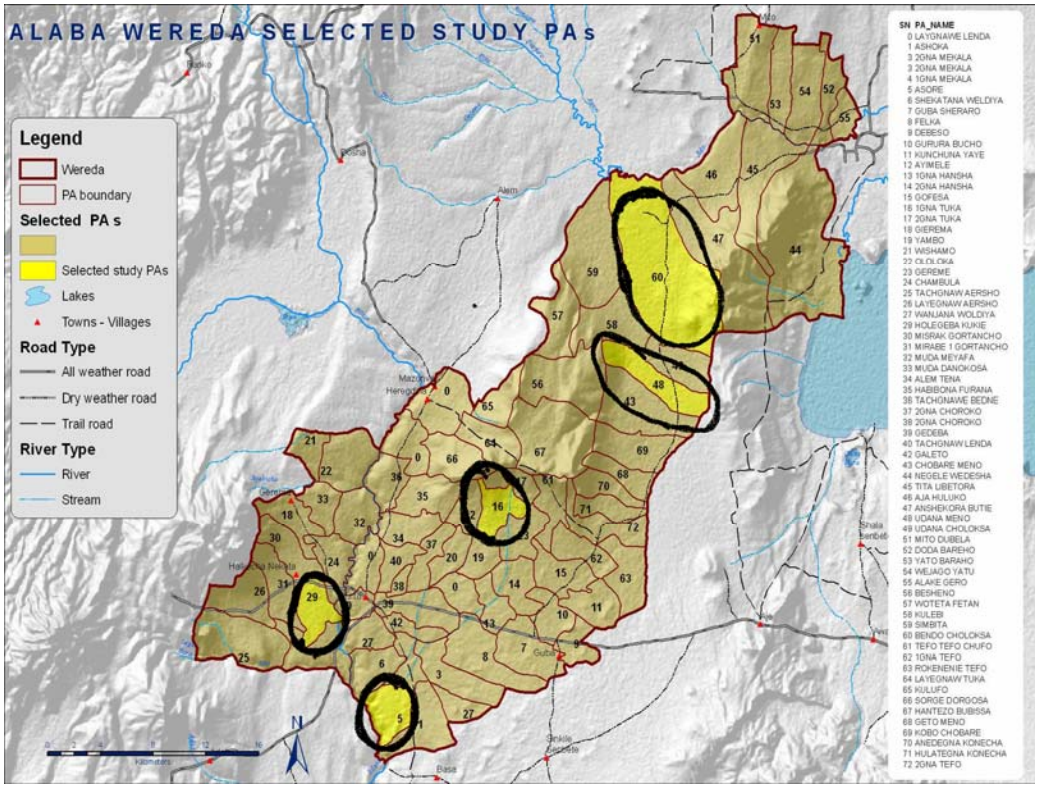
The study was conducted in Alaba Special Woreda (SNNPRS) is located 310 km south of Addis Ababa and 85 km southwest of Awassa, the regional capital (Figure 3). The woreda is located in 7° 17' N latitude and 38°06' E longitude. Altitude of the woreda ranges from 1554 to 2149 m a.s.l with majority found at about 1800 m a.s.l. Except for few hills, the woreda has suitable land for agriculture in terms of topography.

Agro-ecology of the woreda is classified as dry to moist *weina dega*. The annual rainfall varies from 857 to 1085 mm and occurs in a bimodal pattern with small rains between March and April and main rains from July to September. The annual mean temperature varies from 17 ^{0}C to 20 ^{0}C with a mean of 18 ^{0}C. The major soil types are Anosol (ferralic), Andosol (orthic), Chromic Luvisols (orthic), Phaeozem (orthic) and Solonchak (orthic) (IPMS, 2005).

The woreda consists of 73 rural and 2 urban Kebeles. The total human population of the woreda (in 2004/05) was 210,243 with 49.7% male and 50.3% female (IPMS, 2005). The total number of rural households of the woreda is 35,719 among which 75% are men and 25% are women headed. The total land area is 64,116.25 ha; out of these 75% is suitable for agriculture. Land use of woreda shows 68.7% arable land, 6.7% grazing land, 7.2% forest, 5.7% potentially cultivable, 4.4% uncultivable land (hills) and 7.3% others.



Map of Alaba Special Woreda



Study Kebeles (encircled)

Figure 3: *The location of Alaba Special Woreda and studied Kebeles.*

3.2 Agricultural production and vegetation of the area

Altitude, vegetation and soil of the woreda are fairly uniform and thus the use of these factors to distinguish sub-farming systems in the woreda is not applicable. On the other hand, the types of crops and livestock species differ in different parts of the woreda and this feature was used to distinguish the sub-farming systems in the woreda. Accordingly, two farming systems vis-à-vis the tef/haricot bean/livestock (43 rural Kebeles) and the pepper/livestock farming system (30 rural Kebeles) were identified. Tef, haricot bean, sheep and cattle in the tef/haricot bean/livestock system and pepper, wheat, goats, honey and cattle in the pepper/livestock system were the dominant agricultural commodities produced and marketed (IPMS, 2005).

Maize, tef, wheat, pepper, haricot bean, sorghum and millet are major crops grown in the *Meher* (March and April) and *Belg* (July to September) two cropping calendars. Cropping totally depends on rainfall. On the other hand, the amount and reliability of rainfall in the woreda is low and it is a major limiting factor for agricultural production. Due to the erratic nature of rainfall, crops mostly fail in particular during the main planting season (*Meher*). Crop failures occur almost every three years and the woreda is one of the most drought affected areas in the region (IPMS, 2005).

Considerable sizes of animals are kept by smallholder farmers providing draught power, income, food, manure, saving, and soci-economic functions. According to the recent CACC (2003) census report, there are 161,566 cattle, 34,760 sheep, 43,141 goats, 2,583 horses, 27,661 donkeys, 2,346 mules, 221,342 poultry and 14,690 beehives in the woreda (Appendix Table 12). Oxen are the major source of draught power. Use of donkey for transport of water

and farm goods is very common. Sheep and goats are an integral part of livestock playing versatile roles in the smallholder systems. Animals kept are mostly indigenous breeds and animals with exotic bloods constitute s few cross breed cattle (Holstein Friesian and Jersey crosses) in urban and peri-urban dairying systems and exotic chicken distributed by OoARD. Livestock are reared under extensive management and productivity is substantially low.

Vegetation cover of the woreda is low. Consequently, erosion hazards in the sloppy areas are enormous. Some efforts of soil and water conservation over the last twenty years were unsuccessful because of human intervention and unfavorable soil environments. The commonly observed permanent tree species in the area includes Acacia species, *Cordia africana*, Croton species and Eucalyptus species. These tree species are observed throughout the woreda standing in a scattered pattern.

3.3 Sampling procedure

Prior to the main sampling attempt, discussions were held with woreda livestock experts to make clear the purpose of the study and collaborations during the study. Expert consultation and field visits were also made to select the study Kebeles. In addition, secondary data on socio-economic characteristics, agricultural production, livestock population, farming practices and description of the woreda were collected from published and unpublished sources, so as to device suitable sampling stages.

A stratified sampling technique was employed during the study and Kebeles in the woreda were stratified on the type of crop/livestock production system as well as sheep and goat flock distributions.

Accordingly, based on the flock distribution, the study areas were stratified into sheep dominating, goat dominating and sheep-goat mixed flock sites. Rural [1]Kebeles (50.7%) with relatively dense population and fragmented land holding, majority of which found in the tef/haricot bean/livestock production system dominantly own sheep. These Kebeles are located across the 'Bilate river watersheds' and towards boundaries of the Kambata and Hadiya administrative zones (Figure 3). In the drier Kebeles (dry *weina dega),* northern parts of the woreda across boundaries of the Silti administrative zone and the Oromiya regional state (Aje, Alage), land holdings are generally large and goats are dominant. The majority (38.3%) of these Kebeles are found within pepper/livestock system. As a third category, there were some Kebeles (11.0%) that own reasonable crop and grazing lands and these keep sheep and goat mixed flocks.

Proportionally, one Kebele from the sheep-goat mixed, two Kebeles from the sheep dominant and two Kebeles from the goat dominant i.e., a total of five Kebeles with dry road accessibility were selected (Figure 4).

Since the study was intended to describe the production situations, households who owned flock of at least one breeding female and others were selected randomly to participate in the household survey. Development agents (DAs) and Kebeles authorities listed the total households who own the desired flock types and sizes in their respective Kebeles.

[1] Kebeles (also called Peasant Association) is the lowest administrative unit in Ethiopia that consists of villages/*got*s and hundreds of households.

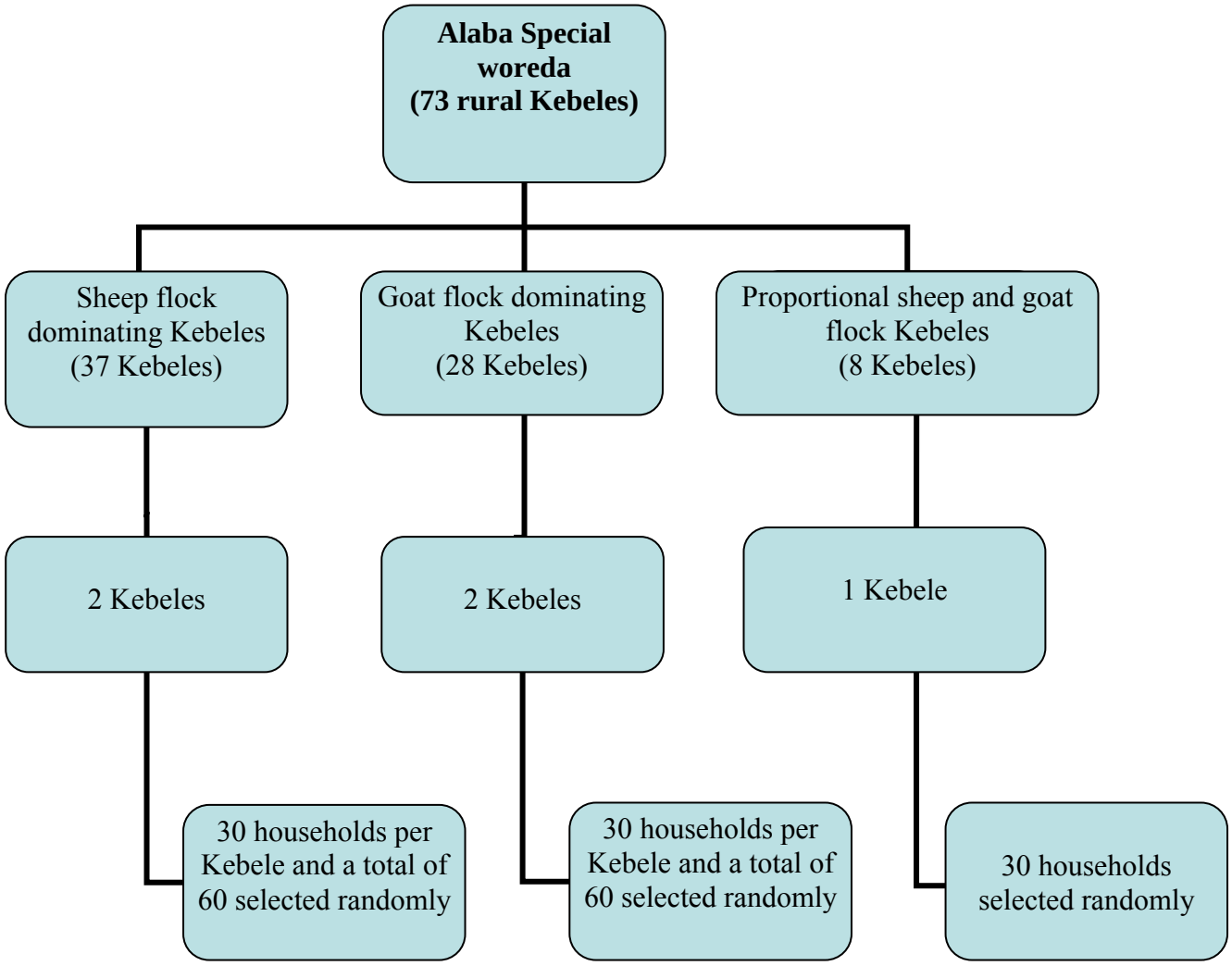


Figure 4: *Stratification and staging of study Kebeles and households.*

Based on this information, a total of 30 households were randomly selected from each of the five selected Kebeles giving up 150 households.

3.4 Household survey

Informal and formal survey tools were employed to gather information on sheep and goats production and marketing details. Discussions using checklists were held with woreda livestock experts, development agents and key informants in all the selected Kebeles to collect relevant information on almost all aspects of livestock production in the woreda. Information obtained from the discussions was used to prepare a structured questionnaire. The questions were framed in such a way that farmers could provide information that is most recent and easy to recall. The questionnaire covered various aspects of all species of livestock with more details on sheep and goats production and marketing systems. The questionnaire was pre-tested and then translated into Amharic (Appendix 1).

DAs (animal science graduates from ATVET colleges) working in the woreda who speak the local Alabigna language were recruited, intensively trained and administered the questionnaire to the 150 selected households under the close day-to-day supervision of the researcher.

Body weight and linear measurements of body length, heart girth and height at wither from [2]adult males and females of 131 sheep and 104 goats in respective study Kebeles were taken using weighing scale and tape meter to estimate adult weights and establish relationship between body weight and the linear measurements.

[2] Adult flock includes male and female flocks above sexual maturity and broken two and more pairs of milk teeth, but pregnant flock were not included

3.5 Rapid appraisal of marketing systems

Agricultural commodity prices including sheep and goat extending from 2000 to 2006 were collected from the woreda Disaster Prevention and Preparedness Commission (DPPC) desk to comprehend the price pattern of sheep, goats and other important local commodities over years, seasons and months. Data on total skin production of over sixteen years (1991-2006) were also collected from Desk of Livestock and Fisheries Development, OoARD to indicate the skin production patterns over the years.

Rapid market appraisal (RMA) as outlined by Holtzman (2002) was employed to study the marketing systems of sheep and goat in the woreda. Local traders, agents of export abattoirs, terminal traders, export abattoirs, consumers and transporters were interviewed using respective checklists.

All possible sheep and goat market chains to and from Alaba were identified. Geographical Positioning System (GPS) (GARMIN® GPS72 2002-2003) readings of the market places were taken and mapped using Geographical Information System (GIS). Seasonality of animals supplied, demanded and prices were assessed. Alaba Kulito (in Alaba town) and Adilo market (in neighboring town) were visited during major festivals and none-festival periods to comprehend the types of animals marketed, volume of supplies, demands, prices, major market participants and routes of animals to and from these markets. Preferences and purchasing prices of consumers in Addis Ababa, the larger traditional consumer of animals originated from the study areas were assessed during festival markets.

Butcher, hotel, restaurant and cafeteria owners providing catering services in the Alaba Kulito town were interviewed regarding their consumption patterns, their preferences and uses of sheep and goat meat, as well as preferences of their customers to mutton and goat meals. Services and infrastructure facilities of all market places were observed. Collection, processing and marketing operation of sheep and goat skins at Alaba Kulito legally registered skin business centers were observed and assessed.

3.6 Data management and analysis

The survey and relevant secondary data were organized, summarized and analyzed using SPSS statistical package (SPSS 12.0, 2003). Descriptive, chi-square, correlation, regression and one way ANOVA (Zar, 1996) were employed in data analysis. Mean and percentage values of various parameters were compared across the three studied areas of the woreda (mixed flock site, goat dominating site and sheep dominating site). Accordingly, values of parameters that differed significantly among the three studied areas were separately presented, whereas, in case of parameters that did not differ among the three sites, values are combined and overall estimates were reported for the woreda.

Data from household survey (most recent and easy to recall) were used to estimate mortality, reproduction and offtakes of flocks for a period of time extending from November/December 2005 to November/December 2006. The following formulae were employed.

Overall mortality rates for particular age and sex structure of flocks (per sheep and goat):

$$\text{Overall mortality rates (\%)} = \frac{\text{Number of deaths per structure}}{\text{Number of stock within each structure}} \times 100$$

Overall mortality rates for the flock as a whole:

$$\text{Overall mortality rates (\%)} = \frac{\text{Total deaths}}{\text{Total number of animal in flock}} \times 100$$

$$\text{Fertility} = \frac{\text{Number of females that gave birth}}{\text{Number of females exposed to males/mated}} \times 100\%$$

$$\text{Litter size/prolificacy} = \frac{\text{Number of offspring produced}}{\text{Number of females that given birth}}$$

$$\text{Weaning rates} = \frac{\text{Number of offspring weaned}}{\text{Number of females exposed to males/mated}} \times 100\%$$

$$\text{Lambing/kidding rate (\%)} = \frac{\text{Number of offspring produced}}{\text{Number of females exposed to males/mated}} \times 100$$

$$\text{Lamb/kid survival rate (\%)} = \frac{\text{Number of offspring weaned}}{\text{Number of offspring produced}} \times 100\%$$

$$\text{Annual reproductive rate (ARR)} = \frac{365 \times \text{litter size}}{\text{Days of lambing interval}}$$

$$\text{Gross offtake rate (\%)} = \frac{\text{Gross offtake}}{\text{Total flock size}} \times 100$$

$$\text{Sale rate} = \frac{\text{Flock sales}}{\text{Total flock}} \times 100$$

$$\text{Net offtake rate (\%)} = \frac{\text{Gross offtake} - \text{Acquisitions}}{\text{Total flock size}} \times 100$$

Acquisition = Sum of purchases + exchanges or gifts

Gross offtake in period (t) = sum of sales + slaughters + exchanges + gifts (t)

3.7 Statistical model

Wherever ANOVA test were employed, the following single factor ANOVA model was used.

$$Y_{ij(i)} = \mu + \tau_i + \varepsilon_{ij}$$

$Y_{ij(i)}$ = Production and marketing parameters

μ = Overall mean

$_i$ = 1, 2, 3 flock distribution sites

$j_{(1)}$ = 1, 2,…, 30 (Mixed flock site)

$j_{(2)}$ = 1, 2,…, 60 (Goat dominating site)

$j_{(3)}$ = 1, 2,…, 60 (Sheep dominating site)

ε_{ij} = Random variation among individual subjects

4. RESULTS AND DISCUSSION

4.1 Sheep and goat production system

4.1.1 Demographic and socio-economic characteristics of the households

4.1.1.1 Demographic characteristics

Demographic characteristics of the households are presented in Table 1. All the interviewed households belong to Alaba ethnic groups (100%) and are all Muslims (100%). The average family size of the households was 6.7±0.18 (ranging from 2-13) and it is higher than the average values at the national (5.2) and SNNPR (5.1) levels (CACC, 2003). This is attributed to the common practice of polygamous marriages (26.8% two and 10.0% three wives) and low awareness of family planning. The household size is comparable across the three studied sites ($P>0.05$). Having many members of the family seems to be considered as an asset and security in times of retirements. The family size is comparable to the value reported for Wolaita zone (6.9) (Tsedeke and Endrias, 2006) and Umbulo-Wacha watershed of Boricha woreda, Sidama zone (6.3) (Kebebe *et al.,* 2006) but it is lower than 7.5 persons per household which, is reported for Dale district of Sidama zone (Endeshaw, 2007).

Majority of the household heads (96%) are married and 57% of the household members were males while 43% were females. The average age of the household husband and wife is 40.3±0.92 and 31.1±0.94 years, respectively. The majority (about 96%) of the households is headed by men. In central highlands of Ethiopia, labor availability is higher for male-headed

Table 1: *Socio-economic characteristics of households in the three studied sites of Alaba Special Woreda (Nov/Dec 2006). (Based on data from of the selected study household*s)

Descriptors	**Mixed flock site* (n_1=30)**	**Goat dom. site (n_2=60)**	**Sheep dom. site (n_3=60)**	**Overall (N=150)**	**Test**	
	Average(SE)	*Average(SE)*	*Average(SE)*	*Average(SE)*	*F-value*	*P-value*
Family size	7.0(0.36)	6.3(0.29)	6.9(0.29)	6.7(0.18)	1.565	0.213
Age of household husband in years	42.0(1.87)	39.8(1.30)	40.0(1.68)	40.3(0.92)	0.394	0.675
Age of household wife in years	30.7(1.98)	31.8(1.31)	30.7(1.69)	31.1(0.94)	0.148	0.863
	Percent	*Percent*	*Percent*	*Percent*	χ^2	*P-value*
Family members <15years	43.5	51.1	49.5	48.9		
Family members from 15 - 65 years	56.0	48.1	49.5	50.3		
Males	55.6	51.6	57.3	55.0		
Females	44.4	48.4	42.7	45.0		
Family members > 65 years	0.5	0.8	1.0	0.8		
Educational level of household heads						
Literates	30.0	18.3	51.7	34.0	19.586	0.001
Children in school	15.8	10.1	22.8	16.2	11.105	0.000
Male headed households	93.3	98.3	95.0	96.0		
Female headed households	6.7	1.7	5.0	4.0	1.56	0.458

dom.: dominating; **Mixed flock site: Asore Kebele; Goat dominant site: Udana Meno and Bendo Choloksa Kebeles; Sheep dominant site: Hologeba Kuke and Andegna Tuka Kebeles;* χ^2*:Chi-Square*

households than the female-headed ones and this is because female farmers tend to use less of their labor time in farm activities due to heavy commitment to domestic chores (Addisu *et al.,* 1998). Above half (56%) of the household members were with productive (active working) age group (15-55 years) and are the main source of farm labor. Children below 15 years of age make 48.9% of the household family and often provide the bulk of labor in sheep and goat management. Household labour is an essential resource that influences management practices, enterprise combinations, labour hiring/sharing strategies and overall levels of technical and economic performance (ILCA, 1990). The amount of household labour available and the manner of labour allocation are critical to effectively carry out farm operation and influence livestock management techniques and adoption of improved technologies (ILCA, 1990; Addisu *et al.,* 1998). Farming communities of Alaba, according to this study, have better chance of benefiting from the opportunities that could be derived from readily available family labor.

Overall, sixty five percent of the household members are illiterates. This is nearly comparable to the 63% illiteracy rate in the central highlands of Ethiopia (Addisu *et al.,* 1998). Educational status of household heads differ significantly ($P<0.05$) across the studied sites with better condition in sheep dominating (51.7%) and mixed flock (30.0%) sites than in the goat dominating site (18.3%). This could be attributed to lack of access to education in the remotely located goat dominating Kebeles. The educated households tend to have higher productivity as they are better able to decode new production technology (Addisu *et al.,* 1998). A wide difference in the rate of literacy was noted between the male and female. Literacy rate among adult males is 29.1 % while it is only 7.7% among adult females. This agrees with the report

of Addisu *et al.* (1998) in the central highlands of Ethiopia where differences exist regarding access to education and males had better educational status than females.

One sixth of young children below 15 years of age are enrolled in schools. Twenty three percent of children go to school in the sheep dominating sites and 15.1% in mixed flock Kebeles and these percentages are significantly higher ($P<0.05$) than that of 10.1% of children that attend school in goat dominating Kebeles. Big responsibility of children in herding flocks, farm responsibility, limited access to education in remote areas and low awareness of the family are the major impediments of children education. The problem is more pronounced in remote Kebeles where goat flocks dominate. Herding sheep and goats is a demanding job as they wander around and easily lost or taken by predators (Solomon *et al.,* 1991).

4.1.1.2 Household holdings in study sites

The sheep and goat flocks manifest a distinct pattern of distribution in the woreda. Three clusters of sites were identified where both sheep and goat were dominant, or either sheep or goats were dominant. Except for chicken holdings, the average holdings of total land, grazing land, cattle, sheep, goat and equine vary significantly ($P<0.05$) among the three sites (Table 2). Except for the particular species of livestock dominating in the respective sites, wherever differences exists, mean holdings were higher for goat dominating than the other two sites.

Mean sheep holding of the households varied significantly ($P<0.05$) across the sites being dominant in sheep dominating site (7.4), moderate in mixed flock site (4.7) and low in goat dominating site (2.7). Similarly, mean holdings of goats also varied significantly ($P<0.05$) across the sites and abundant in goat dominating site (11.5), moderate in mixed flock site (6.9)

and least in sheep dominating site (1.2). The study also confirmed that as land is getting shrink households tend to rear more of sheep than goats and cattle or the vice versa while in areas with modest land holding (mixed flock site) households rear proportional mixes of sheep and goat flocks.

The sites also differ ($P<0.05$) in holdings of cattle and equine, both being more abundant in goat dominating site (Table 2).

Table 2: *Average land and livestock holdings/household in the three studied sites. (Based on data from of the selected study household*s)

Particulars	Mixed flock site	Goat dom. site	Sheep dom. site	Overall	Test	
	Mean (SE)	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*F-value*	*P-value*
Total land (ha)	2.1(0.16) [a]	2.9(0.15) [b]	1.7(0.10) [a]	2.3(0.09)	25.610	0.000
Grazing land (ha)	0.3(0.04) [a]	0.6(0.06) [b]	0.2(0.02) [a]	0.4(0.03)	20.214	0.000
Cattle	8.6(0.75) [a]	10.8(0.90) [a]	6.2(0.49) [b]	8.5(0.47)	11.065	0.000
Sheep	4.7(0.38) [a]	2.7(0.39) [b]	7.4(0.47) [c]	5.0(0.31)	34.177	0.000
Goats	6.9(0.70) [a]	11.5(0.91) [b]	1.2(0.23) [c]	6.5(0.55)	67.896	0.000
Equines	1.4(0.20) [a]	2.1(0.22) [b]	0.8(0.14) [c]	1.5(0.12)	13.467	0.000
Chicken	3.4(0.82) [a]	3.7(0.53) [a]	4.2(0.61) [a]	3.8(0.36)	0.334	0.717

[a, b, c:] Different superscripts denote significant differences at $P<0.05$ between means within rows

The major holdings were correlated using the overall data of the three sites as well as separately for the three study sites (Appendix Table 3, 4, 5 and 6). There is a positive and significant correlation between total land and grazing land holding ($r=0.937$; $P<0.05$) indicating that households with larger land holding allocate more land for grazing of their livestock. On the other hand, total land holding had positive but insignificant correlation with sheep and goat holdings in all the three sites. Grazing land had positive but insignificant

correlation with sheep and goat holdings in the mixed flock and goat dominating sites but the relationship was negative and insignificant with sheep holdings in the sheep dominating site. The sheep and goat holdings were positively correlated (but insignificant) in mixed flock site as expected because in this system, both sheep and goat are found proportionally. More fascinatingly, in the other two systems too, sheep and goats have positive but insignificant correlation which signifies the importance and integration of both species in the farming systems of Alaba.

4.1.1.3 Land holding and land use systems

The average land holding across all the study sites per household is 2.3±0.09 ha. This is within the range of holdings of 2.01 to 5.00 ha for 32.6% and 16.2% of smallholder farmers in the country and SNNPRS level, respectively. Land holdings range from 1.01 to 2.00 ha for about 30.8% of farmers in the SNNPR and for 33.3% of farmers at the national level (CACC, 2003). Land holding found in this study is comparable with the regional and national holdings.

Table 3: *Land holding (ha) and land use systems of the households.*

Particulars	**Mixed flock site**	**Goat dom. site**	**Sheep dom. site**	**Overall**		**Test**	
	*Mean(SE)**	*Mean(SE)*	*Mean(SE)*	*Mean(SE)*	*%*	*F-value*	*P-value*
Crop land	1.64(0.14)[a]	2.05(0.12)[b]	1.38(0.09)[a]	1.70(0.07)	76.9	10.568	0.000
Grazing land	0.31(0.36)[a]	0.58(0.06)[b]	0.22(0.02)[a]	0.38(0.03)	17.2	20.214	0.000
Fallow land	0.01(0.01)[a]	0.06(0.02)[b]	0.03(0.01)[a]	0.03(0.01)	1.4	3.691	0.027
Vegetation	0.08(0.02)[a]	0.17(0.03)[b]	0.05(0.01)[a]	0.10(0.01)	4.5	7.251	0.001

*SE: Standard error

*P<0.05; [a, b:] Different superscripts denote significant differences between means within rows

Total land holding is significantly higher ($P<0.05$) in goat dominating sites (2.9 ha) than in the mixed flock (2.1 ha) and sheep dominating (1.7 ha) sites. Land allocated for different purposes including grazing is also significantly ($P<0.05$) higher in goat dominating Kebeles than the others. An average of 0.38 ha or 17.2% of total land, usually around the homestead (*dejaf*), is grazing land.

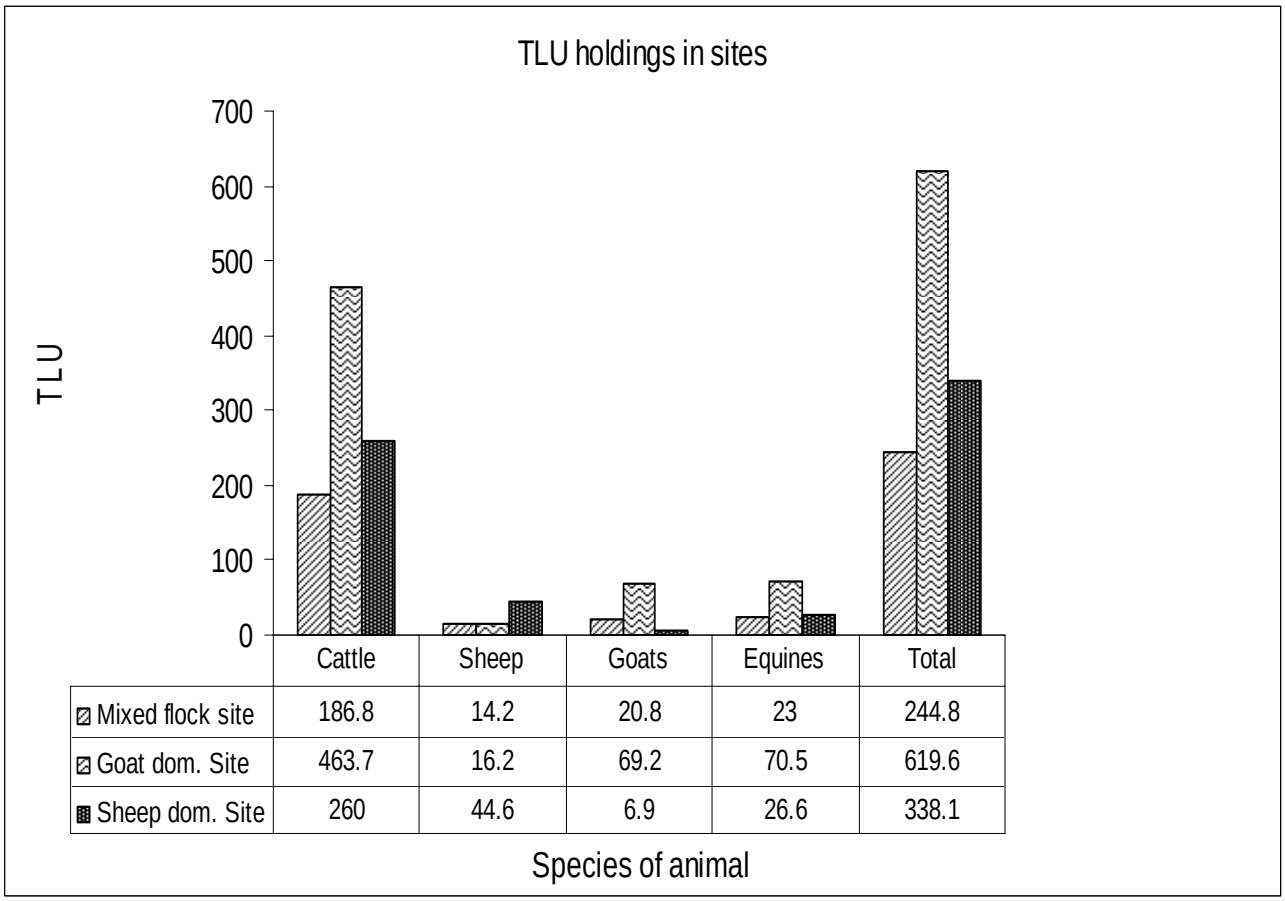
Above half hectare of grazing land in goats dominating site is significantly ($P<0.05$) higher than the 0.22 and 0.31 hectare, respectively in Kebeles where sheep and proportional sheep and goat flocks dominates. The size of total land is an important determinant to availability of feed from grazing which make major source of livestock nutrition in Alaba. This depict that grazing land is better available in the goat dominating site. An average of 0.1 ha or 4.5% of the land is covered with vegetation. Chat is the dominant vegetation in these lands. About 76.9% of total land is allotted for crop production and this implies that majority of land is used for crop production and further encroaching into the grazing lands.

4.1.1.4 Livestock holding and composition

The household animal species composition, holding, age and sex structures, ownership and original acquisitions are presented in Appendix Table 2. The overall average number of livestock per household was 8.5 cattle, 5.0 sheep, 6.5 goats, 1.5 equines and 3.8 chickens (Table 2).

An average holding per household in terms of TLU for livestock (excluding chicken) is 8.0 and of these cattle, sheep, goat and equines constitute an average of 6.1, 0.5, 0.6 and 0.8, respectively (Figure 5). Above half of the total TLU in the study area are found in goat

dominating site and the remaining 20.4 and 28.1 percents, respectively are in mixed flock and sheep dominating sites. Except sheep, all other livestock are predominant in goat dominating site. Sheep dominating site possess about 59.5% of the total sheep TLU whereas the remaining 21.6% and 19.9%, respectively are found in goat dominating and mixed frock sites.



	Cattle	Sheep	Goats	Equines	Total
Mixed flock site	186.8	14.2	20.8	23	244.8
Goat dom. Site	463.7	16.2	69.2	70.5	619.6
Sheep dom. Site	260	44.6	6.9	26.6	338.1

Figure 5: *Total TLU holdings in the study sites*.

The total TLU holding of Alaba, according to this study, is considerably higher than results reported for Wolaita (3.6) and Dawuro (5.6) zones of SNNPR (Tsedeke and Endrias, 2006). Cattle being the most important animal constituted 75.7% of the total TLU while sheep, goats and equines constitute 6.2%, 8.1% and 10.0%, respectively. Cattle were found to be abundant

livestock in terms of relative total liveweight and ILCA (1990) assert such large relative total liveweight indicates the relative output, relative pressure exerted on feed supplies, and constraints and management objectives of the household animal production. Across all the study sites, household hold mixed species composition, and this according to ILCA (1990), decreases competition for feed resources (different species tend to make use of different components), reduces risk by lessening the dependency on one species for meat and milk and increases the likelihood of meeting basic consumption needs, particularly milk.

The majority of livestock are privately owned. Although lower figure of livestock share holdings were found, discussion with key informants revealed that it is an important means of building livestock assets in the area. The majority of the inventory stocks were built through birth. Purchase, gifts from different sources and inheritances from family are important ways of building livestock holdings. Foundational stocks of specific age and sex classes for each species within studied species were acquired through purchase constituting acquisitions of 29.4% for cow, 42.1% for oxen, 44.7% for ewes, 36.0% for does and 57.6% for female donkey. This clearly indicates the high importance of these stocks for breeding and production purposes and also objective allocation of considerable household incomes for building livestock asset in the study area.

Flock structure of sheep and goats are shown in Figure 6. The sheep flocks were composed of sucking lambs (22.8%), weaned male lambs of 3-6 month age (16.2%), weaned female lambs of 3-6 month age (12.2%), intact/entire males of above six months or puberty ages (5.8%), female of above six months age or puberty age (39.3%) and castrates and fattening males (3.6%). Likewise, 26.7% sucking kids, 12.3% weaned male lambs of 3-6 month age, 12.7%

weaned female lambs of 3-6 month age, 5.9% intact males of above six months or puberty age, 39.4% breeding female of above six months age or puberty age and 3.1% castrates and fattening males comprised the goat flocks.

Breeding female (39.4% ewes and 39.3% does) and pre-weaned young (22.8% lambs and 26.7% kids) constitute the larger proportion of both sheep and goats flocks. The sex-proportion of the flocks represents 37.1% male and 62.9% female in sheep and 34.6% male and 65.4% female in goats. Holdings of sheep and goat flock structures were comparable and this is in agreement to of ILCA (1990) reports this could attributed to similarities in off-take, mortality and management objectives of the household.

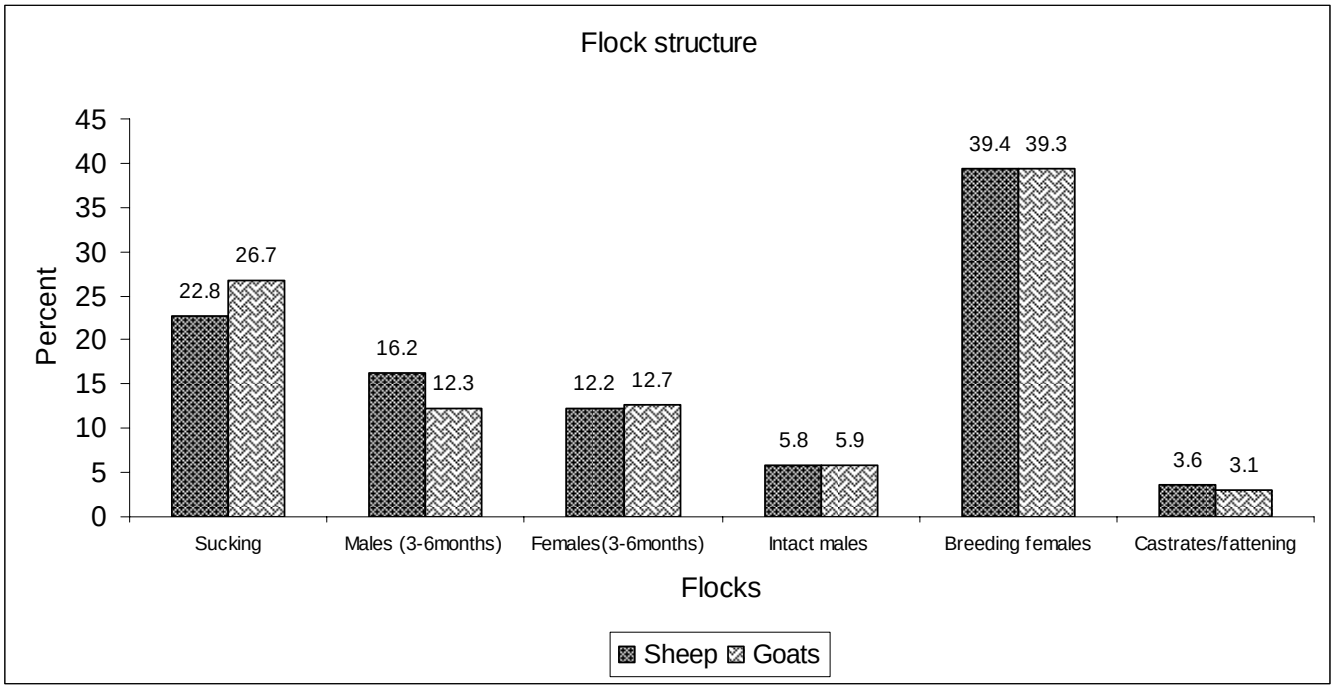


Figure 6: *Flock structures of sheep and goats.*

An overall ratio of breeding ewes to rams was 6.7 (4.5 for mixed flock site, 9 for goat dominating site and 7.3 for sheep dominating site while that of the bucks to does is 6.8 (5.2 in

mixed flock site, 6.6 in goat dominating site and no buck in sheep dominating site). The high ram to ewe ratio in goat dominating site is due to existence of little number of ewes (a total of 7 ram and 63 ewes). The ratio of breeding male to female observed in this study is favourable under the extensive production system and this confirms report of Ahmadu and Lovelace (2002). The recommended breeding male to female ratio for sheep and goat under traditional production system is 1:25 (Wilson and Durkin, 1988).

The sheep to goat ratio of the study sites was 0.8, indicating the dominance of goats flock in the woreda. This could be attributed to the large goat holdings per household in the goat dominating Kebeles where larger land holding favors availability of grazing lands and browses for the flocks. Flock structure observed in this study is in line with that of ILCA (1990) where it was explained that flock structures formed by different age and sex classes of animals indicate the owner's management objectives (milk or meat), problems or constraints in the system, birth and death rates and off-take levels.

Mean holding of 5.0 sheep in the present study is close to the value of 4.2 sheep in south western part of Ethiopia (Berhanu, 1998) whereas the value found in this study is much higher than values reported fro different parts of the country, such as 0.5 sheep in both west and north Shewa zones of the central Ethiopian highlands (Agajie *et al.,* 2002), 0.8 sheep in Kombolcha and Gursum areas of Eastern Ethiopia (Workneh, 2000), 0.6 sheep in Wolaita and 1.5 sheep in Dawuro zones of SNNPR (Tsedeke and Endrias, 2006) and 1.4 sheep in Boricha woreda of Sidama zone, SNNPR (Kebebe *et al.,* 2006) were lower than the present report in Alaba. On the other hand, an average of 15.6 sheep/household (Agyemang *et al.,* 1985) and 24.3 sheep (Abebe *et al.,* 2000) were reported in Debre Berhan area. Mean holding of 6.5 goats in Alaba

is comparable to average reports of 7.0 Arsi-Bale goats in the rift valley areas and 6.0 Keffa goats in south western parts of Ethiopia (FARM-Africa, 1996). As in case of sheep holdings, goat holding of Alaba is much higher than an average goat holdings of 2.6 in Kombolcha and Gursum (Workneh, 2000), 0.4 in Wolaita and 0.6 in Dawuro zones (Tsedeke and Endrias, 2006), 1.8 in Boricha woreda (Kebebe *et al.,* 2006), 0.5 both in west and north Shewa zones (Agajie *et al.,* 2002) and 0.6 in Debre Berhan (Abebe *et al.,* 2000). The present larger flock holding in Alaba could be because households selected in this study were all flock owners and not represent flock holding of an average household in the area.

The proportion of breeding ewes (39.3%) are below observations of Berhanu (1998) (54.4%) in south western Ethiopia, Abebe *et al.* (2000) in Debre Berhan (42.4%) and Duguma *et al*. (2005) (49.7) in East Wollega and West Shoa Zones under farmers management conditions. This implies that flocks in the study sites are more diverse embracing other sex and age classes unlike other locations reported the dominance of dams. The breeding rams (5.8%) found in this study is above reports of Duguma *et al*. (2005) (only 2.0%) but below reports of Abebe *et al.* (2000) (12.5%), Berhanu (1998) (8.6%) and Agyemang *et al.* (1985) (22.4%). The relatively fewer mature rams as compared to breeding females observed in this study agree with Duguma *et al*. (2005) that this may reflect that male animals are sold or consumed early in life while female are retained for breeding. This confirms the earlier findings of Wilson and Durkin (1988) reported that under rural production systems more males of breeding age are sold off or slaughtered for home consumption.

About 62.9% female and 37.1% male sheep flocks of the present study are different from 74.8% female and 25.2% males observed in Debre Berhan (Agyemang *et al.,*1985) and 75.0%

female and 25.0% male in East Wollega and West Shoa Zones (Duguma *et al*., 2005). Castrate sheep (3.6%) found in this study is slightly higher than the observations of Berhanu (1998) and Agyemang *et al.* (1985) who reported a value of 2.8%. The relatively higher proportion of castrates observed in this study may be attributed to the intense castration practices for fattening management to respond to the growing market demand and price. Kids comprised 51.7% of the goat flock and this is similar to the finding of Markos (2000) i.e., 48.9% in Sidama. Bucks of about 5.9% in this study are considerably lower than the reports of Markos (2000) (18.9%) for Sidama goats, FARM-Africa (1996) (22.1%) for Arsi-Bale goats in rift valley areas and 25.3% for Keffa goats in south western Ethiopia. The proportion of castrates (3.1%) in the present study is comparable to 3.5% reported for Arsi-Bale and 4.4% for Keffa goats (FARM-Africa, 1996). Does representing 39.4% in Alaba are comparable to the value of 32.2% in Sidama zone (Markos, 2000). Total females of the current study (65.4%) are slightly lower than 74.4% reported for Arsi-Bale and 70.1% Keffa does (FARM-Africa, 1996).

4.1.1.5 Purpose of keeping sheep and goat

Respondents of 36.1%, 29.4% and 26.7%, respectively, in the sheep dominating, mixed flocks and goat dominating sites kept sheep and goats for sale (Table 4). This implies that sale of sheep and goats to generate cash constitute the primary purpose among others to rear flocks.

Table 4: *Purposes of keeping sheep and goats.*

	Mixed flock site	Goat dom. Site	Sheep dom. site	Overall	Test	
Purposes	**N (%)*	*N (%)*	*N (%)*	*N (%)*	χ^2	*P-value*
Sale	30(29.4)	58(26.7)	60(36.1)	148(30.5)	3.041	0.219
Meat	20(19.6)	31(14.3)	47(28.3)	98(20.2)	10.994	0.004
Milk	20(19.6)	58(26.7)	1(0.6)	79(16.3)	116.973	0.000
Manure	7(6.9)	8(3.7)	9(5.4)	24(4.9)	1.563	0.458
Social capital	2(2.0)	18(8.3)	1(0.6)	21 (4.3)	21.678	0.000
Saving	23(22.5)	44(20.3)	48(28.9)	115(23.7)	0.745	0.689
Total	**102(100.0)**	**217(100.0)**	**166(100.0)**	**485(100.0)**		

**Total count of responses for each factor (in this case purpose) and a household often mention multiple responses for those non-overlapping factors/parameters otherwise once*

Higher (P<0.05) respondents (28.3%) in sheep dominating site slaughter sheep and goats for family consumption than the percentages who do so in the other two sites, whereas differences between the later two was not significant. This could attribute to high sale off-take of flock in these drier Kebeles to purchase food items during an extended drought seasons. In the contrary, significantly higher (P<0.05) respondents (26.9%) in goat dominating Kebeles largely rear goats for milk consumption followed by households in mixed flock site (19.6%) also milk their goat. Whereas in sheep dominating Kebeles goat milk consumption is rare (1%). There is a strong perception among the farmers that goat milk has a medicinal value. Only 4.9% of the overall respondents realize the importance of sheep and goat manure for land fertilization and fuel. For a total of 23.7% respondents, sheep and goat provide a saving function. In goat dominant site, large holding of flock and other livestock represent prestige within the community and considerable (P<0.05) households (8.3%) rear flock for social capital.

The importance of goats as milk producer for family consumption found in this study is in agreement with observations of Abule (1998) and FARM-Africa (1996) in the rift valley areas, Markos (2000) in Sidama zone and Adugna (1998) in Kochore district of Gedio zone (SNNPR). In adjacent localities of Alaba, FARM-Africa (1996) reported extensive milking practice of Arsi-Bale goats which is highly valued as source of nourishment for children. About 41% of the total goat-owning households in the Oromiya Regional State, more often in the *kolla* agro-ecological zone use their goats for milk production (Workneh and Rowlands, 2004).

4.1.1.6 Labor allocation and gender role in sheep and goat management

According to three-quarter of the respondents (75.7%), availability of labor for flock management is adequate. All household members are involved in sheep and goat management. However, women and children below 15 years are responsible for several important routine tasks. Women clean flock barns (66.0%), care for lambs/kids (44.9%), and engage in goats milking (80.4%) and goat milk processing (67.1%). Boys have responsibilities of flock herding (45.8%), watering (45.6%) and deliver extensive care (26.6%) for young animals. This is in agreement with Sinn *et al. (*1999) that even when men and women farm side by side throughout the day, planting and harvesting crops, the small livestock are typically the primary responsibility of women and children. About 85.0% traditional and veterinary services for sick flock and 43.1% of fattening managements are rendered by men. Fattening operation usually consists of feeding grains and mineral supplements which is done by the husband. Wives (34.8%) and boys (17.2%) are in charge of processing (cooking and fraying) and feeding the grains and other supplements to the animals. Girls provide assistances to their mothers and

carry out cleaning of barns (31.1%), milking (19.6%), milk processing (32.9%) and providing care to the young (7.9%) and fattening flocks (4.5%).

Table 5: *Division of labor in sheep and goat managements.*

Tasks	Responsibility				
	Men (%)	*Women (%)*	*Boys (%)*	*Girls (%)*	*Hired labor (%)*
Flock herding	32.1	12.3	45.8	8.3	1.4
Cut-and-carry grasses/browses	29.5	33.8	25.9	9.5	1.3
Watering flock	40.3	12.4	45.6	1.3	0.4
Clean flock barn	-	66.0	2.9	31.1	-
Cares young flock	20.6	44.9	26.6	7.9	-
Fattening managements	43.1	34.8	17.2	4.5	0.4
Treat sick flock	85.0	1.8	13.2	-	-
Milk goats	-	80.4	-	19.6	-
Process goat milk	-	67.1	-	32.9	-
Sale sheep and goats at markets	82.2	5.2	12.6	-	-
Decides use of proceeds	73.7	20.2	6.1	-	-
Owner of the flocks	68.2	29.0	2.8	-	-

Larger flocks (68.2%) of the household are owned by the husband. Women owned considerable (29.0%) flock while boys own some 2.8% flocks. Women owned flocks could be sold or exchanged as the women necessitate unlike the other household flocks which often decided by aspiration of the household heads (men). Women and children have property right over the flocks but are not decision makers when it comes to selling or exchange. About 82.2% of sheep and goats are sold by husbands. Husbands possess more power (73.7%) in deciding the use of incomes generated from sale of animals and skins.

Some households encounter labor shortage for flock herding and watering. They cope up with the problem by using family/relative labor (37.3%), alternative herding with neighbors (35.3%) and tethering and confining flocks within in fences (21.6%). Use of hired labor for flock management is minimal and uncommon (5.9%).

Gender differentials in the decision making processes of the farm household chores play significant role in the economic performance of the household (Addisu *et al.,* 1998). Thus policy makers, technology generators and extension agents should recognize and give due to attention to the importance of gender towards the development of the sector (Addisu *et al.,* 1998).

Many women in the developing world work an average of 12-16 hours a day (Sinn *et al.,* 1999). In rift valley area of Adami Tulu, Abule (1998) reported that women spent over 2 hours every day with livestock or livestock-related activities. In Ethiopia, women are the major and important forces in performing the major portion of the animal production activities in rural farms (Tadelech, 1998; Zinash, 1998). Traditionally, small stocks are looked after by women and children (Zahra *et al.,* 1998). This study also revealed the versatile role of women in rural farm operation in general and sheep and goat production in particular.

4.1.2 Sheep and goat husbandry practices

4.1.2.1 Feed and water resources, seasonal availability and utilization

According to respondents, the major feed resources for sheep and goats includes grazing on crop stubble (13.4%), private pastures (13.3%), road sides (13.2%) as well as weeds from crop fields (11.6%) (Table 6). In addition, tillers (dense population of the crop competes for

nutrients and water and thus household uproots and offer to livestock) and fillers (crops intentionally planted on part of crop lands or around homestead to be used as feed) (8.9%), cut-and-carry of local browses and grasses (9.1%) and grazing on communal pastures (9.4%) make substantial contribution in sheep and goat feeds. However, the type of feed utilized for sheep and goat differed among the three studied sites. For example, communal grazing is mostly practiced in goat dominated site (13.2%) than in the other two (Table 5). This could be attributed to the availability of communal grazing land mainly in goat dominating site. Similarly, browse species are more important ($P<0.05$) in goat dominating and mixed flock Kebeles whereas the reverse is true regarding the use of cut-and-carry feeds, as these are more used sheep and mixed flock Kebeles. Crop residues (4.7%) are utilized by sheep and goats most often when it is fresh before over mature and dried. Apart from animal feeds, crop residues have alternative uses for fuel, construction, sale, compost making, mattress and thatches. Improved forage and root/tuber crops constitute small portion of the flock diets in the studied areas. Adoption and utilization of improved forage is low. Limited use of improved forages in the woreda is demonstrated by the existence of a small number of forage demonstration and multiplication sites and the limited awareness towards the use of improved forages at smallholder farms (only 0.2% respondents in sheep dominating site).

Table 6: *Available feed resources and use patterns.*

Feed types	Mixed flock site	Goat dom. site	Sheep dom. site	Overall	Test	
	N (%)	*N (%)*	*N (%)*	*N (%)*	χ^2	*P-value*
Communal grazing	11(4.7)	58(13.2)	36(8.1)	105(9.4)	39.048	0.000
Road sides grazing	29(12.4)	58(13.2)	60(13.5)	147(13.2)	2.041	0.360
Grazing stubble	29(12.4)	60(13.6)	60(13.5)	149(13.4)	4.027	0.134
River side grazing	17(7.3)	23(5.2)	19(4.3)	59(5.3)	5.280	0.071
Private grazing	30(12.9)	59(13.4)	59(13.3)	148(13.3)	0.507	0.776
Cut-and-carry	23(9.9)	26(5.9)	52(11.7)	101(9.1)	27.096	0.000
Crop residues	11(4.7)	19(4.3)	23(5.2)	53(4.7)	0.613	0.736
Browse species	28(12.0)	59(13.4)	31(7.0)	118(10.6)	43.737	0.000
Improved forages	-	-	2(0.5)	2(0.2)	3.041	0.219
Root & tuber crops	4(1.7)	-	2(0.5)	6(0.5)	3.596	0.166
Weeds	28(12.0)	44(10.0)	57(12.9)	129(11.6)	13.372	0.001
Tillers and fillers	23(9.9)	34(7.7)	42(9.5)	99(8.9)	4.278	0.118
Total	**233(100.0)**	**440(100.0)**	**443(100.0)**	**1116(100.0)**		

Availability of feeds depends on the season of the year when lands are covered with either *Meher* or *Belg* season crops. Major *Belg* season crops including maize, sorghum, haricot bean, finger millet and pepper and these are available on lands from around March/April to harvest time in November/December (Appendix 7). Tef, wheat and haricot bean are major *Meher* crops planted in July and harvested around November/December. The duration extending from planting of major *Belg* and *Meher* crops until their harvest makes major challenge to the availability of sheep and goat feeds. After harvest of *Belg* crops (December/January) sheep and goats graze the crop stubbles for few months and then the *Meher* crops take over from July to

part of December. During these extended times when land is covered with crops, grazing on communal, private, road and river sides constitute major sheep and goats feed. Sheep and goats on average grazes for about eight hours a day either roam freely, tethered or herded. Cut-and-carry or grazing/browsing of local grasses and browses are also major feed source for sheep and goats from crops planting to harvest. Tillers, fillers and weeds from crop fields make substantial part of sheep and goat feeding. After harvest, crop residues (straws and fresh tops and thinning of stovers) and crop stubble are the major feeds for sheep and goats.

Seventy nine percent of the total households responded that during both the *Meher* and *Belg* cropping seasons, sheep and goats graze tethered or herded. About 45.1% of the respondents in sheep dominant and 42.9% in mixed flock sites tether their flocks to avoid crop damages, which is higher ($P<0.05$) than goat dominating site (Table 7). This is because the goat dominating Kebeles are relatively better endowed with extensive private and communal grazing lands and browse to accommodate free roaming of their flocks.

Table 7: *Reasons for tether feeding of sheep and goats.*

Reasons	**Uniform flock site**	**Goat dom. site**	**Sheep dom. site**	**Overall**	**Test**	
	N (%)	*N (%)*	*N (%)*	*N (%)*	χ^2	*P-value*
Avoid crop damages	30(42.9)	28(37.8)	60(45.1)	118(42.6)	61.017	0.000
Save labor	14(20.0)	7(9.5)	33(24.8)	54(19.5)	26.302	0.000
Protect from predators	14(20.0)	29(39.2)	34(25.6)	77(27.8)	1.161	0.590
Use marginal lands	9(12.9)	7(9.5)	5(3.8)	21(7.6)	8.25	0.016
Avoid unwanted breeding	3(4.3)	3(4.1)	1(0.8)	7(2.5)	3.147	0.207
Total	**70(100.0)**	**74(100.0)**	**133(100.0)**	**277(100.0)**		

Tethering of flocks to save labor requirements is more common ($P<0.05$) in sheep dominating site (24.8%) than the other two sites. This indicates that due to land shortages, flocks require herding or tethering to avoid damages on crop and other garden vegetations.

Virtually one third of the total respondents tether their flock to avoid losses by predator. Difference across the sites is non-significant and this indicates that predator is a cross-cutting challenge to sheep and goat production in all parts of Alaba.

Occasionally, depending on availability, household food leftovers, grains (commonly maize and haricot bean) and minerals (common salt and mineral soil, *bole*) are offered to sheep and goats (Table 8). Food leftovers and *attela*[3] from local *areke* and *tella* (36.2%) and grains (34.9%) are often common ($P<0.05$) local supplements offered to flock in sheep dominating site. This could be due to the feed shortage caused by small grazing lands and also the emerging sheep fattening in sheep dominating Kebeles. Total respondents of 23.1% usually offer green leaves to young and sick flocks at home. Chat *garaba*[4] is an important feed source for sheep and goats.

With regard to the type of animals that get supplemental feed, ewes and does are commonly supplemented, particularly during the time of pregnancy and early lactation. The proportion of households supplementing is more or less similar in all sites and ranged from 28 to 30.4 percents. Households of 27.9% in sheep dominating and 23.2% in mixed flock sites offer local supplements to castrated and fattening sheep while goat receives from their owners of 31.8% in goat dominating and 24.1% in mixed flock sites. Lambs receive green leaves and food

[3] Attela is a by-product of the local areke and tella beverages.
[4] Garaba is leave and stem of chat plant which is older and less succulent.

leftover from 26.8% respondents in uniform flock and 20.2% respondents in sheep dominating sites. Rams are less prioritized to receive supplements from 22.2% and 21.9% respondents in mixed flock and sheep dominating sites, respectively. Similarly, kids and bucks in mixed flock and goat dominating sites receive supplements from comparable proportion of respondents in sheep and mixed flock goat dominating site.

Table 8: *Common local supplements offered to sheep and goats*.

Particulars	Mixed flock site	Goat dom. site	Sheep dom. site	Overall	Test	
	N (%)	*N (%)*	*N (%)*	*N (%)*	χ^2	*P-value*
Green fodder	15(21.4)	35(28.0)	30(19.7)	80(23.1)	1.004	0.605
Food leftovers and *attela* (local *areke, tella*)	24(34.3)[a]	41(32.8)[b]	55(36.2)[b]	120(34.6)	10.208	0.006
Grains (cooked/roasted)	22(31.4)[a]	40(32.0)[b]	53(34.9)[b]	115(33.1)	8.106	0.017
Salt, *bole*	9(12.9)	9(7.2)	14(9.2)	32(9.2)	2.92	0.232
Total	**70(100.0)**	**125(100.0)**	**152(100.0)**	**347(100.0)**		

Major sheep and goat feed from natural pasture, crop residues, browse and bushes, crop residues, thinning, weeds and fodder plants identified in this study are also major sheep and goat feed source in Ethiopia (Markos, 2000; Tsige-Yohannes, 2000; Adugna *et al.*, 2000; Berhanu *et al.*, 2002). Adjacent to Alaba, in the Mid Rift Valley of Ethiopia, Abule (1998) and Amsalu *et al.* (2002) reported that natural pasture makes major contribution in livestock feeds. A marked seasonal variation in the quantity and quality of feed supply and the acute problem of feed supply during dry season found in this study is in agreement to Adugna *et al.* (2000) and ILRI (2000).

Table 9: *Reported reasons for feeds shortage.*

Particulars	Mixed flock site *N (%)*	Goat dom. site *N (%)*	Sheep dom. site *N (%)*	Overall *N (%)*	Test χ^2	Test *P-value*
Declining yields of grazing land	25(32.1)	23(26.4)	35(28.5)	83(28.8)	16.751	0.000
Increase of livestock population	12(15.4)	10(11.5)	10(8.1)	32(11.1)	7.786	0.020
Cultivation of grazing lands	23(29.5)	28(32.2)	41(33.3)	92(31.9)	9.656	0.008
Drought	10(12.8)	20(23.0)	21(17.1)	51(17.7)	0.045	0.978
Increase of human population	8(10.3)	6(6.9)	16(13.0)	30(10.4)	6.25	0.044
Total	**78(100.0)**	**87(100.0)**	**123(100.0)**	**288(100.0)**		

Shrinking sizes of the grazing lands driven by the expansion of land cultivation was reported to be the leading reasons for feed shortage across all the study sites but it was more emphasized in sheep dominating site than in the others (Table 9). Declining yield and carrying capacity of the grazing lands was rated as the second important impediment in adequate supply of feeds across all the sites. Increases of human and livestock population and drought are also mentioned to cause feed shortage.

River water is used by about 55.2% of total flock owning households and constitutes the major source of flock water. This is in agreement to the observation of Abule (1998) who reported the same for livestock around Adami Tulu. Most respondents (93.8%) in sheep dominating Kebeles use river water for their flocks as rivers are found in close distance from homestead.

Rivers are often found at long distances from homestead in goat dominating Kebeles, but considerable number of household (54.3%) use the Dijo River, which is located across

boundaries of Silti zone and Alage. Households found in near distances alongside Bilate River (Asore and Hologeba Kebeles) mainly uses river water for their flocks. Considerable (P<0.05) households (21.9%) in Tuka and parts of Udana Kebeles mainly use trough equipped with motorized water schemes. Some households (4.0%) uses harvested water fro their flock but the use of rain and well water is not frequent. Rebeka (2006) also reported harvested rain water as an important water source for livestock in Alaba area.

Construction of ponds to harvest rain water for the dry season is a long held practice in Alaba. More commonly in the drier *weina dega* areas, one or more ponds are found in rural village. Ponds are communal resources utilized and managed by community-set local by-laws and regulations. Significant proportion of households (21.9%) use pond water for family and livestock, particularly during the dry season when other water sources dry up.

Table 10: *Time taken (hours) to travel to primary and secondary water sources.*

	Mixed flock site	**Goat dom. site**	**Sheep dom. site**	**Overall**	**Test**	
Water sources	*Mean(SE)*	*Mean (SE)*	*Mean(SE)*	*Mean(SE)*	*F-value*	*P-value*
Primary sources	1:00(0:10)[a]	5:35(0:20)[b]	0:25 (0:10)[a]	2:35(2:15)	179.440	0.000
Secondary sources	0:15(0:05)	0:20(0:05)	0:17(0:10)	0:17(0:05	2.138	0.121

[a, b] *Mean are different at P<0.05*

About 53.3% of the total households reported that they encounter water shortage for their flocks. Flock owning households of about 34.5% in mixed flock and 34.5% in goat dominating sites reported that they travel far distances to water sources and it is the major reason for sever water problem during dry season. In addition, 75.0% respondents in mixed flock and 63.2% in

goat dominating sites added that it is more aggravated due to drying of the water sources in their locality. Farmers in sheep dominating site did not report any watering problem.

Table 11: *Watering frequency of sheep and goats in dry seasons.*

	Sheep	**Goats**
Frequencies	*N (%)*	*N (%)*
Daily	15(10.0)	2(1.3)
Every two days	63(42.0)	6(4.0)
Every three days	63(42.0)	52(34.7)
Every four days	9(6.0)	64(42.7)
Above four days	-	26(17.3)
Total	**150(100.0)**	**150(100.0)**

Overall, trekking flocks forth and back to major water sources (usually rivers) takes about an average of three hours (Table 10). Distances to secondary water sources (pond water and troughs) take about twenty minutes. An average round trip of about five and half hours to a water source is common in goat dominant Kebeles ($P<0.001$) than in others.

As to water scarcity arise from drying up of water sources and long distances, 42.0% of sheep and 34.7% goat owners water their flock commonly every three days (Table 11). Among goat owning households about 42.7% indicated that they water their animals every four days and occasionally about 17.3% households water in further extended interval of five or more days. This is because in major goat distributed areas water source is far away from the homestead. Besides, goats are better adaptive to water scarcity than sheep (Ibrahim, 1998).

4.1.2.2 Sheep and goat health managements

Almost all (99%) and 64.0% of respondents, respectively, reported the occurrence of morbidity and loss of their sheep and goats during the year 2005/2006. Overall, 34.6% flock owners rated diseases and parasites are the main cause of mortality (Table 12). Fasciolosis, pneumonia, sheep pox, blackleg and anthrax were reported as the most prevalent flock health threats across all the sites (Appendix 8). Major diseases and parasites causing mortality and morbidity in this study are in agreement to reports of Markos (2000) for goats in Awassa Zuria woreda and Berhanu (1998) for sheep in south western parts of Ethiopia. This confirms findings of Tekelye *et al*. (1992) who reported considerable morbidity and mortality of sheep primary caused by infectious causes under farmers' management condition of Debre Berhan area. Pneumonia at large (Tekelye *et al*., 1992) and endoparasites (fascioliasis, cestodiasis and gastrointestinal nematodes and lung worms) (Tekelye and Kasali, 1992) are major causes of morbidity and mortality in sheep. Similarly, Tembely (1998) reported that parasitic diseases (gastrointestinal nematodes and fasciolosis) and infectious diseases (*Peste des Petits Ruminants*/PPR, Contagious Caprine Pleuro-Pneumonia/CCPP and respiratory disease syndrome) are major causes of morbidity and mortality of sheep and goats in Ethiopia. Mastitis was reported to be a major health problem in lactating goats.

In the study sites large flocks from radius areas usually use common water points (river and pond) and this might have contributed to the spread of infectious and parasitic diseases. Further, the major water sources of flocks in the study sites including rivers (Bilate and Dijo) and ponds; and these may make the microecology favourable for transmission of *F. hepatica* by the snail, *Lymnaea truncatula.*

Considerable loss of animals by predators (mainly foxes and hyenas) was reported by 19.2% of the total respondents. This is particularly apparent in the bush and forest abundant extensive grazing areas where wild animals are concentrated.

Table 12: *Major causes of sheep and goat mortality.*

	Mixed flock site	**Goat dom. site**	**Sheep dom. site**	**Overall**	**Test**	
Causes of death	*N (%)*	*N (%)*	*N (%)*	*N (%)*	χ^2	*P-value*
Diseases and parasites	29 (33.0)	59(34.3)	60(35.7)	148(34.6)	1.774	0.412
Feed poisoning and deficiency	25(28.4)	20(11.6)	36 (21.4)	81(18.9)	21.578	0.000
Physical damages	2(2.3)	2(1.2)	2(1.2)	6(1.4)	0.694	0.707
Predators	7(8.0)	50(29.1)	25(14.9)	82(19.2)	35.872	0.000
Undetermined reasons	16(18.2)	24(14.0)	25(14.9)	65(15.2)	1.561	0.458
Ectoparasites	9(10.2)	17(9.9)	20(11.9)	46(10.7)	0.361	0.835
Total	**88(100.0)**	**172(100.0)**	**168(100.0)**	**428(100.0)**		

The loss by predators is significantly higher in goat dominating Kebeles ($P<0.05$) than in others. This is in agreement to FARM-Africa's (1996) report of high loss of goat flocks in Keffa area of SNNPR. Respondents of about 19.8% and 14.0%, respectively reported flock mortality due to severe feed deficiency and/or poisonous local botanicals and undetermined reasons. Respondents and key informants listed variety of local grasses and browses causing poisoning to their flock and the problem is more apparent during dry season when flock are less fortune to obtain adequate feed.

This study found high mortality rates of pre-weaned young (28.4% for lambs and 12.2% for kids) and breeding female (23.7% for ewes and 9.4% for does) flocks (Table 13). These values

are lower than the proportions reported by Markos (2000) who said that lamb and kid mortality represented half of the total mortality in small ruminants of Awassa Zuria woreda.

Table 13: *Mean and rate of mortality in sheep and goat flocks.*

Flock structure	Sheep			Goat		
	Mean (SD)	*%*	*Rate*	*Mean (SD)*	*%*	*Rate*
Prenatal mortality[5]	0.02(0.1)	1.2		0.3(0.8)	11.0	
Sucking flock	0.6(1.2)	35.0	28.4	1.0(2.3)	35.5	12.2
Young flocks (3-12 months)	0.3(0.7)	14.1	12.3	0.4(0.9)	14.7	31.5
Dams/breeding female	0.8(1.4)	42.9	23.7	0.8(1.7)	30.6	9.4
Intact/breeding males	0.1(0.4)	5.5	20.5	0.2(0.6)	6.9	30.4
Castrates and fattening	0.1(0.4)	1.2	8.7	0.03(0.3)	1.2	8.6
Overall mortality rates	21.7			25.3		

However, this study confirms the reports of Armbruster and Peters (1993) in southern Cote d'Ivoire that under traditional sheep and goat production systems, mortality rates of lambs and kids up to 365 days was 48.1 and 44.2%, respectively. The same author also reported that mortality rates of 18.1% for sheep and 19.6% for goats from 0-90 days. ILCA (1990) reported that high mortality in young stock is a major cause of low productivity in many African livestock production systems.

Mortality rate of breeding rams and bucks observed in this study are 20.5 and 30.4%, respectively. Mortality rates in post-weaned young (28.4% for lambs and 35.5 for kids) and dams (42.9% for ewes and 30.6% for does) are high. Mortality rates for different age and sex classes of goat flock found in this study lies within range of values reported by other

[5] Reproduction losses including embryonic mortality and abortions before normal delivery of the dams

investigators. Mortality rate of goats (25.3%) and sheep (21.7%) in this study is comparable to findings of ILCA's (1990) report of mortality rates between 25 and 35% for African sheep and goats. Result of the present study also confirms the finding of Armbruster and Peters (1993) who reported mortality rate of 20.9% in sheep and 23.3% in goats. Webb and Mamabolo (2004) reported mortality rates of goats ranging between 3.8 and 40.1% in Mpumalanga, South Africa. Ahmadu and Lovelace (2002) reported mortality rates of 51, 26 and 23%, respectively, for suckling kids, young (rearing) flocks and breeding male and females flocks under traditional production systems of Zimbabwe.

The present study confirmed that mortality of young flock (0-365 days) represented nearly half of the total mortality in both sheep and goats and that of breeding female represented 42.9% of the total mortality in sheep and 30.6% in goats, which is quit indicating that these flocks are highly prone to death than others. The [6]prevalence of PPR and other diseases caused devastating loss of flocks in woreda (complete loss of flock in some households of the study sites was noted) during the study period and this could attribute to the present exacerbated mortality rates.

Sixty percent of the respondent reported that mortality is the major cause of (45.5% for sheep and 49.2% for goats) flock loss from the systems. Moreover, about 17.6% of respondents culled their flocks because of health problems by diseases and parasites (37.3%). Thus, this study confirmed that diseases and parasites are the major impediment of flock management hindering productivity of smallholder sheep and goat at Alaba.

[6] Public Animal Health Clinic, Alaba OoARD

Households apply various methods of treatments for their flocks with health problems. Fifty four percent respondents apply traditional treatments using different parts of various plants (leaves, stems, roots), water, kerosene, soil and local extractions mixed in varying proportions or alone for different diseases and parasites and flock structures. Similarly, Markos (2000) and Tsedeke and Endrias (2006) reported the wide application of ethno-veterinary practices to flock and herd with health problem. Elders are often skilled and experienced in providing the treatments.

Branding of flocks with hot wood and metal is one of the traditional methods practiced to treat sick animal that 40.0% of the respondents apply. This is in agreement to observation of Gebre-Egziabher *et al.* (1998) that farmers around Bako brand their cattle which have been adopted through a long time trial and error exercise often applied for curative purpose when veterinary services are inaccessible. The same author noted that considerable loss of skins and hides is due to branding and thus farmers need to be thought and provided efficient veterinary services. About 60.0% of the considered flock owners do not practice branding of animals. About 56.7% of them do not brand because it causes serious infection of the branded body parts which often causes mortality or further health complications. The other respondents do not brand to avoid subsequent drop of skin quality (24.4%) and value (18.9%).

Respondents of 28.5% take their sick flocks to veterinary centers. Only about 22.8% of the respondents have access to veterinary services and even this is practical for households in Asore and Hologeba Kebeles that are close to Alaba. On average, the veterinary center is located at 20.5km from considered households with so long variation for households in both goat and sheep dominating sites. Less adequately, flocks of about 57.3% respondents received

vaccination. Some 2.9 and 2.1 percent of the respondents indicated that they immediately slaughtered and sold the sick animals, respectively.

Alaba Kulito animal health clinic is the only public veterinary unit serving the vast geographical area and numerous livestock resources in the woreda. About 13.0% of the flock owners treat their flocks with veterinary supplies purchased from open (illegal) markets. Among the respondents, 27.3% indicated that inaccessibility of the public veterinary services and 16% reported availability and affordability of contraband drugs in local markets are the major reasons for the use of illegal drugs.

However, about 59.3% of the respondents do not use contraband drugs. About 50.0% of the respondents do not use as it usually does not cure their flocks and about 28.4% received advices from health professional not to use illegal drugs. The other 20.6 and 1.0%, respectively, do not use it because they either can not afford it or it is not available in their area.

4.1.2.3 Breed types and preference to sheep and goats

Types of sheep observed in the study areas are of fat-tailed coarse hair type. It may belong to the Arsi-Bale breed (Workneh et al., 2004; Solomon, 2006). Likewise, goats observed may belong to Arsi-Bale breeds (FARM-Africa, 1996; Tesfaye et al., 2006) that they share explanatory characteristics employed in the phenotypic description of the Arsi-Bale goats.

Respondents of 27.2%, 24.0% and 23.2%, respectively prefer sheep to goats for they are easy to manage, high market demand and high market prices (Table 14). Immediate return due to high reproduction efficiency is comparably appreciated by about 25.6% sheep and 23.9% goat

owners. About 22.6% of goat owners prefer goat over sheep for they produce considerable milk for family consumption. For about 14.0% respondents, adaptation of goats under climatic stresses and extensive production environment are considered as valuable attributes.

Table 14: *Household preferences to sheep and goats.*

	Sheep	**Goat**
Attributes	*N (%)*	*N (%)*
High market demand	61(24.0)	41(13.1)
High market value/price	59(23.2)	32(10.2)
Tame to manage	69(27.2)	51(16.2)
Immediate returns	65(25.6)	75(23.9)
Adaptive to production environments	-	44(14.0)
Produce milk for family consumption	-	71(22.6)
Total	**254(100.0)**	**314(100.0)**

Weight and linear body measurements were taken and estimated (Table 15). Weight and linear body measurements of goats observed in this study (BW of 26.5 kg for male (M) and 22.5 kg for female (F), HW of 64.9 cm for M and 62.9 cm for F and HG of 69.4 cm for M and 66.9 cm for F) are lower than the findings of FARM-Africa (1996) reported BW of 42.1 kg for M and 30.4 kg for F, HW of 73.2 cm for M and 66.1 cm for F, HG of 85.0 cm for M and 74.9 cm for F for Arsi-Bale and BW of 40.5 kg for M and 28.2 kg for F, HW of 75.6 cm for M and 66.7 cm for F, HG of 82.7 cm for M and 72.2 cm for F for Keffa goat breeds.

However, body weight of mature male (26.5 kg for buck) and female (23.0 kg for ewe and 22.5 kg for doe) flocks found in this study is comparable to exhaustive review of FAO (2002)

in sub-Saharan Africa regions reported mature weight of ewe ranging between 22.7 to 34.1kg, ram between 26.7 to 31.6kg, doe between 25.0 to 31.8kg and bucks between 29.2 to 30.4kg.

Often infrastructures required in production and marketing of livestock at smallholder systems are lacking. These days, marketing of flocks on live weight basis is common in local and urban market centers of Alaba areas. Considerable households reported that they prefer to market in live weight basis. However, in some local markets weighing scale are not available. Thus, it needs to estimate weight from other easily measurable linear parameters. Similarly, Adugna (1998) estimated body weight using heart girth measurements for sheep and goat flocks in Kochore district of SNNPR.

A step-wise regression of linear measurements was run and heart girth was found to fit to estimating body weight in both species. Mature male sheep and goats constitute less parts of the flock structure and thus their numbers were few.

Linear equation fitted to the flock data provided

Body weight = 0.725 (Heart Girth) – 26.17 ($r = 0.921$; $P<0.01$) for sheep;

Body weight = 0.935 (Heart Girth) – 39.68 ($r = 0.963$; $P<0.01$) for goats

The models are both significant at 5% level. About ninety three percent of the variability in body weight of goat is explained by its heart girth while it is eighty five percent in sheep.

Table 15: *Linear measurements of mature sheep and goats.*

Linear measurements	Sheep			Goat		
	Male (N=17)	*Female (N=114)*	*Overall (N=131)*	*Male (N=21)*	*Female (N=83)*	*Overall (N=104)*
	Mean(SD)	*Mean(SD)*	*Mean(SD)*	*Mean(SD)*	*Mean(SD)*	*Mean(SD)*
Body weight (BW), kg	19.9(4.1)	23.0(4.4)	22.6(4.5)	26.5(11.0)	22.5(5.5)	23.3(7.1)
Height at wither (HW), cm	60.6(4.6)	63.6(4.3)	63.6(4.4)	64.9(8.0)	62.9(4.6)	63. 3(5.5)
Heart girth (HG), cm	63.2(5.7)	67.9(4.9)	67.3(5.2)	69.4(10.1)	66.9(6.0)	67.4(7.0)
Body length (BL), cm	82.3(6.8)	86.3(6.1)	86.8(6.4)	81.7(10.3)	81.9(9.1)	81.9(9.3)

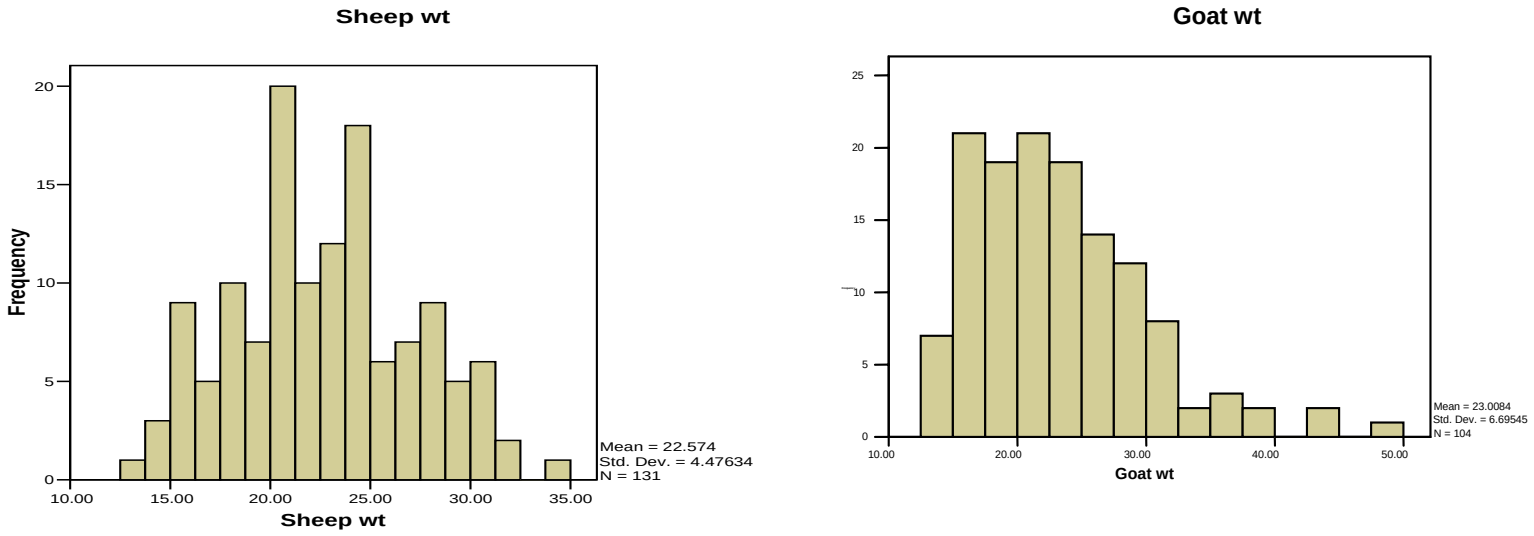


Figure 7: *Normal distribution of adult flock weight.*

4.1.2.4 Sheep and goat breeding management

There is often no selective mating policy in the study sites. Ram and bucks run with flock throughout the year. Thus mating and conception could occur all-year round. This is in agreement to previous observations reported for sheep and goat flocks (Rawlings *et al*., 1992; FARM-Africa, 1996; Berhanu, 1998).

Only 37.3% of all sheep and goat respondents owned breeding ram and buck. Larger households retain young male for castration and fattening. This implies that retention of young male for breeding is seldom practiced by owners.

The majority of breeding rams and bucks originated from the same or another village. In dry season, immediately after crop harvest ram and buck from different flocks while roam freely mates females within the same village or from other villages. Berhanu (1998) and Jaitner *et al.* (2001) reported similar situations. Two possible breeding seasons of the flocks were identified. As to 60% sheep and 58.0% goat owners, major breeding time of the flocks is between November and January. Until crops are harvested, flocks are usually tethered and maintained under nutritional stress. Between November and January, immediately after harvest the flocks freely graze on crop stubbles and aftermaths. Thus, adequate nutrition for reproductive process and access to breeding males creates favorable situation to the reported intensive flock breeding. This in agreement to findings of Mukasa-Mugerwa (2002) observed peak conceptions of ewe in response to feed flushes or when crop residues are available. Similarly, Takele *et al.* (2006) reported availability of adequate feeds immediately following crop harvest allows free access to aftermath improve testicular sizes and semen characteristics in rams.

About 32.7% of the sheep and 34.7% of goat keepers reported that the second minor breeding season is between April and June. As in main season, this is also attributed to improved feed supply from grasses and browses grown immediately after the *belg* shower rains. Lambing and kidding of the flocks mated in major breeding season occur in an entry to wet season from April to May whereas births of the minor breeding season during occurs in dry season from October to December. Mukasa-Mugerwa *et al.* (2002) found that mating of ewes in the dry season lead to higher fertility than those mated in the wet season that ewes from the previous wet season came with enough body reserves. The same author confirmed that lambing in the subsequent wet season further enhanced weaning rates and productivity due to better grazing during lactation. In rams, Takele *et al.* (2006) confirmed that adequate seasonal feed availability result superior reproductive performance. This implies that major lambing and kidding during wet season is favourable to the new borne.

It was observed that there is no deliberate practice of making selective breeding to avoid risks of the inbreeding depression in the flocks. It is of more concern that almost all breeding rams and bucks originated from their respective flocks might imply that the relationship of animals within a flock and even within a village is narrow and inbreeding is widespread and increasing. This is in agreement with Berhanu (1998) and Jaitner *et al.* (2001).

4.1.2.5 Productive and reproductive performances of sheep and goat

Weaning age of 4 month for kids and 4.6 month for lambs in this study is early than 5.9 and 6.6 months, respectively for kids and lambs of Kochere district (Adugna, 1998) and 4.8 and 5.3 months, respectively for kids and lambs in Wolaita area (Adugna, 1990). This could attribute to the relative better feed supply compared to the densely populated Kochore and

Wolaita areas. Tesfaye *et al.* (2000) reported weaning age of 90.18 days for Boran Somali and 92.46 days for Mid Rift Valley goats. Records of birth and weaning weights to estimate birth and weaning weights and weight gains up to weaning were small at present.

Age at puberty for sheep (6.7 months for male and 6.9 months for female) observed in this study is below 300 days reported for male but comparable to 231 days for female tropical sheep elsewhere (Combellas, 1980). About 7.0 months for female goats is in agreement with observation of Markos (2000) reported 7 to 8 months for female but that of males (6.6 months) is vary widely than the 12 months for male in Awassa Zuria woreda. Payne and Wilson (1999) reported tropical male goats reach sexual maturity at 132 days.

Beginning from ages of comparable 7.1 and 7.2 months, respectively male goat and sheep are slaughtered for family consumption. Female are often retained for breeding but when necessary slaughtered from an ages of 7.4 months in kids and 7.7 months in lambs. Slaughter ages observed in this study are early than findings of Adugna (1998) reported 10.8 months for both male and female kids and 13.5 months for female and 13.8 months for male lambs. In rural Alaba, there is strong consumption tradition of young lambs and kids that believed to well build body and health of sick family and mothers and this could attributed to the observed early slaughter ages.

Age at first parturition observed in this study (12.7 months for lambing and 12.1 months for kidding) is comparable to findings of Awotwi and Fynn (1992) reported mean ages of 13.2$\pm$ 0.2 and 11.0$\pm$0.1 months, respectively at first lambing and kidding in backyard systems of southern Ghana. FAO (2002) reported age at first lambing ranges between 16.2 and 16.9 months and that of at first kidding from 13.5 to 17.5 months in mixed farming systems of sub-

Sahara African countries. Early age at first parturition observed in this study agree with finding of Wilson (1989) reported management decisions concerning the age at which females should be mated for the first time may be based on a minimum age, on a minimum weight or on a combination of both criteria. The same investigator found that under uncontrolled breeding systems in Ethiopia, about 95% of ewes conceived for the first time before the age of 15 months.

Table 16: *Productive and reproductive parameters of sheep and goat flocks*.

Parameters	**Sheep**		**Goats**	
	Male Mean (SD)	*Female Mean (SD)*	*Male Mean (SD)*	*Female Mean (SD)*
Weaning age (months)	4.6(0.55)		4.0(0.21)	
Age at puberty(months)	6.7(1.06)	6.9(1.05)	6.6(1.23)	7.0(1.79)
Slaughter age (months)	7.2(2.13)	7.7(2.35)	7.1(2.18)	7.4(2.13)
Age at first parturitions (months)	12.7(1.50)		12.1(2.27)	
Parturition interval (months)	7.8(1.61)		6.9(1.29)	
Fertility (%)	83.6		83.8	
Prolificacy or litter size	1.70		1.75	
Lambing/kidding rate (%)	142.5		146.5	
Annual reproductive rate	0.89		1.03	
Weaning rates (%)	52.7		65.2	
Lamb/kid survival rate (%)	37.0		44.5	

Lambing interval of 7.8 month for ewes found in this study confirms earlier report of Wilson (1989) ranging between 230-437 days. Combellas (1980) also reported a comparable lambing interval of 247 $\pm$ 53 days in tropical sheep elsewhere. Kidding interval of 6.9 months in this study is earlier than 9 to 12 months for flocks in Awassa Zuria woreda (Markos, 2000). In

neighboring Arsi Negelle area, Tatek *et al.* (2004) reported comparable interval of 8.07 months for Arsi-Bale goats under farmers' management conditions. Wilson (1989) reported kidding interval ranging between 238 and 391 days for African does. The shorter interval observed in this study could attribute to the uncontrolled breeding systems.

Litter size or prolificacy of 1.70 in sheep and 1.75 in goats observed in this study are comparable to observations in African flocks ranging between 1.08 and 1.75 for does but slightly higher than repots for ewes ranging between 1.02 and 1.43 (Wilson, 1989). Endeshaw (2007) reported litter size of 2.07 for goats in drier parts of Dale district. Awotwi and Fynn (1992) reported prolificacy of 1.3 in sheep and 1.8 for goats under backyard systems of southern Ghana. Combellas (1980) also reported comparable litter sizes ranging between 1.2 and 1.6 for tropical sheep elsewhere. Foote (1991) (cited in Mukasa-Mugerwa *et al.,* 2002) reported litter size of tropical sheep ranging between 1.01-1.60. Tatek *et al.* (2004) reported litter size of 1.21 for Arsi-Bale goats in Arsi Negelle. Mukasa-Mugerwa *et al.* (2002) reported litter sizes of 1.13 in Menz and 1.14 in Horro Ethiopian highlands sheep. Armbruster and Peters (1993) reported litter size of 1.19 for Djallonke sheep and 1.52 for Djallonke goats in southern Cote d'Ivoire under traditional production systems. FAO (2000) reported prolificacy of sheep ranging between 1.09 and 1.16 for sheep and 1.26 and 1.52 for goats in mixed farming systems. Twining is most common among Alaba flocks constituting 80% in sheep and 82.2% in goats and this could attribute to the present litter sizes.

Fertility rate of 83.6 percent in ewe and 83.8 percent in does observed in this study is below the findings of Awotwi and Fynn (1992) who reported 93.3% in sheep and 99% in goats under backyard systems of southern Ghana. However, it is higher than findings of Mukasa-Mugerwa

et al. (2002) reported 76% in Menz and 67% in Horro Ethiopian highlands sheep. Lambing rate, a product of fertility and prolificacy is a good measure of ewe reproduction (Foote, 1991 cited in Mukasa-Mugerwa *et al.,* 2002) and the present 142.5% lambing and 146.5% kidding rates fall within the 65-200% vales reported for tropical hairy sheep (Foote, 1991 cited in Mukasa-Mugerwa *et al.,* 2002) but higher than the findings of Mukasa-Mugerwa *et al.* (2002) who reported 87% in Menz and 81% in Horro ewes. FAO (2000) reported lambing rate ranging between 108.2 and 119.1 and kidding rates between 120.1 and 133.6 for sub-Saharan Africa flocks. A composite parameter ARR, a product of the size of the litter and the number of days in the year divided by the parturition interval (Wilson, 1989) is 0.89 for sheep and 1.03 for goat in this study and comparable to Wilson (1989) reported values ranging between 0.98 and 1.97 for sheep and 1.17 and 2.41 for goats. The same author reported 0.82, 0.85 and 1.46 vales Yatenga sheep in three different years in elsewhere tropical sub-Saharan Africa.

Weaning rate of 52.7% in lambs and 65.2% in kids observed in this study is below findings of Awotwi and Fynn (1992) reported 85.7% for lambs and 85.8% for kids. Mukasa-Mugerwa *et al.* (2002) reported comparable 57% in Horro and higher a 73% in Menz ewes. Lamb survival rates of 37.0% observed in this study is significantly lower than finding of Mukasa-Mugerwa *et al.* (2002) reported 83 and 68 percent, respectively for Menz and Horro sheep. The low weaning rates and young survival observed in this study clearly depict the high pre-weaning loss of kid and lamb. This could clearly depict that loss of lamb and kid crops at Alaba condition is critical.

The reproductive performance of the breeding female is possibly the single most important factor influencing flock productivity (ILCA, 1990) and there is evident potential of high

reproductive efficiency in African indigenous small ruminants (Wilson, 1989; Armbruster and Peters, 1993; Tatek *et al.,* 2004). Traditional breeders appear to exploit this potential relatively well, especially in regard to age at first parturition and the intervals between successive births (Wilson, 1989). Mortality rates reduced the potential productivity. Management and hygienic measures are important approaches to reduce high lamb and kid losses in traditional flocks.

4.1.2.6 Housing and management practices

About 98.6% of respondents accommodate their flocks in the main houses together with the family members. Confining of flocks in separate barns (only 0.7% respondents) or adjoining structures (0.7% respondents) is uncommon. Key informant farmers during group discussion indicated that the local tradition is that '*sheep, goats and honey bees survive less in the absence of smoke from the house fire.*' Flocks are kept in house at night and during the day when the heat intensity is high. Young animals are kept around the homestead until weaning to avoid walking long distances in search of feed and water and to minimize exposure to predators. The major reason for housing flocks at night with the family is to minimize attack by predators and to avoid theft. Predators rarely destroy barns and also main houses and causes complete loss of flocks. Fox and hyenas are the major predators. Housing of flocks in the main house is more common than other reports in the country (Nigatu, 1994; FARM-Africa, 1996; Berhanu, 1998; Markos, 2000). Confining of flocks together with family has zoonotic health implications, nevertheless, to reduce predator and theft losses household for long held the tradition of sharing the same roof with their flocks.

Lambs and kids are often offered with green leaves and leftover food until weaning. In cases of loss of their dams, young animals are offered with cow's milk and household leftover foods

until they start grazing and browsing. Respondents of 10.7% practiced early weaning (preventing suckling by herding separately or tethering) of young animals to maintain body condition of mothers for the subsequent reproduction.

Respondents of 91.3% castrate their male animals. Ninety percent of the households use traditional methods of castration (stick, stone to crash vas deference of the testes) and the remaining use modern methods (using Burdizzo) at the Alaba Kulito animal clinic. According to 68.7% of the total respondents the major reason of castration, is to fatten and sale. Thirteen percent of the total flock owners in all sites castrate males with undesirable physical characteristics like black coat color and small body size at early age to avoid breeding. Several intact males in a household make noises and become restless and difficult to handle thus 18.7% of the respondent castrate their animals to tame. The average age of castration is 1.1 year for sheep and 1.6 year for goat. This is attributed to the households' interest to castrate and fatten sheep as early as possible to take advantage of the higher demand and prices at the present market.

Sheep owing respondents of 65.5% dock the tail of female sheep at an average age of 3.7 days to facilitate mating. Tail docking at a very early age is done to minimize stress and enhance recovery. Docking of tail often around middle is done using knife.

Respondents of 57.3% practiced selection of flocks for breeding and fattening purposes. Breeding female goats are selected for high milk yields considering long ear, large teat and udder, known local ecotypes for their milking potential from adjacent Arsi (Ropi and Aje) and other niches.

Table 17: *Management practices of young, breeding and fattening flocks.*

Particulars	**N (%)**
Practice weaning	16(10.7)
Castrate male sheep and goats	137(91.3)
Traditional methods	123(89.8)
Modern methods	11(8.0)
Both traditional and modern methods	3(2.2)
Provide special management for fattening animals	120(80.0)
Practice culling of sheep and goat	114(75.8)
Dock tail of female sheep	98(65.5)
	Average
Age at tail dock of female sheep (SD) (days)	3.7 (1.94)
Age at castration of rams (SD)(years)	1.1 (0.48)
Age at castration of bucks (SD) (years)	1.6 (0.66)

Sheep for sale at targeted festival/holyday markets either home born or purchased are selectively castrated and receive fattening managements of supplementation with locally available feeds and health management (deworming and treatment). For satisfactory final weights and condition households select fattening sheep with desirable physical characteristics and known local ecotypes. Sheep from Adilo and other parts of Kambata areas are preferred for their quick response to fattening management, better adaptation to the local environments and posses market desirable physical traits (coat colors, ear and horns). Above one-third respondents of both sheep and goat owners select animals for fattening based on body conformation (length and body height). Notably, 31.2% of both sheep and goat owning respondents consider the physical characteristics of the animals.

Table 18: *Selection of sheep and goats for castration and fattening.*

Characteristics	Sheep	Goat
	N (%)	*N (%)*
Conformation	59(34.1)	54(35.1)
Known local ecotypes	20(11.6)	27(17.5)
Physical traits	54(31.2)	48(31.2)
Age	40(23.1)	25(16.2)
Total	**173(100.0)**	**154(100.0)**

Respondents of 32.3% sheep and 41.9% goat owners indicated that coat color is one of the most important traits. White, light brown and mixture coat colors have a preference in that order in both sheep and goats. The orientation of horns is prominently considered among 41.0% goat and 29.3% sheep owners. The presence, medium size and up-ward orientation of horns add high aesthetic value. The width, length and fatness of the tail are vitally important in sheep that 31.7% of the respondents look intently.

Respondents of 23.1% sheep and 16.2% goat owners mentioned that age of the animals is important factor at the market. Young fattened animals fetch higher prices because of the tenderness of their meat. Thus, farmers respond to the market requirements by fattening animals that have often erupted not more than three pairs of incisors during sale. Higher proportion of households considered age of sheep implies that they are well responding to the consumers preference that larger terminal traders and consumers in final markets highly requires the age of animal.

Table 19: *Desirable physical traits of sheep and goats for breeding and fattening.*

Physical traits	Sheep	Goat
Coat color	54(32.3)	49(41.9)
Horn	50(29.9)	48(41.0)
Ear	10(6.0)	14(12.0)
Tail	53(31.7)	6(5.1)
Total	**167(100.0)**	**117(100.0)**

About 11.6% sheep and 17.5% goat owning respondents prefer to fatten sheep and goat from certain known areas or flocks. Adilo is the most preferred site to acquire breeding and fattening sheep. Goats are preferably acquired from Ropi and Aje localities of south- west Arsi. The main criteria for choice of animals from specific localities are better response to management, adaptation to the production environments, good outputs (milk and meat) and desirable physical characteristics (coat color, conformation, tail, horn, etc).

The study identified that body conformation (height and length) and physical characteristics (coat color, horn, tail) are the major criteria that household consider to select sheep and goats for castration and fattening. This is in agreement to the findings of Jaitner *et al.* (2001) who reported that growth (conformation and growth rates), color, horns and breeds are important traits of owners in The Gambian. Coat color and horn in both sheep and goats and tail in sheep are very important traits. This clearly depicts body conformation and certain physical traits (tail, coat color, horn) are foremost criteria that producers, traders and consumers critically consider and accordingly breeding efforts needs to assimilate the stakeholder preferences.

4.1.2.7 Acquisition, disposal and culling practices of sheep and goats

The major factors that account to increase and reduction of flock size are shown in Table 20. Mortality represented 45.5% of total loss in sheep and 49.2% in goats and it was found to be the major cause for flock size decline in the studied areas. This is considerably higher than the findings of Workneh (2000) who reported 22.5% of death and other losses for goat flock in Eastern Ethiopia. Sale removed an average of 1.5 sheep and 1.6 goats per household over a year time and it constituted total disposal of about 31.1% in sheep and 29.4% in goats. Workneh (2000) reported comparable result of 35.7% goat exit through sales in Eastern Ethiopia. Intact male, castrate and weaned young animals are usually sold in need of immediate cash. Pre-weaned young and breeding females are disposed as the last resort. Fattened flocks are sold at targeted seasonal festival markets.

Slaughter represents a total disposal of 14.3% in sheep and 8.0% in goat. Workneh (2000) reported higher exit of goats through slaughter (15.2%) in Eastern Ethiopia. Total loss of 10.7% in goat due to predators attack is higher than 1.0% in sheep. This is due to the fact that the majority of goats are found in localities where predators are abundant. Share holding is apparent in sheep flocks represented 5.9% of the total disposal. This could attribute to the current rising demand and prices for sheep encouraging farms to expand more of sheep flock through purchase, share holding and gifts.

Birth at home was a major source of building household flock and constituted about 54.9% in sheep and 63.3% in goat flocks. Purchase, gifts from family and relatives and share holding, respectively contribute 18.5%, 14.2% and 12.4% of the total sheep acquisitions, while 15.6%, 10.5% and 10.5% for goats.

Table 20: *Sheep and goat flock dynamics.*

Routes	Sheep	Goat
	Percent	*Percent*
Exit through (Subtraction)		
Sales	31.1	29.4
Mortality	45.5	49.2
Slaughter	14.3	8.0
Theft/robber	1.4	2.1
Predator	1.0	10.7
Gift/inheritance	0.7	0.6
Share holding	5.9	-
Enter through (Addition)		
Home born	54.9	63.3
Share holding	12.4	10.5
Gifts/inheritance	14.2	10.5
Purchased	18.5	15.6

Gifts or inheritances from family and relative are important sources of flock build up. Young family units are presented with sheep and goat flocks from relatives and family. Share holding is a local strategy that is of mutual benefit to the poor as well as the rich also harmonizes the relationship between poor and rich farmers. Flocks are held in share for breeding or fattening purposes. Agreements are made between the donors and recipients either to share incomes from sale of the flock or offspring with agreed proportion. Share holding among resource poor farmers is imperative for efficient utilization of farm resources (feeds, family labor and housing space) and to build flocks under their existing situations of capital limitation. Framers with large holdings of flock and scarce farm resources (land, labor, feed, space) share out their

flock and gains substantial returns in forms of cash and offspring. This implies that such local arrangement of flock acquisition may be due to lack of credit services in the area and provision of credit could further support the ownership and development of sheep and goats. The gross offtake, total voluntary disposal of animals through sale, slaughter, exchange and/or giving (ILCA, 1990) accounting 19.1 percent in sheep is higher than goats (12.8 percent). Sale-offtake accounts 11.9% in sheep and 9.9% in goat flocks while net off-take is 11.3% in sheep and 9.1% in goats.

Besides to the dynamics of flocks through major exit routes, 75.8% of the respondents practiced culling out of unproductive or poor performing flocks. Of these 28.4% and 26.8% respondents, respectively cull flocks with reproductive problems and old age. Breeding females of both species, with poor mothering ability, and that fails to conceive through repeated mating and has a known history of repeated abortion are primarily culled from the system. Aged breeding females are also culled and replaced by young flocks.

Respondents of 17.6% cull their animals for health problems. Similarly, 12.6% respondents cull animals with physical damage due to mechanical or pathogenic factors. According to 14.5% of the respondents, animals with some undesirable phenotypic characteristics, for example black coat color, are also culled.

4.1.2.8 Consumption of sheep, goats and their products

Sheep and goat are slaughtered for household meat consumption. Major slaughter are made during festivals and various family and cultural events representing total slaughter of 53.2 and 42.0 percents, respectively contribute to considerable flock off-take. Major festival of large

flock slaughter is during Id Al Fetir fasting periods. Large volumes of flocks are also slaughtered for Id Al Maulid festivals. In occasions when there is birth, burials, circumcision, etc sheep and goats are slaughtered. Some 4.5% of the respondents indicated that they slaughter sheep and goats for wedding ceremony. Slaughter for regular family consumption other than the major festivals and events is rare and only 0.4% of the respondents do so.

Of those slaughtering households, 97.8% sheep and 83.3% goat owners commonly slaughter male flock. Female are primarily kept for breeding and seldom slaughtered. Some 13.3 goat and 2.2% sheep owners responded that when available at home they non-selectively slaughter either male or female animal during festivals and events. Few households (3.4%) in goat dominating site slaughter female goats.

The majority (98.9%) of goat keeping respondents in goat dominating and mixed flock sites milk their flock for household consumption. Within the household member children are the most frequent consumers (89.9%) of the goat milk. However, in all goat rearing areas, all household members consume goat milk with coffee. Households having sizeable milking goats mix goat milk with cow milk and processes into dairy products. Goat milk is believed to have medicinal value and is consumed by about 5.6% sick family and 4.5% aged people. This is in agreements with previous reports by Nigatu (1994). Sheep are not milked at all in the area as there is no custom of consuming sheep milk. However, key informants affirmed that this is due to the low lactation yield of sheep and they do not produce surplus besides to their offspring. This is in agreement to findings of Legesse *et al.* (2007) reported that sheep are not milked in the adjacent Adilo areas. Due to uses of goats milk and milk products for home consumption

(97.8%) and lack marketing tradition and access (2.2%) goat milk and milk products are not marketed.

4.1.2.9 Sheep and goat skin production and preservation

Sheep and goat skins are important by-products. Respondents of 68.2% and 59.2%, respectively produced sheepskins and goatskins sold the skin. However, 20.5% sheepskins and 26.7% goatskins producers used the skins locally as prayer's mat. About 64.0% of the total respondents make certain precaution during flaying and apply preservations. This is in agreement to Akloweg and Workneh (2004) reported that air drying and curing with salt are common practice of skin preservation in Ethiopia. Respondents of 68.1% and 31.9%, respectively employ common preservation measures of sun or smoke drying and application of salt to retain the quality of the skins. Respondents pass skins to markets on average of 2.2 days after slaughter. This is one of the reasons for the poor quality of skins in the woreda, as it is characterized by hot climate which enhances deterioration of skin quality. Akloweg and Workneh (2004) highlighted that when skin is left uncured, the combination of water and bacteria will cause putrefaction at a rate dependent upon the surrounding temperature.

The major quality defects respondents confront are flay-cut (52.1%) and contamination with bacteria and dirt (29.0%). Damages due to excessive drying of skins constitutes about 15.4% of the total defects. Small size of skins and meat left on skins contributes to 1.3 and 1.5 percent of the skin defects. Sixty percent of the total respondents do not brand their flocks (Table 15) to avoid damage to the skin and to get better prices from quality skin they present to market and thus defects due to branding were not worth mentioning.

Development efforts in production and supply of quality skin have been carried out in the woreda and rewarding outcomes were reported. For example, a UNIDO pilot project aimed at reducing losses in skins and hides related with poor production, collection, preservation and marketing has been implemented in Alaba woreda. The project provided training for professionals, slaughter house and private skin and hides workers), financial and material supports (Zewdu, 1998; OoARD[7], 2007).

Table 21: *Main uses of sheep and goat skins.*

Purposes	**Sheepskin**	**Goatskin**
	N (**%**)	*N* (**%**)
Sale	90(68.2)	89(59.3)
Bed/seat sheet	12(9.1)	16(10.7)
For pack animals	3(2.3)	3(2.0)
Prayer mat	27(20.5)	40(26.7)
House decoration (put on wall)	-	2(1.3)
Total	**132**(**100.0**)	**150**(**100.0**)

One of the outcomes of the projects was institutionalization of identifying defects and grading systems of the hides and skins. Identification of defects has created awareness in the common defects and their effects on grade of the skins and this might have equipped both traders and producers with basic knowledge that has probably helped them to minimize defects and produce acceptable grades of skins.

[7] Project document from the Desk of Livestock and Fisheries Development, Alaba Special Woreda OoARD

4.1.2.10 Extension services in sheep and goat production

The majority of the respondents (75.2%) reported that the existing extension system is not providing any assistance in sheep and goat development. Some 10% of the respondents who had received improvement techniques did not apply to their flocks because it was not relevant to their problems, affordable, and accessible or was not easy to apply. Development agents provided about 73.0% of the development techniques. Support from NGOs (5.4%) is very low. Respondents of 13.5 and 8.1 percent, respectively learnt improvement practices from their neighbors and Kebele administrators.

About 52.8% of the respondents indicated that the improvement practices obtained through meetings in the Kebele. The other 25.0, 19.4 and 2.8 percent respondents, respectively had trained, heard from friends and made practical tour. Training was mainly offered to the safety-net program beneficiaries. The intervention embraces distribution of sheep and goats coupled with training on feeding, health and fattening managements.

4.1.2.11 Institutions and innovations in sheep and goat production and marketing

Institutional support in sheep and goat production is limited to health services which are basically irregular on-farm flock vaccinations and services at the Kulito station. About 76.3% of the respondents obtain health services from the woreda OoARD with modest cash charge. About 19.3 and 4.4 percent of flock owners obtain alternative veterinary services from illegal sources and private veterinary centers.

Access to credit services in the area is very much limited and only 6.7% of the total respondents received credit. Ninety percent of the credit received in kind (animals). The major

source of credit is the OoARD offered about 80.0% of the total credit for fattening of sheep, goats and cattle. About 40.0% of the total credit targeted women and the remaining 60.0% to men.

Flock building through credit and gifts from NGOs and GOs comprises 23.3% and 20.0%, respectively. On the other hand, the majority (56.7%) of the total respondents received breeding and fattening flocks through share holding arrangements. About 22.1% of the total respondents confirmed the existence of cooperatives in their localities mainly operates in crop production through delivery of inputs to producers and later collect, store, market the products and allocate income to members.

Table 22: *Sheep and goat development supportive interventions and institutions.*

Particulars	**N**	**Percent**
Households received credit	10	6.7
In cash	1	10.0
In kind	9	90.0
From governmental offices (OoARD)	8	80.0
From NGOs	2	20.0
For crop production	1	10.0
For sheep, goats and cattle fattening	9	90.0
Husband taken	6	60.0
Wives taken	4	40.0
Received sheep and goats in gifts or other means	30	20.1
Credit	7	23.3
Gift from NGOs, GOs	6	20.0
Share [fattening = 5.9%; breeding = 94.1%]	17	56.7

4.2 Sheep and goat marketing system

4.2.1 Market participants

As indicated in section 4.1.1.6 nearly one-third of the respondents (31%) (Table 5) rear sheep and goats to generate income. Smallholder farmers are the main suppliers of the animal and sale at any time when immediate income is required.

One-third (33%) of the considered households also purchase animals for breeding (76%), slaughter (16%) and fattening purposes (8%). Rural assemblers buy animals from farm gates and local markets to sale in Alaba Kulito and other surrounding markets. They are usually farmers who run business often during off-farm seasons to generate income from trade of sheep and goats or other animals (cattle and equines). They purchase few animals usually below 10 and visit different incentive markets (Alaba, Besheno, Adilo, etc). They maintain the unsold animals on their farms until sold in subsequent market days. This implies that local assemblers are in a better position to maintain flocks to sale in incentive season and market place unlike medium and large traders in urban areas face serious difficulty of holding the unsold animals.

Individual consumers or those provide catering services purchase animals from Alaba Kulito and other local markets. Household consumers often purchase during cultural and religious holidays/festivals. Agents for export abattoirs purchases animals from Alaba and other surrounding markets. They usually purchase young male sheep and goats on live weight basis within body weight range of 13-30 kg for both sheep and goats. They supply animals to the

export abattoirs. The demand of export abattoirs often reach peak during Muslim fasting period for the export market in the Gulf of Arabia regions.

Specialized and large traders of terminal markets (Addis Ababa and Shashemene) purchase sheep and goats from Alaba Kulito and other surrounding markets for major cultural and religious holidays/festivals. They visit only during holidays/festivals seasons however, purchase large number of fattened male animals with higher body weight and body condition and gorgeous physical characteristics (color, tail, horn). Animals purchased from local markets get to their destination by truck. Transporters prefer to carry small ruminants that they have light weight compared to other agricultural commodities (cattle and grains).

Various governmental and non-governmental organizations purchase large number of breeding and fattening sheep and goats from Alaba area. These include institutions within the region or other regions. The Alaba woreda OoARD also purchases large number of animals from the local markets with 'Safety-Net' funds obtained from donors channeled through the regional food security coordination office and targets the destitute and vulnerable farmers to support food security at the household level. These excess demands and raised purchases tend to shoots-up sale prices and this in turn motivates local farmers to sale as many animals as possible; affecting household flock production through the removal of young breeding flocks. This is in agreement to Workneh (2006) reported that the current market prices may offer greater incentives in the short-term than the longer-term advantages of retaining inputs for breeding and this place serious concern to the present sudden surge of the rising off-take on supplies of replacement breeding stock.

Brokers are involved in transactions and transportations of animals and obtain commission of unfixed amount from sellers, buyers and transporters. They are not legalized and their roles are controversial for the different market participants. Farmers complain about the high commission charges, misbehavior, misinformation and repel buyers if not involved. However, traders who come from distant locations require guarantee of local brokers for any disagreement arising after purchase of the animals (when sold by thieves/robbers and family or share holders disagree to sale). Brokers often involve personal and residential details of sellers and buyers and easily manage discrepancies.

4.2.2 Mode of marketing and price setting

The majority of the producers, about 96.7% market their animals on 'eye-ball' estimation. Few farmers (2.0%) prefer to sale on live weight basis for it fetches better prices. Animals marketed on live weight basis are only young male animals required by the export abattoirs. Producers of 37.0% prefer "eye-ball" marketing for it fetches better prices and that of 36.3% prefer for majority of their customers purchases on 'eye-ball'. Animals are marketed on individual basis and agreement to prices reached after a long one-to-one bargaining between buyers and sellers and some times brokers. Local and terminal traders and exporter agents are better informed of the demands and prices of animals and are decisive to fix prices. Producers usually sale with the trader prices for their immediate income needs. This is in agreement with findings of Kebede and Rey (1992). However, 17.1% respondents market in 'eye-ball' due to lack of marketing on live weight bases and conversely some 9.6 percent respondents do not thrust measurement accuracy (weighing scale). Households preferring live weight marketing acknowledge incentive prices (50%), save energy and time (25%) and preference of their

customers (25%). This could attribute to lacking of infrastructure required in production and marketing of livestock in the country (Ayele *et al.,* 2003). These days, marketing of flocks on live weight basis is becoming common in centers of Alaba areas and there is a growing interest of producers to market in live weights. However, in some local markets weighing scale are not available.

In markets of Alaba and its surrounding (particularly the Adilo market) supply of animals reaches peak during the major holidays/festivals. Only few and common large traders visit the seasonal festivals markets with less competition among themselves and they are more influential in determining the prices. This is in agreement to previous reports of ILCA (1990), Kebede and Rey (1992), ILRI (1995) and Ayele *et al*. (2003). The major animals supplied are fat male sheep and some goats. Major Holiday markets in Alaba area include Ethiopian New Year, Ethiopian Easter, Christmas, Id Al Fetir and Id Al Adha in that order of importance.

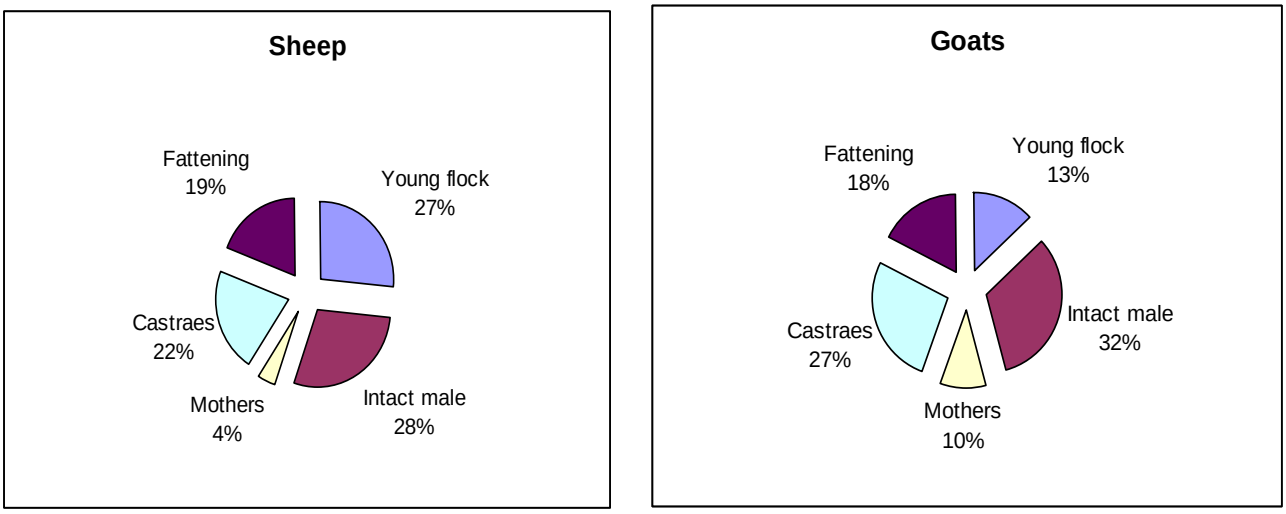


Figure 8: *Classes of sheep and goats sold for urgent income needs.*

For urgent farm income requirements, 32% of goat and 28% of sheep owners largely prefer to dispose intact male followed by castrates (22% sheep and 27% goats) for they earn reasonable income. Young lambs (27%) and kids (13%) are often sold by the households but fetches low price. Comparable fattened sheep (19%) and goats (18%) are also sold for immediate cash. Breeding females are considered as a last resort (does 10% and ewes 4%) to sale when other flocks are all sold. Higher sale of breeding does (10%) might attributes to the high sale rate of flocks including breeding does in goat dominant site. These Kebeles are drought prone and often encounter crop failures for household consumption and sale and the households sale as large as possible flocks to generate income and purchase food for their family.

4.2.3 Household marketing

4.2.3.1 Purposes of sales

Sheep and goat are sold to fulfill immediate farm cash requirements. Thirty-five of the total respondents sold their sheep and goats to purchase food items. The woreda is known to be drought prone and the sale rate is highest during crop failures and before harvest of staple food crops. Households of 17.6% sale sheep and goats to generate incomes for purchasing farm inputs during cropping seasons. Sheep and goat are often at immediate disposal for several income requirements in the rural households. In these household sheep and goats are considered as the major farm buffering assets. Rural households do not sale large animals and other farm resources for urgent needs because acquiring back them is not easy. Therefore sheep and goat are always at disposal to buffer disaster of the farm households.

Table 23: *Purposes of sale of sheep and goats.*

Purposes	Mixed flock site *N (%)*	Goat dom. site *N (%)*	Sheep dom. site *N (%)*	Overall *N (%)*	Test χ^2	Test *P-value*
Purchase farm inputs	7(12.7)	9(18.0)	19(20.2)	35(17.6)	6.265	0.180
School expenses	59.1 ()	7(14.0)	13(13.8)	25(12.6)	2.463	0.651
Medical expenses	8(14.5)	4(8.0)	12(12.8)	24(12.1)	3.556	0.469
Escape loss risks	2(3.6)	-	1(1.1)	3(1.5)	0.750	-
Purchase food items	19(34.5)	22(44.0)	28(29.8)	69(34.7)	4.139	0.388
Pay back credits	7(12.7)	7(14.0)	13(13.8)	27(13.6)	7.902	0.095
Purchase livestock, cloth, assets, etc	7(12.7)	1(2.0)	8(8.5)	16(8.0)	0.686	0.953
Total	**55(100.0)**	**50(100.0)**	**94(100.0)**	**199(100.0)**		

4.2.3.2 Types of animals marketed and their prices

All age, sex and weight classes of sheep and goats with majority of young flocks are marketed. An average number of 1.8 male and 1.4 female young sheep and 1.8 of both male and female young goats per household are the dominantly sold flock compared to others. Sale price of 378.1 Birr and 334.4 Birr for fattened sheep and goats, respectively and purchase prices of 190.0 Birr and 220.0 Birr for fatten sheep and goats, respectively are high. Average sale price for all animals of similar category is higher than that of purchase prices except for ewes and young female lambs their purchase price is higher than sale price. This could be attributed to the fact that female animal are required for breeding and purchased usually after crop harvests. Thus the relatively sufficient cash after crop harvests and the high demand of female sheep (lamb and ewes) for breeding purpose contribute to higher purchasing prices than the selling prices.

Table 24: *Classes and sizes of household marketed flocks and their prices (Birr).*

Types and classes of flocks	Sold	Sale prices			Purchased	Purchase prices		
	Mean(SD)	*Mean(SD)*	*Min*	*Max*	*Mean(SD)*	*Mean(SD)*	*Min*	*Max*
Sheep								
Breeding females/ewes	1.5(0.9)	121.8(23.8)	80	167	1.9(1.4)	139.5(24.5)	100	190
Breeding/intact male	1.2(0.4)	136.2 (37.0)	80	210	1.0(0.0)	145.0(26.5)	120	180
Young females (3-12 months)	1.4(0.7)	89.0(24.6)	40	120	1.3(0.5)	107.7(32.1)	65	190
Young males (3-12 months)	1.8(0.9)	88.1(27.0)	54	150	1.7(1.2)	97.3(32.6)	60	120
Castrate/fatten	1.5(0.9)	334.4(105.3)	245	550	1.0	190.0	190	190
Goats								
Breeding females/does	1.7(0.8)	140.3(36.9)	85	210	1.3(0.5)	134.0(30.4)	93	180
Breeding/intact male	1.5(0.7)	110.2 (27.7)	63	155	1.1(0.4)	90.7(21.9)	60	120
Young females (3-12 months)	1.8(0.8)	92.5(32.1)	53	170	1.0	60.0(14.1)	50	70
Young males (3-12 months)	1.8(0.9)	91.6(24.9)	50	150	1.0	75.0	75	75
Castrate/fatten	1.4(0.5)	378.1(126.3)	220	600	1.0	220.0		220

4.2.4 Market locations and routes

Farmers market sheep and goats at farm gates or the nearest local/primary markets. Farmers use all markets found in their localities regardless of political boundaries and ethnic and cultural differences. Farmers of Alaba Special Woreda found adjacent to the Oromia Region State, Silti, Hadiya and Kambata administrative zones of SNNP enter to their nearest respective markets. Aje and Ropi markets (Oromia), Alem Gebeya and Silti Mazoria markets (Silti Zone, SNNP), Bonosha market (Hadiya zone, SNNP), Damboya and Adilo markets (Kambata zone) are the main markets farmers use. Besheno, Guba, Mito and Kobo are the small local markets found in the woreda that farmers in nearby localities use. Households in the mixed flock and sheep dominant sites market their sheep and goats in Alaba Kulito market whereas producers in goat dominant sites often enters to Besheno market. Sale price of animals in Alaba Kulito is perceived to be better than other local markets. However, farmers sale in markets near to their localities to avoid walking long distances, and to minimize transaction costs and personal expenses. For urgent income needs farmers also visit markets in the nearest days in either near or distant locations. Except on Sundays, one can find market days throughout the week in near radius areas.

Farmers and rural assemblers from different local markets (Figure 9 and Appendix 11) supply animals to Alaba Kulito market. Thursday followed by Tuesday, is the major market day for sheep and goats of varying sex, age and weight. There are two possible exit market routes through which animals from Alaba area reach to the final consumers (Figure 10). The first route is agents of export abattoirs collect young male sheep and goats from the local markets.

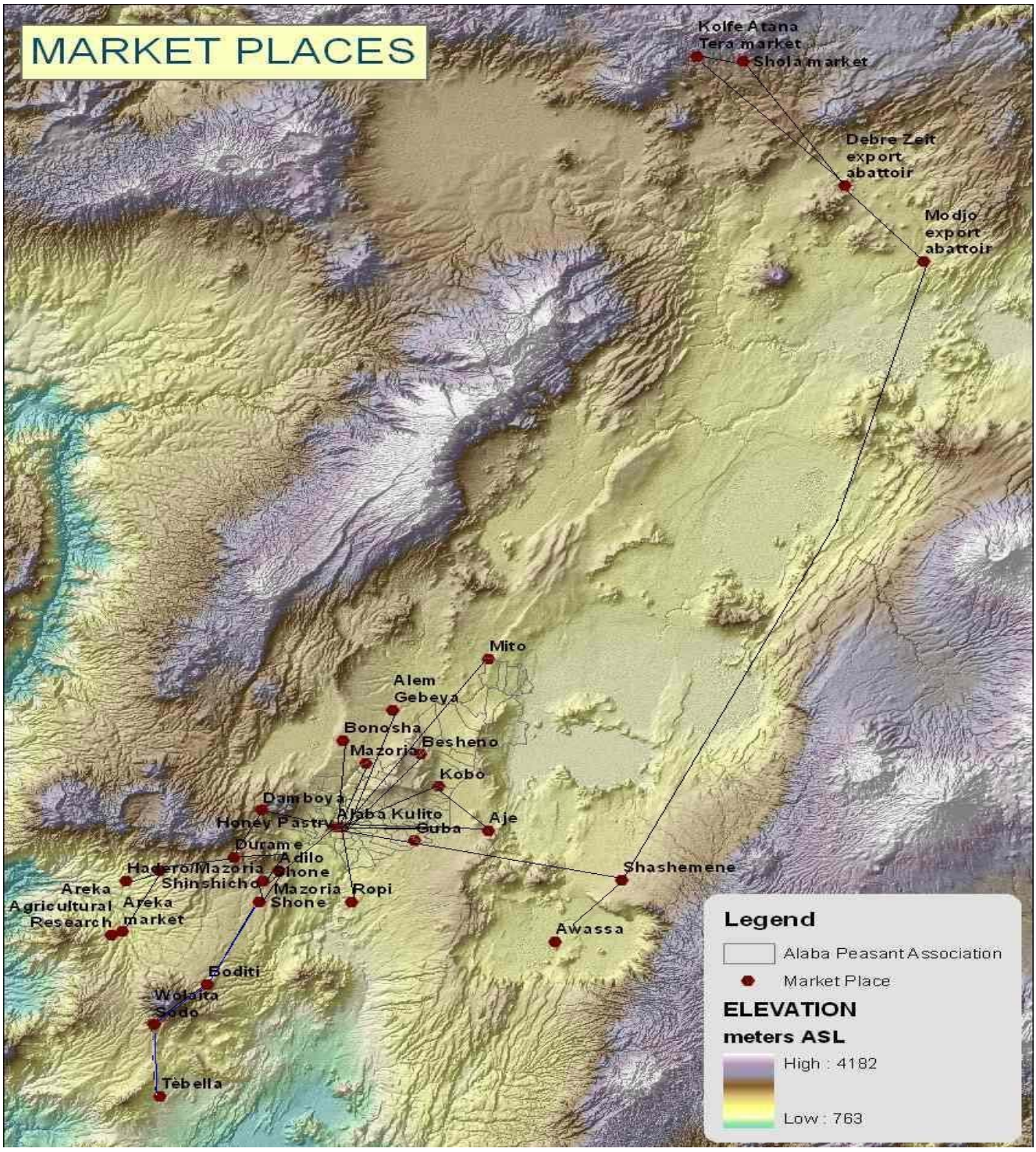


Figure 9: *Geographical location of sheep and goat markets.*

These agents are usually based in Shashemene and visit market days in Alaba. The agents purchase full truck/s animals (usually 70) from a single market day when sufficient supply or from their customer suppliers of rural assemblers who purchase animals from different surrounding local markets and assemble at Alaba Kulito. The second and most important route is medium and large traders who collect animals from Alaba areas supply to secondary and terminal domestic markets in Shashemene and Addis Ababa. Animals that exit through this route are mainly exceptionally fattened male animals usually supplied during holidays. Large traders collect animals from the Adilo and Alaba Kulito markets which are channeled from various surrounding localities (Figure 9 and 10) through chains of rural assemblers and farmers. Adilo is the largest and well known fattened small ruminant market visited by terminal traders in the SNNPR. Fattened animals from Alaba alone or assembled together with that of Adilo markets are transported to the domestic secondary and terminal markets.

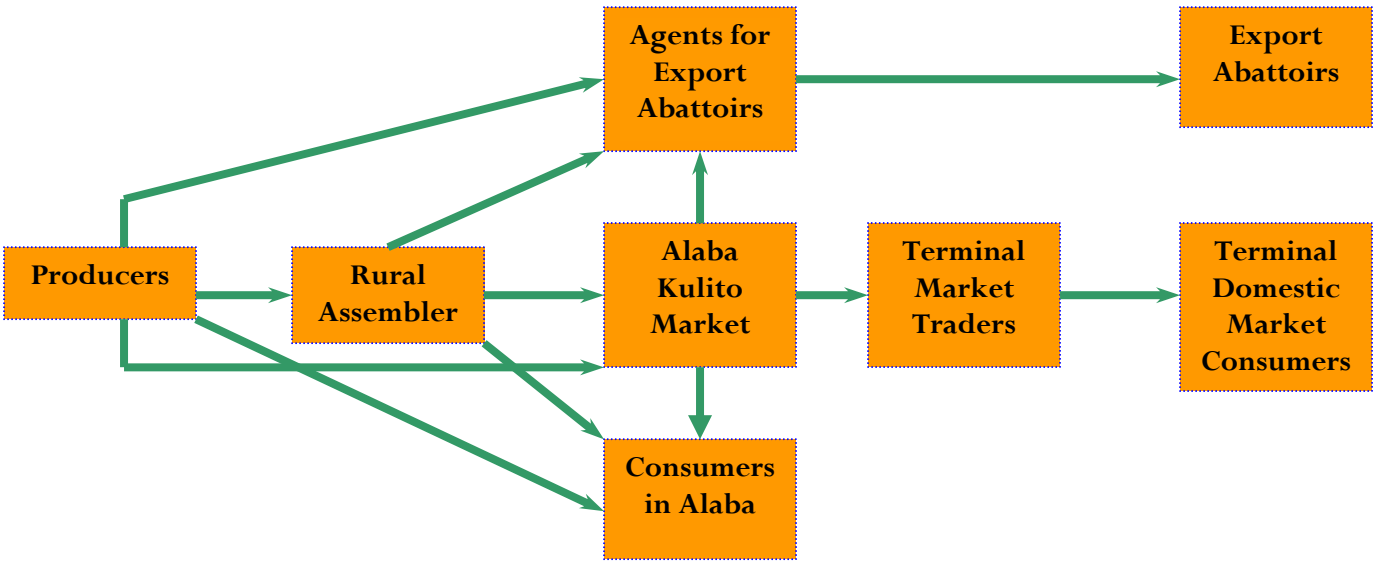


Figure 10: *Market chains of sheep and goats.*

Agents of export abattoirs and medium and larger terminal traders purchase considerable number of sheep and goats from Alaba Kulito market and represent major channel of flock exit from Alaba area.

4.2.5 Seasonality in marketing

There is a remarkable pattern of seasonal variation of animal supply, demand and price. The variability in sales is typical to the seasonal holiday markets, crop planting and harvesting seasons and drought seasons and years. During major cultural and religious holidays demand for animals, supply by the producers and prices of animals increases. Accordingly, the majority (67.0%) of the households prefer to sales their animals during festival markets. Major targeted markets in Alaba area are Muslim holidays.

Majority (66.2%) of flock purchase is made immediately after crop harvest with income from sale of crop. Sheep and goats serve as savings and accumulation of assets. Respondents of 33.8 and 20.3 percent respectively purchase and sale flocks during planting seasons. Flock sales of 20.3% were made during planting seasons to purchase farm inputs (seed, fertilizer and farm implements). Demand for animals during holidays and crop harvest seasons is high and the prices paid is also higher than other seasons in the year. Household supply of animals corresponds to the seasonal holiday markets. Trends of prices for sheep and goats over years and seasons also had shown variation (Appendix Table 9 and 10). Sheep and goats prices in recent years are growing. April and May had higher price of sales than other months throughout the considered year. Sale rates during crop failure and drought seasons are considerably high to generate income for purchasing family food and consumption items.

Table 25: *Percentage of households target seasonal festival markets.*

Target markets	Mixed flock site	Goat dom. site	Sheep dom. site	Overall	Test	
	N (%)	*N (%)*	*N (%)*	*N (%)*	χ^2	*P-value*
New Year	18(18.9)	21(15.9)	37(21.8)	76(19.1)	9.842	0.007
Easter	22(23.2)	11(8.3)	32(18.8)	65(16.4)	28.710	0.000
Christmas	9(9.5)	17(12.9)	21(12.4)	47(11.8)	0.651	0.722
Meskel	-	5(3.8)	-	5(1.3)	7.759	0.021
Id Al Adha	20(21.1)	39(29.5)	35(20.6)	94(23.7)	0.826	0.662
Id Al Fetir	26(27.4)	39(29.5)	45(26.5)	110(27.7)	4.943	0.084
Total	**95(100.0)**	**132(100.0)**	**170(100.0)**	**397(100.0)**		

About 27.7% and 23.7% of the total respondents, respectively targets the Id Al Fetir and Id Al Adha Muslim holidays/festivals. Large proportion of the respondents in goat dominating Kebeles targets these markets in particular. New Year and Easter are commonly targeted by respondents in Kebeles where sheep or mixed flocks dominate. Meskel is rarely targeted only reported in goat dominating Kebeles where households in these Kebeles take their animals to the adjacent Meskel celebrating Gurage and Silti areas.

This is in agreement to previous findings reported peak supplies, sales and prices of sheep and goats during holidays in Nigeria (Jabbar, 1998) and Ethiopia (Kebede and Ray, 1992; Ehui *et al.*, 2000). Ehui (2000) reported that in Addis Ababa households are more likely to buy live sheep during the quarters in which the Ethiopian New Year and Easter fell (August–October and May–July, respectively). Jabbar (1998) highlighted that higher price at short mainly festival-related peak periods may not contribute much to the increased small ruminant production. The same author proposed that production technologies that require extra cash or

labor may not be in high demand among subsistence oriented farmers and under such circumstances, production technologies that contribute to year-round increased supply, such as disease control measures that would increase flock size and provide farmers with better leverage, may make a better overall contribution to aggregate supply.

4.2.6 Preferences of domestic markets to the local animals

New Year, Easter, Christmas, Id Al Fetir and Id Al Adha in that order are peak seasonal markets when the supply, demand and prices of animals reaches peak in Addis Ababa sheep and goat markets. For these distinctive markets, traders from Addis Ababa visit different sheep and goat markets in the country. Animals are collected, assembled and transported to terminal markets as the festival days approach. This is to minimize animal management requirements and to avoid loss/decline in condition of fattened animals.

Visits by large traders to the various parts of the country is based on their prior knowledge to the locations, the type, condition and volume of animals supplied, financial capacity for purchase and transport, transport accessibility, preferences and requirements of the major urban customers and the production and marketing skills of the local producers.

In Addis Ababa, sheep and goats are sold along asphalt road sides and it is the mode of animal display to attract consumers/travelers. ‘Shola’, ‘Kolfe Atana Tera’, ‘Addisu Gebeya’ and ‘Kera’ localities are the main market locations. Traders take their animals to these locations based on the requirements and preferences of the major customers of respective locations. Sheep are dominant over goat in supply, demand as well as in price in Addis Ababa markets.

Sheep from Debre Berhan, South region, Wollega, Jimma and Jiru areas are well known local animals demanded in Addis Ababa.

In Addis Ababa, sheep from various niches of southern region particularly from Adilo, Alaba, Kambata Tambaro, Dawuro, Wolaita, Gamo Gofa and Hadiya areas are collectively termed as "*Wolaita sheep*". They are highly preferred by the Addis Ababa consumers and fetch highest prices than sheep from other parts of the country. According to the consumers, the major reason they prefer these animals is the pleasant flavor and tenderness of meat, relatively young aged (usually break not more than to two three pairs of milk teeth), high carcass and edible non-carcass component yields and high aesthetic value (attractive physical appearance in terms of coat color, conformation, hair types and body condition).

According to Jabbar (1998) such significant volume of purchase and strong preference by buyers for specific species and breeds attribute due to long established consumer preferences and cultural tradition. Higher prices for certain breeds paid by buyers indicate that there is excess demand for the breed and this imply that producers and sellers could benefit from increased production by targeting specific buyer categories and times of the year to sale their animals, thereby taking advantage of existing market niches (Jabbar, 1998). This study clearly depicts that areas producing the fattened "Wolaita sheep", including Alaba and other broad woredas and zones of SNNPR could have enormous room of incentive domestic market provided that the smallholder production situations are well addressed and intervened.

4.2.7 Consumption patterns of individual and catering services

Catering service providers and individual consumers in Alaba utilize sheep and goats. The use of goat meat in both Muslim and Christian catering services is scarce. This is attributed to the attitude of local consumers who perceive goat meat makes digestive discomforts.

In Alaba area both service providers and consumers prefers beef over small ruminant meats. Service providers prefer to slaughter cattle that it is more profitable with satisfactory services in terms of reasonable quantities, diverse meals and acceptable prices. For reasons of low carcass and edible non-carcass yields, high mutton and goat meat prices and small quantity and few meal types (*tibs, dulet* and *wots*), sheep and goats are less preferred in the service businesses. A variety of meals including *kurt, kitfo, milas-senber, gored-gored, zilzil and betin tibs, kornis, gubet, mahiberawi, sekondo*, etc are prepared from beef with satisfactory quantities and reasonable prices. In Alaba Kulito town, few service providers with accustomed consumers slaughter 2-5 sheep per day.

Rural households and urban resident in Alaba slaughter large numbers of sheep and goats during the Id Al Fetir fasting period and Id Al Adha holidays. Considerable number of sheep and goats are also slaughtered for New Year, Easter and Christmas in Alaba town.

4.2.8 Marketing infrastructures and price information

Of the total visited sheep and goat rural market places that enter to and exit from Alaba, 61% are fenced. All terminal markets are not fenced. The fences were constructed by the respective town municipalities. In all the markets, animals whether marketed or not are charged once at the enclosure exit routes. The amount of charge varies from 1 to 2 birr, with an average of 1.13

birr. Farmers complained that they are repeatedly charged for a single animal until it sold in subsequent market days. This is in agreement to Tsedeke and Endrias (2006) who reported similar complaints of Wolaita and Dawuro farmers on repetitive tax. In fenced areas, collection of the charges is undertaken properly. However, in markets without enclosures, like Adilo the process of collecting taxes sometimes involves armed police force and various other people and it is so tiresome, time consuming and complicated. Occasionally, in an attempt to by-pass the charge collectors, conflicts between the rural producers and police causing physical injuries are apparent. Terminal markets are free of charges however traders are charged 1.00 birr/head of animals on purchase markets and in entry to Addis Ababa.

There is no any market infrastructure facilitating marketing of small ruminants and other animals in all the surveyed markets. Price information, animal holding grounds and other marketing supportive schemes are lacking in all the surveyed markets. This is in concord among others with Kebede and Ray (1992), Ayele *et al.* (2003) and Workneh (2006) who reported very weak or non-existence of livestock market support services and infrastructure in the country. Market information/intelligence at rural farms is practiced in such a way that total farmers of about 38.7% planned to sale their animal obtain status of current price information from their neighbors/friends/relatives visited or who marketed animals in the nearest market days or the farmer himself makes reconnaissance market survey. When the income required from the sale of an animal is not for urgent purposes, farmers wait for incentive market seasons or uses to the nearby market places.

Price information of domestic and export markets is not clear in the current marketing systems and traders are sensitive and unwilling to inform the purchasing and sale prices in end markets.

In the absence of market information system, the share of the total value that producers receive is minimal and discourages production (ILCA, 1990; ILRI 1995).

Export agents purchase animals on live weight basis with varying prices across market locations of Alaba area based on distance and accessibility for transportation. This is a more organized marketing system that they purchase and sale on a live weight basis however, the seasonal purchase price is vague for producers and other market participants. Workneh (2006) affirmed that most of the livestock keepers in Ethiopia have a very weak market orientation and their mode of production is largely subsistent; they do not have easy access to up-to-date market information; they rely heavily on the limited and seasonal domestic livestock markets. Market information is crucial to producers, wholesalers and consumers to help them make decisions on what and whether to buy and sell (ILRI, 1995).

4.2.9 Sheep and goats skin marketing

Sheep and goat skin is an important by-product marketable in Alaba area. The skins are sold in rural markets for individual collectors, in Alaba Kulito town for legal collectors and illegal individuals. In Alaba skins are used for various purposes and the majority (60% of sheepskins and 59.3% of goatskins) is sold at rural and urban markets. Muslim households use considerable sizes of sheepskins (18.0%) and goatskins (26.7%) for prayer mat. However, goatskin is commonly used compared with the sheepskin which might be due to lower price of goatskin compared to sheepskin. Considerable, 31.8 and 40.7 percent, respectively total sheep and goat skins produced at household were not marketed and instead used for various household purposes.

This clearly indicates that large proportion of skins produced in rural areas like observed in Alaba might used for various household purposes and such tradition of misusing the skins in various parts of the country make large cumulative loss to the national benefit obtained from domestic leather industry utilizing the raw material and export markets.

One-third (33.3%) of the total households sale their sheep and goat skins to illegal individual collectors and only 19.3% sales to legal collectors in Alaba Kulito town. Illegal collector sale skins to the large trader in Shashemene town. These individuals are headache for the legal hide and skin businesses in the town. They do not pay trade taxes and other legal fees and also do not spend preservation costs. As a result they pay modestly higher prices for producers. Rural collectors purchases about 24.5% of the total skins and they are usually agents for legalized traders in Alaba Kulito or sometimes sale to the illegal collectors. Collectors in Besheno market which is large market located in near distances to Andegna Tuka, Bendo Choloksa and Udana Meno Kebeles collects considerable skins of about 22.7%.

An average sale price of 24.82 Birr ranging from 19 to 30 Birr for sheepskin is nearly about four fold higher values to the 6.53 Birr ranging from 3 to 14 Birr of goatskin. One of the reasons households prefers sheep over goats is the high value of its skins.

4.4 Sheep and goats production and marketing: constraints and opportunities

Smallholder farmers rearing sheep and goat confess a range of interlinked technical, socio-economic and institutional bottlenecks. Constraints requiring proper and timely intervention towards improved smallholder sheep and goat production were identified. Existing and emerging opportunities that tie-up improved production and incentive benefit to producers and traders were also identified.

4.4.1 Sheep and goat production constraints

Constraints hampering performances of smallholder sheep and goat are presented in Table 26. One quarter of total flock owners across all the study sites reported that diseases and parasites are overriding problems in sheep and goat production. Respondents reported the problem of diseases and parasites across the sites were not significantly different ($P>0.05$). This clearly depict that it is a major cross-cutting impediment to the flock production. Considerable flock owners, 98.7 and 64.0 percent, respectively reported the occurrence of morbidity and mortality to their flocks. Diseases and parasites contributing 34.6% of the total flock loss is the largest single factor to the immense flock mortality (21.7% in sheep and 25.3% in goats). The effect of morbidity on productive and reproductive performances of the flocks is also apparently higher. Limited capacity and coverage of the existing public veterinary institution to serve the broad geographical area and vast livestock population in the woreda further worsen consequence of diseases and parasites.

The situation of inadequate quantity and quality of feed and nutrition reported across the study sites differ significantly ($P<0.05$). About one quarter percent respondents both in mixed flock

and sheep dominating sites are significantly higher (P<0.05) than that of 9.2 percent households in goat dominating site face difficulty of providing adequate and quality feeds to their flocks. Feed shortages encounter often during cropping seasons but widespread through out the year when lands are covered with both *Belg* and *Meher* crops.

Table 26: *Major constraints of sheep and goat production.*

	Mixed Flock site	**Goat dom. site**	**Sheep dom. site**	**Overall**	**Test**	
Constraints	*N (%)*	*N (%)*	*N (%)*	*N (%)*	χ^2	*P-value*
Diseases and parasites	30(24.4)	59 (25.8)	60(24.0)	149(24.8)	1.510	0.470
Feeds and nutrition	29(23.6)	21(9.2)	55(22.0)	105(17.4)	58.571	0.000
Water	2(1.6)	53(23.1)	4(1.6)	59(9.8)	100.619	0.000
Labor shortage	2(1.6)	1(0.4)	4(1.6)	7(1.2)	2.023	0.364
Drought	8(6.5)	16(7.0)	14(5.6)	38(6.3)	0.211	0.900
Predators	4(3.3)	50(21.8)	15(6.0)	69(11.5)	57.206	0.000
Lack of technologies/inputs	17(13.8)	10(4.4)	29(11.6)	56(9.3)	18.85	0.000
Lack of extension support	22(17.9)	14(6.1)	44(17.6)	80(13.3)	36.161	0.000
Lack of capital	9(7.3)	5(2.2)	25(10.0)	39(6.5)	17.637	0.000
Total	**123(100.0)**	**229(100.0)**	**250(100.0)**	**602(100.0)**		

In contrast, shortage of water is a major constraint in goat dominating Kebeles than in others. About 6.3% of the total respondents mentioned that the recurrent drought is major ground to the feed and water scarcity. Flock losses by predator are devastating in goat dominating site than the others. Group discussants exasperatingly responded the massive attack of fox to young and that of hyena and other wild animals to the adult flock. Significant (P<0.05) households (29.1%) in this site reported destruction of their flock by predator.

An overall of about 9.3% respondents reported lack of improved technologies and inputs for intensive and market-oriented sheep and goat production. This is more noticeable ($P<0.05$) in mixed flock and sheep dominating Kebeles that have better market access and limited land holdings. Technological inputs to mitigate the clear and present danger of flock health and nutrition are critical requisite. Lack of capital to build flock holding and purchase production inputs (largely health and feeding) is among limiting factor for about 6.5% of the total respondents.

The total and significant ($P<0.05$) households (13.3%) condemned that the current extension system is providing them little support to enable them expand their flock production. It is anticipated that the extension service system could impartially support the farming activities that uphold the livelihood of the smallholder farmers. Sheep and goat are providing an evident contribution through income, food, manure, saving and social and cultural functions. However, the current extension system in the woreda is undergoing insignificant intervention towards addressing the identified bottlenecks.

4.4.2 Marketing constraints of sheep and goats and skin

Marketing of sheep and goat and their skins generate significant incomes to the rural households. However, they face various marketing constraints. Households selling sheep and goat are often interfered by brokers.

Table 27: *Sheep, goat and skin marketing constraints.*

Constraints	Mixed flock site *N (%)*	Goat dom. site *N (%)*	Sheep dom. site *N (%)*	Overall *N (%)*	Test χ^2	Test *P-value*
Sheep and goat						
Excessive tax	12(17.4)	5(6.9)	24(21.4)	41(16.2)	18.175	0.000
Brokers/dealers	21(30.4)	21(29.2)	36(32.1)	78(30.8)	12.38	0.002
Seasonality of markets	8(11.6)	7(9.7)	15(13.4)	30(11.9)	4.375	0.112
Lack of access to incentive markets	9(13.0)	19(26.4)	15(13.4)	43(17.0)	0.685	0.710
Lack of price information	19(27.5)	20(27.8)	22(19.6)	61(24.1)	8.123	0.017
Total	**69(100)**	**72(100.0)**	**112(100.0)**	**253(100.0)**		
Skins						
Lack of price and market information	22(28.6)	50(45.5)	47(29.4)	119(29.9)	1.281	0.527
Lack of extension support on skin handling & marketing	52(67.5)	53(48.2)	107(66.9)	263(66.1)	0.398	0.820
Poor skin of local animals	3(3.9)	7(6.4)	6(3.8)	16(4.0)	0.105	0.949
Total	**77(100.0)**	**110(100.0)**	**160(100.0)**	**398(100.0)**		

About 30.8% of the households annoyingly responded that their sheep and goats marketing are highly abused by brokers and it is rated as a primary marketing problem. Brokers either require high rates of commission or misinform and repel purchasers. Due to lack of marketing systems with transparent and standardized price/price information, the price is fixed through long one-to-one bargaining with traders and brokers, 24.1% of the total respondents usually hold less power to determine sale prices. Farmers of total 17.0% stated that lack of access to incentive export and domestic markets hinders them from obtaining fair share of values from the final consumers of their flocks. Excessive tax, particularly charges imposed in cases when animals

are not sold in one or more market days, was complained by about 16.2% of the total households. Incentive sheep and goats markets appear only during major festival and thus about 11.9 percent of the total respondents should bound themselves to these seasonal marketing.

Regardless of the high value of skins to the rural households, traders, processors and the nation, the current extension system is not providing any support to farmers in aspects of skin production, preservation and marketing. As the result, 66.1% of the farmers produce poor quality skins with various defects and receives low price. Households of 29.8% consider lack of marketing and price information affected their skin marketing while some 4% reported that flocks affected by ectoparasites and poor nutrition produced poor quality skin.

Skin marketing involves multifaceted problems from the local producers until it reaches the processing plants. Farmers usually supply skins through extended days contaminated with dirt and microbes and deteriorated. Traders collect and apply a range of preservation processes including removing meat leftovers, applying salt, drying, washing, packing, trade certifying and transporting. The processors at terminal markets are few in number and could alone fix prices. Further, they have affinity to skins from certain locations and markets. According to skin traders, skins from Alaba area are rated to be poor compared with that of Awassa, Shashemene, Wolaita Sodo, and Arba Minch areas in the southern region. The local hides and skins processing units operate with poor processing and preservation facilities and inexperienced workers. Illegal traders make high competition to the raw materials in local areas. These all coupled with the poor marketing systems (ambiguous grading and

standardization, absence of price information and non-competitive trade) makes potential drawbacks on production and marketing of skins from Alaba area.

4.4.3 Opportunities

Modest interventions on the existing flock impediments, for example minimizing flock loss through diseases and parasites control and protection against predators and proper feeding during *Belg* and *Meher* cropping seasons could potentially boost the flock performances. The local sheep flocks demonstrate remarkable response to the local fattening management practices and possess desirable physical characteristics adding high aesthetic value. The local feeding management system entirely depended on natural pastures of spicy herbs drawn the preference of urban consumers like the present "organic agricultural products".

There is a growing demand for sheep and goats in both the domestic and export markets. Young male flocks have huge demand of export abattoirs. Rural assemblers and agents for export abattoirs collect these young flocks at farm gates and local markets. Fattened flocks have high demand and incentive price during seasonal Holiday markets with peak demands in New Year and Easter holidays. Adilo is a potential local market for fattened flocks.

Smallholder farmers are aware of the current high market values and demand for sheep and goats. Several development partners involved in higher learning, research and development are currently committed to sheep and goat development in the woreda. These could facilitate entry of intervention (inputs, technology and recommendation). The support of safety-net programme of OoARD is making substantial contribution in building flock holdings targeting women and destitute households.

Considering these emerging and existing opportunities, the extension system needs to organize and guide to focus on sheep and goat production and marketing in order to improve income and enhance smallholder livelihoods.

5. SUMMERY AND CONCLUSIONS

The sheep and goat flocks manifest a distinct pattern of distribution in the woreda with different flock sizes. Intervention works in different parts of the woreda needs to correspond to the household flock holdings and preferences; relevant to either the larger sheep, largely goat or both sheep and goat mixed holding.

Larger part of the flock is composed of young lambs and kids and ewes and does while others often exit through high sale off-take to fulfill immediate household cash needs for which sheep and goat are at immediate disposal.

Major sheep and goat feeds obtained from grazing on crop stubble, private pasture, road side, communal pasture, weeds, tillers and fillers, local browses and cut-and-carry of local browses and grasses. Feed availability largely depends on the season of the year when lands are covered with either *Meher* or *Belg* season crops. Quality and quantity of the seasonal available feeds are usually inadequate. Optimum utilization of seasonal available feeds through preservation of crop residues and grasses and strategic supplementation with low cost alternatives like development of improved forage is vital to balance seasonal feed supply and animal requirements.

River, pond, trough water, harvested water, rain and well water are common source of flock water. Flocks inaccessible to rivers suffer from severe water shortage and households often in goats dominating Kebeles water their flocks at extended intervals. Strategic development and use of the village ponds (proper collection of the rain water, proper use systems optimizing the

livestock density and other purposes using the pond water) to alleviate severe water shortage is indispensable.

Flock morbidity and mortality are exceedingly noticeable and diseases and parasites cause massive loss of the flocks. Predators cause immense loss of young kids in goat dominating Kebeles. The veterinary service needs to provide strategic disease and parasite control and treatment measures. Timely reaction to the disease outbreaks and establishment of low-cost and readily available local veterinary service through trained community members needs to be devised. Housing and close supervision of young lambs and kids is obligatory to avoid the devastating attack of predator. Diseases and parasites causing high flock morbidity and mortality are not evidently identified and requires further clinical and laboratory investigation to pinpoint diagnostic and preventive measures. Various ethno-veterinary practices are applied in the study area. However, its veterinary importance needs further investigation.

Major lambing and kidding come about in wet season when adequate feed available both for the lactating mothers and new borne. Reproductive performances of the flocks are within satisfactory ranges with the possibility of further improvement through appropriate strategies of feeding management and husbandry practices.

Households make intense selection of breeding and fattening flocks considering body conformation, physical characteristics and known local ecotypes for higher marketable weight together with desirable body characteristics in sheep and premium dairy characteristics in goats. Goats are extensively milked for family consumption. Breeding systems strictly needs to consider the animal traits producers and consumers demand.

Households enter into nearest market places within and outside the region. Adilo is a potential local flock market. Marketing, supply, demand and price of sheep and goats are typically seasonal and reaches peak during the major holidays. Fattened flocks are largely marketed during festival markets and highly demanded by Addis Ababa consumers. New Year, Easter, Christmas, Id Al Fetir and Id Al Adha are peak seasonal holidays in major terminal markets. Majority of the Muslim households are accustomed to the Muslim holidays. However, nowadays there is apparent awareness to the incentive religious and traditional festivals and they are evenly targeting incentive Christian and traditional festival markets. Demand for young flocks in the export abattoirs are also reaching peak during the Muslim fasting period.

There are more than five potential holiday markets with sufficient duration to complete fattening cycles. Households rear few sheep and goats mixed with other livestock. Targeting the seasonal holiday market demands and consumer preferences could largely benefit the producers and requires planned breeding or acquisition of flocks with moderate prices (poor conditioned or young flocks), appropriate inputs (feeds, supplements, deworming, etc) and intensive management practices.

Extension and institutional supports rendered in sheep and goat development are minimal. Sheep and goat are crucial in the livelihood of the smallholder farmers. Taking this into consideration the extension and institutional systems are mandated to commit in alleviating the widespread barriers hindering the performance of flocks so that the producers could benefit from the flocks they keep. Inputs and improved technologies relevant to the smallholder need to be delivered.

Minimizing the involvement of brokers in marketing processes and delivery of update marketing information requires consideration of marketing development. Marketing intervention of equipping marketing infrastructures and delivery of market and price information for efficient marketing requires national policy platforms. Barriers to local and export markets should disappear and encourage producers and traders.

Goat meat consumption in Alaba area is limited. However, there is an emerging pattern of goat meat consumption in big cities. In Awassa there is an exceptional way of roasting goat meat and high interest and demand of consumption. Likewise, consumption of raw goat meat in Addis Ababa and other big cities is noticeable. Simple cooking techniques and consumption behavior from big cities could be adopted to Alaba and this possibly enhances the offtake and prices of animals at local markets thereby benefit the producers.

Household level fattening managements is extensive through extended period using generous farm inputs. Partial budget analyses of the smallholder fattening operation could show profitability of the enterprise. Research needs to provide information on efficient and economic utilization of the available resources.

In drier *weina dega* Kebeles of the woreda sale off-take of flocks including breeding stock during severe drought seasons is considerably higher to generate income for purchase of food items. Considerable number of household awfully raised their complete removal of flocks to purchase food items during severe drought. Copping strategies to alleviate the food shortage during severe drought season through food-for-work, cash-for-work, food-aids or credit needs to be devised.

Quantitative aspects of marketing (supply, demand, prices, producer and consumer behavior) require prompt further investigation to provide complete marketing information.

The private sector needs to be encouraged in areas of sheep and goat development like the currently growing floriculture industry by generating and availing appropriate information for investment on the potential benefits to be gained from the growing domestic and export markets.

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APPENDICES

Appendix 1: *Questionnaire.*

Sheep and Goat Production and Marketing Systems in Alaba, Southern Ethiopia

SECTION ONE: GENERAL

A. Demography, occupation and education in the last 12 months

SN	*Name*	*Marital status 1=Single 2=Married 3=Widowed 4=Divorced*	*Age*	*Sex 1=Male 2=Female*	*Education 1=Illiterate 2=Read&write 3=High school 4=Others*	*Occupation*			
						Rainy season		*Dry season*	
						Major	*Second*	*Major*	*Second*
1									
2									
3									

Code for occupation 1=Farmer 2=House wife 3=Student 4=Herder 5=Trader 6=Handicraft maker 7=Unemployed 8=Government or Kebele employee 9=NGO employee 10=House maid 11=Pensioned (or retired) 12=Others

B. Land holding and land use systems

1. What is the size of your total land holding? (*Exactly as indicated on land holding certificate*) ____ha
2. How much is your land allocated for the followings?
   1=Crop land_____ *timad* 3=Fallow land_____ *timad*
   2=Grazing/pasture land _____ *timad* 4=Others_____ *timad*

C. Purpose of keeping sheep and goat in the three cluster groups of households

1. Why you keep sheep and goats? (Rank)
   1=Sale (income source) 2=Meat 3=Milk 4=Manure
   5=Sacrifices/rituals 6=Social and cultural functions 7=Saving
   8=Distribute benefits/risks with other animals
   9=Others, specify

D. Compositions and ownership of household livestock in the last 12 months

1. How many of the following animals you keep?

SN	*Structures*	*Size owned*	*Ownership*			*Origin*			
			Own	Share	*Ribi*	Family	Home born	Purchase	Gift
	Cattle herd								
1	Cows								
2	Bulls								
3	Heifers								
4	Male calves								
5	Female calves								
6	Oxen (draft)								
7	Oxen (fatten)								
	Sheep flock								
1	Lambs (<3 months)								
2	Male lambs (3-6 months)								
3	Female lambs (6-12 months)								
4	Ewes								
5	Rams (intact) (>6months)								
6	Castrates/fattening								
	Goat flock								
1	Kids (<3 months)								
2	Male kids (3-6months)								
3	Female kids (6-12 months)								
4	Does								
5	Bucks (>6months)								
6	Castrates/fattening								
	Equines								
1	Stallion /male horses								
2	Mare/female horses								
3	Female donkey								
4	Male donkey								
5	Mules								
	Chicken								
1	Total								

SECTION TWO: SHEEP AND GOAT PRODUCTION

A. Feed and water resources, seasonal calendars and feeding managements

1. What are the major basal feed resources of sheep and goats and their availability?

S	*Feed types and sources*	*Seasonal availability*											
		Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
1	Communal grazing land												
2	Road sides grazing												
3	Grazing aftermath												
5	Grazing in river sides												
6	Private grazing land												
7	Cut grass and browses												
7	Crop residues (straws, stovers)												
9	Indigenous browses												
10	Fodder /improved forages												
11	Enset and banana												
12	Root crops (tubers, leaves)												
13	Weeds												
14	Tillers and fillers												
15	Others, specify												

2. Do you graze your sheep and goats? 1=Yes 2=No
3. If yes, for how long? _____days in a week _____hours a day
4. How sheep and goat graze? 1=Sheep alone 2=Goat alone
   3=Both alone 4=Together with other livestock
5. How you practiced grazing your sheep and goats in the dry season?
   1=Free grazing 2=Partly kept/tethered grazing 3=Fully kept/tethered grazing
6. How you practiced grazing your sheep and goats in the wet season?
   1=Free grazing 2=Partly kept/tethered grazing 3=Fully kept/tethered grazing
7. Is there any poisoning grasses and browses that kills or make sick sheep and goats in this area? 1=Yes 2=No
8. If yes, what are they (local and Amharic names)? _____
9. Do you usually provide your sheep and goats with supplementary feeds in addition to grazing?
   1=Yes 2=No

10. If yes, what type of feed and others?

SN	*Feed types*	*Classes of flocks*							
		Sheep				Goat			
		Young lambs	Ewe	Ram	Castrates	Young kids	Doe	Buck	Castrates
1	Wheat bran								
2	Oil cakes								
3	Maize grain								
4	Haricot bean grain								
5	Crop residues								
6	Leak mineral/stone								
7	Enset (leaf, corm, stem)								
8	Roots and tubers								
9	Food leftovers								
10	Fodder leaves								

11. When you usually offer your sheep and goats with supplements?
    1=Dry season 2=Wet season 3=Both
12. In what intervals you offer supplements to your sheep and goats?
    1=Daily 2=Twice a day 3=Whenever available 4=Others, specify
13. If you not provide with supplements, why?
    1=Not accessible 2=Expensive
    3=Not want to offer sheep and goats 4=Others, specify
14. Do you practice tether feeding of sheep and goats? 1=Yes 2=No
15. If yes, why?
    1=To avoid crop and vegetation damages 2=Save labor
    3=Protect from predators and theft 4=Utilize marginal land and hillsides
    5=Prevent breeding 6=Others, specify
16. Is there feed shortage/constraint for your sheep and goats? 1=Yes 2=No
17. If yes, when? 1=Dry season 2=Wet season 3=Both
18. If feed shortage in your locality, why? (Rank)
    1=Shrinking and decline in productivity of grazing lands
    2=Increase of animal population
    3=Cultivation, settlement and protection on grazing lands 4=Drought
    5=Increase of human population 6=Others, specify
19. What are the common water sources of sheep and goat in this area?

S.N	*Sources of water*	*Estimated distance (1hr=5km)*	*Rainy season*	*Wet season*
1	River			
2	Pond			
3	Rain water			
4	Pipe			
5	Deep well			
6	Water harvest			
7	Others, specify			

20. At what intervals you give sheep and goats with water?

S.N	Frequency	Sheep		Goats	
		Dry season	*Wet season*	*Dry season*	*Wet season*
1	Any time needed				
2	Once a day				
3	Twice a day				
4	Every three day				
5	Every four day				
6	Others, specify				

21. Is there any water shortage/problem to sheep and goats? 1=Yes 2=No

22. If yes, when? 1=Dry season 2=Wet season 3=Both

23. Why shortage of water? (Rank)

1=Drying of water sources 2=Far distant from water sources
3=Not allowed to use sources
4=Provide other livestock than sheep and goats 5=Others, specify

B. Sheep and goats health management

1. What are the common diseases and parasites that affect health and production of sheep and goat?

S N	Local name	Sheep, goat or both affected	Symptoms	Seasons/months
1				
2				
3				

2. What would you do when your sheep and goats sick?

1=Treat with ethno veterinary practices 2=Sales immediately
3=Slaughters immediately 4=Takes to veterinary center
5=Treat with treatments from local traders 6=Others, specify

3. From where you usually obtain veterinary services?

1=OoARD 2=DA offices 3=NGOs 4=Private institutions 5=Open markets

4. Are you accessible to veterinary services in your locality/near distance?

1=Yes 2=No

5. If yes, how far? _____Km

6. How did you obtain services from these institutions?

1=Free of charge 2=Payment 3=Credit 4=Others, specify

7. Did your sheep and goats get vaccine in recent times? 1=Yes 2=No

8. If yes, how? 1=After report of disease cases 2=After certain animals died
3=Before outbreaks

9. Do you use medicines and drugs from open markets/illegal traders for sheep and goats?

1=Yes 2=No

10. If yes, why? 1=Cheap 2=Not accessible to veterinary center
3=Not want to use veterinary center 4=Others

11. If not use, why?

1=Not cures 2=DAs and health experts advised not to use
3=Expensive 4=Not accessible 5=Others

12. Do you cut and/or brand your sick sheep and goats with hot iron?
1=Yes 2=No
13. If yes, why? 1= Treatment of sick animals 2=Identify/tag the animals
3=Others, specify
14. If not, why? 1=Learnt that it affects quality of skin
2= Reduce price of skin 3=Not to form infection 4=Others
15. Has there been any death of your sheep and goats over the last 12 months?
1=Yes 2=No
16. If yes, (specify total number)

S N	Sheep		Goats	
	Structure	*Died*	*Structure*	*Died*
1	Abortion		Abortion	
2	<3 months		<3 months	
3	3-6 months		3-6 months	
4	Ewes		Does	
5	Rams		Bucks	
6	Castrates/fattening		Castrates/fattening	

17. What were the major causes for death/loss of your sheep and goats? (Rank)
1=Diseases and parasite infections 2=Nutritional deficiency and toxicity
3=Mechanical causes 4=Predators
5=Undetermined 6= Ectoparasites 7=Others, specify

C. Sheep and goats breeding and reproductive managements

1. Do you select your male and female animals for breeding purpose?
1=Yes 2=No
2. Do you have your own breeding male animals (ram & buck)? 1=Yes 2=No
3. What are the common sources of breeding males for your flocks?

S.N	Sources of breeding males	Ram	Buck
1	Own		
2	Neighbors		
4	Others, specify		

4. When (season/month) during the year you observes intense breeding and conception?

S. N	Species	Intense breeding and conception months											
		Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
1	Ewe												
	Ram												
2	Doe												
	Buck												

4. How is the reproductive performance of sheep and goats in your farm?

SN	Particulars	Sheep		Goats	
		Male	*Female*	*Male*	*Female*
1	Age at first mate				
2	Age at first parturition (months)				
3	Parturition interval (months)				
4	Average litter sizes (single, twin, triplets)				
5	Infertile				
6	Slaughter age (months)				
7	Number of females mated in the past 12 months				
8	Number of females gave offspring in the past 12 months				
9	Total number of offspring born from mated females in the past 12 months				
10	Total number of offspring weaned out of total born in the past 12 months				

5. What are the reasons you justify that hinders fertility and reproduction of sheep and goats?
   1=Inadequate feed and water supply 2=Inconvenient climatic conditions
   3=Disease and parasite burdens 4=Lack/shortage of breeding male
   5=Drought in the area 6=Others, specify

D. Lamb and kid rearing, castration and culling

1. Do you provide lambs and kids additional feed to their mother's milk until they begin grazing? 1=Yes 2=No
2. If yes, what types of feed resources and feeding?

	Lambs	**Kids**
Feed types	_____	_____
How feed	_____	_____

3. Do you practice weaning of lambs and kids? 1=Yes 2=No
4. If yes, when? Lambs_____ months Kids _____ months
5. Do you practice castration of sheep and goats? 1=Yes 2=No
6. If yes, why?
   1=To fatten and sale 2=To control unwanted breeding
   3=To tame them 4=Others
7. At what age you usually castrate? Sheep __years (months) Goat __years/months
8. How you select sheep and goats for fattening? (Rank)
   1=Conformation (height, length and appearance)
   2=Breed (known local ecotypes)
   3=Physical characteristics (color, horn, tail length and width, ear etc)
   4=Age 5=Others, specify
9. If you practice select with physical characteristics, (Rank)
   1=Color 2=Horn 3=Ear 4=Tail
   5=Body length and height 6=Others, specify
10. Do offer specific feeding and other management practices for castrated sheep and goats?
   1=Yes 2=No

11. If yes, what feeds and for how long?

	Feed types	Duration
Sheep	_____	_____
Goat	_____	_____

12. What is the common method you castrate your sheep and goats?
    1=Local methods (using stone, stick, metal) 2=Burdizzo (OoARD)3=Others, specify
13. Do you practice fattening of sheep and goats for targeted market seasons and market places? 1=Yes 2=No
14. If yes, which season/months (Rank)?
    1=New Year festival 2=Easter 3=Christmas
    4=Meskel 5=Ed Al Fetir 6=Arefa 7=Others, specify
15. Is there and emerging opportunity of increased demand and incentive price for fattened sheep and goats? 1=Yes 2=No
16. Do you practice culling of sheep and goats from flock? 1=Yes 2=No
17. If yes, reasons for culling (rank)?
    1=Old 2=Sick 3=Reproductive problem
    4=Physical defect 5=Unwanted physical characteristics (black olor)
    7=Others, specify
18. How sheep and goats left from your flock over the last 12 months?
    1=Sale 2=Death 3=Slaughter for home consumption 4=Theft
    5=Predator 6=Gift 7=Share arrangements 8=Others, specify
19. How you replace/own sheep and goats left the household flock in various ways?
    1=Home born 2=Share arrangements 3=Gift
    4=Purchase 5=Not replace 6=Others, specify
20. If you sale sheep and goats for urgent income needs, which you prefer to sale?
    1=Lambs and kids 2=Rams and bucks 3=Ewes and doe
    4=Castrates 5=Others
21. How you sale young male sheep and goats?
    1=Sale all when reach to marketing age 2=Sale holding some for breeding
    3=Sale holding some to castrate and fattening 4=Others, specify
22. Do you cut tail of female sheep/ewe? 1=Yes 2=No
23. If yes, why and when (age, months)? _____

E. Sheep, goats and their products utilizations

1. If you slaughter sheep and goats for home consumption, usually when?
    1=For festivals 2=Whenever slaughter age animals available
    3=Wedding 4=Births in family 5=For guests 6=circumcise
    7=At funeral ends 8=Others, specify
2. Which sex of sheep and goats you usually slaughter?
    5.1 Sheep 1=Male 2=Female 3=Both
    5.2 Goats 1=Male 2=Female 3=Both
3. Is milking and use of milk and milk products from sheep and goats common in your area?
    1=Yes 2=No
4. If yes, which animals? 1=Sheep 2=Goats 3=Both
5. If no, why? 1=Cultural taboo 2=Religious taboo
    3=Not common in the area 4=Others

6. For what purposes you usually use the milk?
   1=Children consumption 2=Adult consumption
   3=Processing 4=Medicine 5=Others, specify
7. Who in the family consumes milk? 1=Old people 2=Sick
   3=Children 4=Others, specify

F. Marketing of sheep and goats, their products and by-products

1. Have you sold sheep and/or goats in the past 12 months? 1=Yes 2=No

2. If yes, why? (Rank)
   1= Generate income for farm inputs (fertilizer, seed, others)
   2= Generate income for children school
   3= Generate income for family and animal health treatments
   4= Shortage of grazing land and feeds 5=Generate income to purchase foods
   6=To pay back credits 7=Others, specify

3. Where you sold your animals?
   1= Farmers in the same village 2= Farmers in nearby village
   3= Alaba Kulito market 4= Besheno 5= Guba 6= Adilo
   7= Mito 8= Ropi 9= Bonosha 10= Aje 11= Damboya
   12= Kobo 13= Alem Gebeya 14= Others, specify
4. Have you purchased sheep and/or goats in the last 12 months? 1= Yes 2= No

5. Why you purchased sheep and goats?
   1=Slaughter for festivals 2= Slaughter for ceremonies/rituals
   3=Breeding 4=Fattening 5=Others, specify

6. If yes, from where you purchased?
   1= Farmers in the same village 2= Farmers in nearby village
   3= Alaba Kulito market 4= Besheno 5= Guba 6= Adilo
   7= Mito 8= Ropi 9= Bonosha 10= Aje 11= Damboya
   12= Kobo 13= Alem Gebeya 14=Others

7. How many sheep and goats you sold and purchased in the last 12 months and with how much cost?

S N	Structure	Sold				Purchased			
		Number	*When/ months*	*Unit Price*	*Total price*	*Number*	*When/ months*	*Unit Price*	*Total price*
Sheep									
1	Ewe								
2	Ram								
3	Male lamb								
4	Female lamb								
5	Fatten								
Goats									
1	Doe								
2	Buck								
3	Male kid								
4	Female kid								
5	Fatten								

8. When in the year you prefers to sale and/or purchase sheep and goats?

S N	When	Sheep		Goats	
		Sale	Purchase	Sale	Purchase
1	During festivals (specify)				
2	During planting				
3	During harvesting				
4	Others, specify				

9. How you sales your animals? 1= Live weight basis
2= 'Eye ball' estimation 3=Both

10. Why you prefer this mode of marketing? (Selected above)
1= Incentive prices 2= Avoids mischief
3= Most purchasers like this way 4= Saves my time and energy
5= Other, specify

11. Did you ever obtain animal market price information? 1= Yes 2= No

12. If yes, from where?
1= DAs 2= Governmental organizations, specify 3= NGOs 4= Others, specify

13. Do you face any problem in marketing of your animals? 1= Yes 2= No

14. If yes, what? (Rank)
1= Tax burden
2= Unwanted broker disorder and high commission fees
3= Seasonality of market demand and prices
4= Lack of market road from my areas
5= Lack of market and price information 6= Others, specify

15. Do your family sales milk products from sheep and goats? 1= Yes 2= No

16. If not market your products, why not?
1= Not produce at all 2= Produce but consume at home
3= Not fetches reasonable price
4= Don't have any market demand in my locality 5= Others, specify

17. What you do with the skin(s) of sheep and goats?
17.1 Sheepskin
1= Sales
2= Used for making household materials (seat, bed materials, containers)
3= Used for ride horse/mule seat 4=Prayers mat
5=Home decoration 6=Pomp for metal workers 7=Others, specify
17.2 Goat Skin
1= Sales
2= Used for making household materials (seat, bed materials, containers)
3= Used for ride horse/mule seat 4= Prayers mat
5=Home decoration
6=Pomp for metal workers 7=Others, specify
18. If sold, how much was the average prices (in the last 12 months)?
1= Sheepskins _____Birr 2= Goatskins _____Birr
19. Do you preserve/process skins at home immediately after flaying? 1= Yes 2= No
20. If yes, what? 1= Apply salts 2= Dry 3= Others, specify
21. After how many days (usually) you take the skins to the traders or collectors? __days
22. Where and to whom you usually sales skins?
1=Sub-agents in my locality 2=In Alaba town for any traders
3=Agents/collector in Alaba town 4=Others, specify
23. Did any of your customers have complained on quality of the skins you sold?
1=Yes 2=No
24. If yes, what were the defects they usually complain?
1=Cut during flay 2=Cut during drying
3=Spoiled with bacteria and dirt
4=Too much dried on the sun 5=Others, specify?
25. What are the common problems you encounter in skin production and marketing? (Rank)
1= Lack of market information and markets
2= Lack of capacity building on skin production, preservations and marketing
3= Lack of local organization supports preservation, storage and marketing
4= Animals produce poor quality skins
5= Others, specify

G. Sheep and goats production and marketing constraints

1. Do you want to expand sheep and goats flock sizes and production in the future?
   1=Yes 2=No

S.N	Reasons to expand	Sheep	Goats	Both sheep and goats
1	High market demand			
2	Incentive market prices			
3	Easy to manage and keep			
4	Distribute benefits and losses			
5	Immediate returns			
6	Appropriate for slaughter and home consumption			
7	Others, specify			

2. If no, why?
   1=Shortage of grazing lands and feeds 2=Shortage of labor
   3=Prefer another animal species 4=Marketing problem
   5=Lack of capital to purchase animals and inputs 6=Others, specify
3. What are major constraints hinder production of sheep and goats in this area? (Rank)
   1=Disease and parasites 2=Feed and grazing land shortages
   3=Water shortage 4=Labor shortage 5=Drought 6=Predators
   7=Marketing problems 8=Inadequate/lack of inputs
   9= Inadequate/lack of extension and support
   10=Inadequate/lack of technologies and innovations
   11=Lack of capital and credits 12=Others

SECTION THREE: SOCIAL, CULTURAL AND ECONOMIC CHARACTERISTICS

A. Gender, labor allocation and decision on benefits from sheep and goats

1. Do you encounter labor shortage in sheep and goat production? 1=Yes 2=No
2. For what major tasks you face labor shortage?
   1=Herding and tethering 2=Watering 3=Looking after lambs and kids
   4=Construction of shelter 5=Take care of sick animals 6=Others, specify
3. How you overcome the labor shortage?
   1=Hire laborer 2=Use family labor 3=Use fence
   4=Keep turn by turn with neighbor 5=Others, specify

4. Who do the different tasks and decides on benefits obtained from sheep and goats?

S.N	Particulars	Men	Wife	Boys	Girls	Hired labor	Others, specify
1	Herding and/or tether						
2	Cut-and-carry grasses and browses						
3	Water/take to water sources						
4	Clean sheep and goat barns						
5	Take care of lambs and kids						
6	Take care of sick animals						
7	Fattening managements						
8	Milk						
9	Process milk						
10	Sale animals						
11	Decides on use of income and benefits						
12	Owns sheep and goats						

5. Is there any cultural, traditional and religious taboo in the area that prohibits use of sheep and goat products in this area? 1=Yes 2=No

6. Is there any tradition and culture that exceptionally prefers/requires certain sheep and goat color the area? 1=Yes 2=No

7. Do you sacrifices sheep and/or goats for any religious or traditional occasions?
1=Yes 2=No

SECTION FOUR: EXTENSION LINKAGES IN SHEEP AND GOATS PRODUCTION

1. Have you received any improved management practices on sheep and goats?
1=Yes 2=No

2. If yes, where you obtained?
1=Development agents 2=Community leaders
3=Market participant farmers 4=Neighbors
5=Relatives and friends 6=Radio, television, news letter 7=Others

3. How you received the information?
1=Training 2=Meeting 3=Written pamphlets
4=Heard from friends, relatives 5=Practical visited 6=Others, specify

4. Did you receive training/advice of improved sheep and goat management practice from DAs? 1=Yes 2=No

5. If yes, in what aspects?
1=Feeding (specify: feed production, feed conservation, feeding managements)
2=Health managements 3=Genetic improvements 4=Castration and fattening
5=Lambs and kids rearing techniques 6=Housing of flock
7=Skin production (flaying, slaughter cares, preservation, storage, transportation)
9=Others, specify

6. Did you apply the trainings/advices received to your sheep and goat flocks?
1=Yes 2=No

7. If you applied the trainings/advices, did you achieve any improvements in your flocks?
   1=Yes 2=No
8. If not, why?
   1=Not affordable
   2=Not simple to apply (not understood)
   3=Not accessible (not found in my areas)
   4=Socially and culturally not acceptable in my area
   5=Not relevant to problems of my flock
   6=Labor shortage
   7=Others, specify

SECTION FIVE: INSTITUTIONS AND INNOVATIONS IN SHEEP AND GOAT PRODUCTION AND MARKETING

1. Did you receive credit in recent years? 1=Yes 2=No
2. If yes, in what form? 1=Cash 2=Kind (specify) 3=Both
3. If you received with credit, what was the source?
   1=Governmental banks 2=Private banks 3=Credit institutions
   4=Governmental offices (OoARD, etc) 5=NGOs 6=Cooperatives
   7=Others, specify
4. If received credit, it was for what major purposes?
   1=Crop production (improved seeds, fertilizer) 2=Petty trade
   3=Cattle and small ruminants fattening 4=Others, specify
5. Who received the credit in your family?
   1=Husband 2=Wife 3=Young boys 4=Young girls 4=Others, specify
6. How you made credit arrangements? _____
7. Are you satisfied with the lending regulations and terms to repay the credit?
   1=Yes 2=No
8. Did you receive sheep and goats from any sources? 1=Yes 2=No
9. If yes, from which sources?
   1=Credit 2=Gift from NGOs 3=Gift from GOs (safety-net, credit)
   5=Share arrangements 6=Exchange (crop, other livestock, inputs)
10. If you received sheep and goats from share arrangements, why?
    1=To keep 2=To Fatten 3=To Breed 4=Others, specify
11. How you made the share agreements?
    1=Share incomes from sale of animals received 2=Share new born animals
    3=Share the original animals after certain years 4=Others, specify
12. Is there any cooperative in your area to which you are member? 1=Yes 2=No
13. If yes, in what sector and what services it renders?
    1=Crop production (storage, marketing, deliver inputs to members, etc)
    2=Livestock (Marketing, deliver inputs, assemble products, etc)
    3=Inputs and credits (deliver different inputs, credits, insurance, etc)
    4=Others, specify

SECTION SIX: BUILDINGS

1. Where you confine sheep and goats?
   1=Main house 2=Adjoin house 3=Separate constructed house
   4=Grazing area (open kraals) 5=Others, specify

2. How many houses you have and how they are constructed?

SN	Building (Code1)	Main purposes(Code 2)	Roof materials (Code 3)
1			
2			
3			
4			

Code for 1 1=Main hose 2=Storages 3=Barns 4= Muslim Salat house 5=Others, Specify

Code for 2 1=Resident 2=Storage 3=Animal barn 4= Salat house 5=Kitchen 6=Toilet 7=Other houses

Code for 3 1=Grass thatched 2=Iron sheet 3=Roofing tile

Appendix 2: *Composition, structure, ownership and origin of livestock (November/December 2006).*

	Holdings		Ownership			Origin		
Species and structures of animals	*Mean(SD)*	*%*	*Own*	*Share*	*Inherited*	*Born*	*Purchased*	*Gift*
Cattle (N=1272)	8.5(5.7)							
Cows	2.8(2.4)	32.7	94.0	6.0	5.3	60.0	29.4	5.3
Bull/breeding male	0.5(0.7)	5.3	98.3	1.7	-	86.7	13.3	-
Bullocks	0.8(1.0)	8.9	94.7	5.3	2.7	90.7	6.7	-
Heifers	1.2(1.2)	14.1	99.0	1.0	3.9	85.3	8.8	2.0
Male calves	0.7(0.8)	8.2	96.0	4.0	1.3	96.1	2.6	-
Female calves	0.8(0.9)	9.2	98.8	1.2	-	96.3	3.7	-
Oxen (draft /fattening)	1.8(1.2)	21.6	96.3	3.7	4.9	51.8	42.1	1.2
Sheep (N=750)	5.0(3.8)							
Lambs (<3 months)	1.3(1.5)	26.7	95.5	4.5	-	98.9	1.1	-
Young males (3-6 months)	0.6(1.0)	12.3	100.0	-	-	94.2	5.8	-
Young females (3-12 months)	0.6(0.9)	12.7	97.0	3.0	1.5	82.1	14.9	1.5
Intact/breeding males (>6 months)	0.3(0.6)	5.9	100.0	-	-	83.9	16.1	-
Ewes	2.0(1.5)	39.3	92.0	8.0	2.7	47.3	44.7	5.3
Castrates/fattening	0.2(0.6)	3.1	100.0	-	-	58.8	41.2	-
Goats (N=969)	6.5(6.7)							
Kids (<3 months)	1.5(1.8)	22.8	97.5	2.5	-	98.7	1.3	-
Young males (3-6 months)	1.1(1.5)	16.2	97.0	3.0	-	100.0	-	-
Young females (3-12 months)	0.8(1.3)	12.2	100.0	-	-	96.4	1.8	1.8
Intact/breeding males (>6 months)	0.4(0.8)	5.8	100.0	-	-	86.8	10.6	2.6
Does	2.5(2.7)	39.4	96.5	3.5	1.5	61.0	36.0	1.5
Castrates/fattening	0.2(0.7)	3.6	100.0	-	-	95.5	4.5	-
Equines (N=218)	1.5(1.5)							
Horses (both male and female)	0.2(0.5)	15.1	100.0	-	-	29.6	70.4	-
Male donkeys	0.5(0.7)	31.7	98.2	1.8	1.7	58.6	39.7	-
Female donkeys	0.7(1.0)	51.4	98.6	1.4	3.5	36.5	57.6	2.4
Mules (both male and female)	0.03(0.2)	1.8	100.0	-	-	25.0	75.0	-
Chicken (N=576)	3.8(4.4)	100.0	99.0	1.0	-	60.7	36.4	2.9

Appendix 3: *Correlation of major holdings in the overall study sites.*

		Family size	Total land	Grazing land	Cattle	Sheep	Goats	Equines	Chicken
Family size	Pearson Correlation		.158	.191(*)	.208(*)	.117	-.056	.113	.226(**)
	Sig. (2-tailed)		.053	.019	.011	.153	.499	.167	.005
	N		150	150	150	150	150	150	150
Total land	Pearson Correlation			.878(**)	.350(**)	-.253(**)	.408(**)	.262(**)	.130
	Sig. (2-tailed)			.000	.000	.002	.000	.001	.114
	N			150	150	150	150	150	150
Grazing land	Pearson Correlation				.252(**)	-.229(**)	.275(**)	.197(*)	.150
	Sig. (2-tailed)				.002	.005	.001	.016	.067
	N				150	150	150	150	150
Cattle	Pearson Correlation					.081	.451(**)	.632(**)	.067
	Sig. (2-tailed)					.325	.000	.000	.413
	N					150	150	150	150
Sheep	Pearson Correlation						-.298(**)	-.011	.017
	Sig. (2-tailed)						.000	.894	.834
	N						150	150	150
Goats	Pearson Correlation							.549(**)	.027
	Sig. (2-tailed)							.000	.745
	N							150	150
Equines	Pearson Correlation								.143
	Sig. (2-tailed)								.081
	N								150
Chicken	Pearson Correlation								
	Sig. (2-tailed)								
	N								

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Appendix 4: *Correlation of major holdings in the mixed flock site.*

		Family size	Total land	Grazing land	Cattle	Sheep	Goats	Equines	Chicken
Family size	Pearson Correlation		.233	.270	.366(*)	.132	.362(*)	.118	-.131
	Sig. (2-tailed)		.216	.149	.047	.487	.050	.536	.491
	N		30	30	30	30	30	30	30
Total land	Pearson Correlation			.894(**)	.484(**)	.044	.198	.478(**)	.122
	Sig. (2-tailed)			.000	.007	.819	.293	.008	.522
	N			30	30	30	30	30	30
Grazing land	Pearson Correlation				.397(*)	.113	.195	.331	.183
	Sig. (2-tailed)				.030	.553	.303	.074	.333
	N				30	30	30	30	30
Cattle	Pearson Correlation					.187	.410(*)	.659(**)	-.260
	Sig. (2-tailed)					.321	.025	.000	.165
	N					30	30	30	30
Sheep	Pearson Correlation						.041	.397(*)	-.105
	Sig. (2-tailed)						.829	.030	.580
	N						30	30	30
Goats	Pearson Correlation							.187	.016
	Sig. (2-tailed)							.322	.934
	N							30	30
Equines	Pearson Correlation								-.018
	Sig. (2-tailed)								.923
	N								30
Chicken	Pearson Correlation								
	Sig. (2-tailed)								
	N								

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Appendix 5: *Correlation of major holdings in the goat dominating site.*

		Family size	Total land	Grazing land	Cattle	Sheep	Goats	Equines	Chicken
Family size	Pearson Correlation		.352(**)	.351(**)	.199	.055	.020	.059	.321(*)
	Sig. (2-tailed)		.006	.006	.127	.676	.881	.655	.012
	N		60	60	60	60	60	60	60
Total land	Pearson Correlation			.977(**)	.270(*)	.029	.057	.094	.170
	Sig. (2-tailed)			.000	.037	.825	.666	.477	.193
	N			60	60	60	60	60	60
Grazing land	Pearson Correlation				.249	.021	.039	.079	.130
	Sig. (2-tailed)				.055	.876	.770	.548	.322
	N				60	60	60	60	60
Cattle	Pearson Correlation					.544(**)	.132	.520(**)	.094
	Sig. (2-tailed)					.000	.316	.000	.474
	N					60	60	60	60
Sheep	Pearson Correlation						.209	.257(*)	-.064
	Sig. (2-tailed)						.108	.047	.628
	N						60	60	60
Goats	Pearson Correlation							-.040	.226
	Sig. (2-tailed)							.760	.083
	N							60	60
Equines	Pearson Correlation								.048
	Sig. (2-tailed)								.717
	N								60
Chicken	Pearson Correlation								
	Sig. (2-tailed)								
	N								

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Appendix 6: *Correlation of major holdings in the sheep dominating site.*

		Family size	Total land	Grazing land	Cattle	Sheep	Goats	Equines	Chicken
Family size	Pearson Correlation		.233	.184	.315(*)	.039	-.015	.287(*)	.285(*)
	Sig. (2-tailed)		.074	.160	.014	.769	.910	.026	.027
	N		60	60	60	60	60	60	60
Total land	Pearson Correlation			.805(**)	.129	.047	.094	-.024	.214
	Sig. (2-tailed)			.000	.325	.722	.474	.853	.101
	N			60	60	60	60	60	60
Grazing land	Pearson Correlation				.036	-.146	.020	-.011	.225
	Sig. (2-tailed)				.783	.264	.877	.931	.084
	N				60	60	60	60	60
Cattle	Pearson Correlation					.338(**)	.314(*)	.574(**)	.214
	Sig. (2-tailed)					.008	.015	.000	.101
	N					60	60	60	60
Sheep	Pearson Correlation						.207	.291(*)	.086
	Sig. (2-tailed)						.112	.024	.514
	N						60	60	60
Goats	Pearson Correlation							.554(**)	.093
	Sig. (2-tailed)							.000	.479
	N							60	60
Equines	Pearson Correlation								.353(**)
	Sig. (2-tailed)								.006
	N								60
Chicken	Pearson Correlation								
	Sig. (2-tailed)								
	N								

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Appendix 7: *Seasonal calendar of sheep and goats feed resources and cropping.*

Particulars	Seasonal Calendars											
	Sep	*Oct*	*Nov*	*Dec*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*
Feeding calendar												
Communal grazing	✓	✓	✓					✓	✓	✓	✓	✓
Road sides grazing	✓	✓	✓				✓	✓	✓	✓	✓	✓
Grazing crop stubble			✓	✓	✓	✓	✓	✓				
River side grazing	✓	✓	✓					✓	✓	✓	✓	✓
Private grazing	✓	✓	✓					✓	✓	✓	✓	✓
Cut-and-carry	✓	✓	✓					✓	✓	✓	✓	✓
Crop residues	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓
Local browses	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Improved forages										✓	✓	✓
Enset[8] and banana										✓	✓	✓
Roots and tubers										✓	✓	✓
Weeds	✓	✓								✓	✓	✓
Tillers and fillers	✓	✓								✓	✓	✓
Cropping calendar												
Maize*			H	H				P	P			
Sorghum*			H	H				P	P			
Tef✧			H	H							P	
Wheat✧			H	H							P	
Finger millet*			H	H				P	P			
Pepper*			H	H					P	P		
Haricot bean*							P				H	
Haricot bean✧		H	H								P	

✓: *Months feedstuffs available; H: Harvesting time; P: Planting time; *Belg (short rain) season crops; ✧Meher (main rain) season crops*

[8] Enset is a banana like plant cultivated as food crop in southern and southwestern Ethiopia.

Appendix 8: *Major sheep and goat diseases.*

Local name	Veterinary equivalent	N	%	Species affected	Symptoms
Lugo	Fasciolosis (Liver Fluke)	51	33.7	*S,G,C	Swelling at the sub mandibular area (bottle jaw), emaciation, diarrhea, and depression
Bega	Sheep pox	33	22.0	S,G	High fever, eruption of papule and vesicles, development of pus, scab formation
Tereje (Arae Tizenat)	Anthrax	13	8.4	S,G,C,E	High fever, widespread signs of oedema, , protrusion of rectum, exudation of blood from natural orifices of cadaver and sudden death
Tefiqa	Blackleg	10	7.0	S,C	Pronounced lameness with swelling of the upper part of the affected leg, shivering, skin discoloration (farmers says it occurs due to black spider venom)
Gunfan (Sombe)	Pneumonia	43	28.9	S,G,C,E	Increased respiratory rate, coughing, and abnormal breathing sound on auscultation
Gororisa	Pasteurellosis			S,G,C	Drooling of saliva, swelling of tongue, symmetrical swelling of throat
Hanti Tizenat	Mastitis			S,G,C	Physical, chemical, and bacteriological changes in the milk and pathological changes in the udder
Allatte	Enzootic ataxia (Sway back)			S,G	Hind quarter paralysis, animals can not stand but have a bright face, no treatment available
Ari	CCPP			S,G	Depression, blood discharge from nostrils, low appetite, coughing

*S=Sheep; G=Goat, C=Cattle; E=Equines

Appendix 9: *Mean (SD) monthly price of agricultural commodities in Alaba (2000-2006).*

Month	Livestock prices					Crop prices					
	Sheep	**Goat**	**Ox**	**Cow**	**Chicken**	**Tef**	**Wheat**	**Barley**	**Finger millet**	**Maize**	**Pepper**
Sep	117.43	105.00	759.00	466.57	9.29	242.86	163.57	85.00	66.43	92.14	544.29
	(30.68)	(46.28)	(219.89)	(180.80)	(3.35)	(32.00)	(53.91)	(86.36)	(66.88)	(31.34)	(505.70)
Oct	118.57	96.43	784.29	465.71	7.86	230.71	162.14	116.43	65.00	75.00	453.57
	(38.05)	(21.93)	(241.65)	(151.31)	(2.41)	(26.99)	(63.76)	(89.29)	(65.13)	(21.98)	(353.68)
Nov	112.86	104.29	784.29	467.86	8.29	214.29	132.14	164.29	62.14	88.57	460.71
	(23.60)	(38.56)	(262.86)	(178.37)	(2.14)	(36.79)	(36.38)	(95.37)	(61.09)	(32.37)	(362.24)
Dec	125.00	107.86	847.14	547.14	12.86	215.00	135.71	146.43	80.00	92.86	397.43
	(33.04)	(34.38)	(242.67)	(206.94)	(7.08)	(39.90)	(44.76)	(77.50)	(59.37)	(33.52)	(291.00)
Jan	127.86	111.43	862.14	541.43	11.43	212.14	134.29	104.29	75.00	95.71	410.71
	(29.13)	(29.40)	(205.50)	(192.74)	(4.47)	(39.35)	(35.99)	(78.50)	(56.20)	(36.22)	(332.56)
Feb	120.00	102.14	851.43	539.29	8.71	223.57	139.14	126.43	77.43	99.29	469.57
	(18.26)	(14.39)	(253.41)	(193.57)	(1.25)	(44.79)	(43.25)	(64.85)	(58.18)	(39.31)	(397.66)
Mar	138.57	102.14	802.14	485.00	10.43	232.14	146.00	122.14	76.43	103.57	616.00
	(42.50)	(14.68)	(211.74)	(169.44)	(5.41)	(50.81)	(52.08)	(61.36)	(57.13)	(37.94)	(620.39)
Apr	166.43	120.00	1,026.00	582.71	12.57	247.57	155.43	130.71	76.43	111.43	494.29
	(69.45)	(31.22)	(365.05)	(257.53)	(2.51)	(62.79)	(46.72)	(66.86)	(57.13)	(42.59)	(388.83)
May	168.57	116.71	983.57	595.71	10.29	254.29	161.43	132.86	60.71	120.71	510.71
	(62.50)	(35.90)	(334.82)	(248.92)	(3.86)	(68.34)	(53.75)	(75.44)	(61.94)	(52.63)	(417.30)
Jun	151.43	114.29	984.29	568.57	10.00	255.00	161.43	87.86	52.14	127.14	567.14
	(64.85)	(36.90)	(324.39)	(216.90)	(4.16)	67.27	(48.62)	(88.59)	(66.07)	(46.27)	(418.80)
Jul	136.43	100.00	852.86	480.00	8.86	255.00	170.00	92.14	66.43	127.14	614.29
	(64.21)	(30.14)	(392.50)	(237.28)	(3.76)	76.10	(48.73)	(97.38)	(64.72)	(46.80)	(472.55)
Aug	158.57	113.57	962.86	528.57	10.29	267.14	177.86	61.43	46.43	115.71	625.00
	(73.64)	(39.23)	(518.87)	(265.23)	(5.74)	87.12	(55.06)	(84.15)	(60.26)	(33.96)	(488.41)

Appendix 10: *Mean (SD) yearly price of agricultural commodities in Alaba (2000-2006).*

Year	Prices of livestock					Prices of crops					
	Sheep	**Goat**	**Ox**	**Cow**	**Chicken**	**Tef**	**Wheat**	**Barley**	**Finger millet**	**Maize**	**Pepper**
2000	114.58 (27.75)	97.92 (23.40)	727.92 (116.02)	459.58 (51.10)	8.5833 (2.23)	238.33 (22.50)	162.08 (26.92)	170.83 (52.43)	129.58 (12.33)	114.17 (21.09)	-
2001	97.92 (14.05)	85.42 (13.56)	633.33 (73.40)	401.67 (58.90)	6.67 (2.31)	200.00 (22.16)	102.08 (26.58)	129.17 (37.04)	104.58 (15.29)	53.33 (11.74)	-
2002	119.58 (18.15)	99.58 (14.22)	625.00 (96.34)	360.00 (56.41)	6.92 (2.07)	173.75 (20.35)	99.08 (41.19)	68.75 (41.73)	48.08 (29.47)	59.17 (24.76)	425.00 (128.81)
2003	138.75 (36.19)	90.17 (11.09)	827.25 (232.36)	421.17 (140.80)	9.33 (2.64)	226.08 (18.91)	161.92 (23.01)	150.83 (73.08)	66.25 (69.42)	122.50 (25.89)	950.83 (373.36)
2004	127.50 (30.19)	102.08 (12.87)	861.25 (79.89)	524.17 (97.46)	11.33 (2.50)	239.58 (29.03)	158.75 (22.07)	145.00 (88.16)	47.50 (58.99)	98.75 (19.90)	827.58 (190.46)
2005	136.42 (36.23)	117.50 (33.27)	1,030.83 (179.52)	561.67 (103.47)	12.67 (4.25)	253.33 (18.99)	162.50 (21.79)	134.58 (83.60)	73.33 (65.20)	138.33 (26.49)	770.42 (250.14)
2006	222.92 (57.78)	162.08 (23.01)	1,419.42 (249.25)	928.42 (130.42)	15.00 (4.84)	331.25 (62.31)	226.42 (25.65)	-	-	142.50 (18.40)	621.67 (107.86)

Appendix 11: *Geographical locations of sheep and goat markets (January 2007).*

Markets	Administrative location (woreda, zone, region)	Elevations (m a.s.l)	Degree Readings	UTM Readings	Market attributes		
					Market Days	*Physical Facilities*	*Tax/head animal(Birr)*
Hadero Mazoria	Kacha Bira, Kambata Tambaro, SNNP	1724	N07° 11.079' E037° 2.789'	37N0357908 0794289	Tuesday	Fenced	1.00
Areka	Boloso Sore, Wolaita, SNNP	1750	N07° 04.433' E037° 2.363'	37N0357092 0781675	Tuesday	Fenced	1.00
Shinshicho	Kacha Bira, Kambata Tambaro, SNNP	1852	N07° 12.423' E037°46.343'	37N0364456 0796747	Saturday	Fenced	1.00
Wolaita Sodo	Sodo Zuria, Wolaita, SNNP	2058	N06° 51.720' E037°45.735'	37N0363236 0758601	Saturday	Fenced	1.00
Tebella	Humbo, Wolaita, SNNP	1571	N06°42.062’ E037°46.431’	37N0364472 0740799	Thursday	Fenced	2.00
Durame	Kedida Gemila, KambataTambaro,SNNP	2104	N07° 14.263' E037° 4.208'	37N0378940 0800100	Saturday	Fenced	1.50
Boditi	Damote Gale, Wolaita, SNNP	2050	N06°57.171’ E037°51.334’	37N0373571 0768619	Saturday	Fenced	1.50
Shone	Badawacho, Hadiya, SNNP	1956	N07° 08.249' E037° 6.837'	37N0383752 0789009	Friday	Fenced	1.00
Adilo	Kedida Gemila, KambataTambaro,SNNP	1972	N07° 12.519' E037° 8.858'	37N0387489 0796867	Wednesday	Open	1.00
Damboya	Kedida Gemila, KambataTambaro,SNNP	2240	N07° 20.604' E037° 7.098'	37N384285 0811772	Friday	Fenced	1.00
Besheno	Alaba Special Woreda, SNNP	1980	N07° 28.174' E038°13.824'	37N0415080 0825656	Tuesday	Open	1.00
Guba	Alaba Special Woreda, SNNP	1890	N07° 16.550' E038° 3.180'	37N0413855 804242	Friday	Open	1.00
Kobo	Alaba Special Woreda, SNNP	1819	N07° 23.865' E038° 5.751'	37N0418613 0817712	Friday	Open	1.00
Mito	Alaba Special Woreda, SNNP	-	N07° 40.847' E038° 1.585'	-	Saturday	Open	1.00

Appendix 11: *Continued.*

Markets	Administrative location (woreda, zone, region)	Elevations (m a.s.l)	Degree Readings	UTM Readings	Market attributes		
					Market Days	*Physical Facilities*	*Tax/head animal(Birr)*
Bonosha	Shashego, Hadiya, SNNP	1935	N07°29.991' E038°05.610'	37N0399981 0829034	Monday	Fenced	1.00
Alem Gebeya	Sankura, Silti, SNNP	1865	N07°34.165' E038°10.848'	37N0409627 0836705	Saturday	Fenced	1.00
Mazoria	Sankura, Silti, SNNP	1852	N07°26.936' E038°08.105'	37N0404557 0823396	Tuesday	Open	1.00
Ropi	Siraro, West Arsi, Oromia	1758	N07°08.274' E038°06.588'	37N0401700 0789016	Monday	Fenced	1.00
Alaba Kulito	Alaba Special Woreda, SNNP	1770	N07° 18.433' E038° 4.960'	37N0398740 0807739	Thursday	Fenced	1.50
Aje	Siraro, West Arsi, Oromia	1839	N07°17.896' E038°21.007	37N0428264 0806700	Friday	Fenced	1.00
Shashemene	West Arsi, Oromia	1928	N07°11.285' E038°35.081	37N0454142 0794488	Everyday	Open	-
Modjo export abattoir	Modjo, Oromia	1770	N08°34.548' E039°06.970	37P 0512784 947870	All days	Open	-
Debre Zeit export abattoir	Bishoftu, Oromia	1910	N08°44.817' E038°58.618'	37P0497468 0966788	All days	Open	-
Kolfe Atana Tera	Addis Ababa Admin	2445	N09°02.162' E038°42.976'	37P0468816 0998758	All days	Open	-
Shola	Addis Ababa Admin	2405	N09°01.497' E038°47.767'	37P0477591 0997528	All days	Open	-

Appendix 12: *Census (CACC, 2003) livestock population data for Alaba and its adjacent woredas and zone of SNNRS.*

Species	Alaba Special Woreda	Kedida Gamela Woreda (Kambata Tambaro Zone)	Badawacho Woreda (Hadiya Zone)	Silti Zone
Cattle	161,566	73,960	121,421	87,399
Sheep	34,760	18,394	16,261	24,008
Goats	43,141	11,173	27,214	27,279
Horses	2,583	1,194	-	3,533
Asses	27,661	6,234	10,151	8,231
Mules	2,346	660	-	495
Poultry	221,342	110,992	181,601	104,242
Beehives	14,690	4,264	11,275	3,832

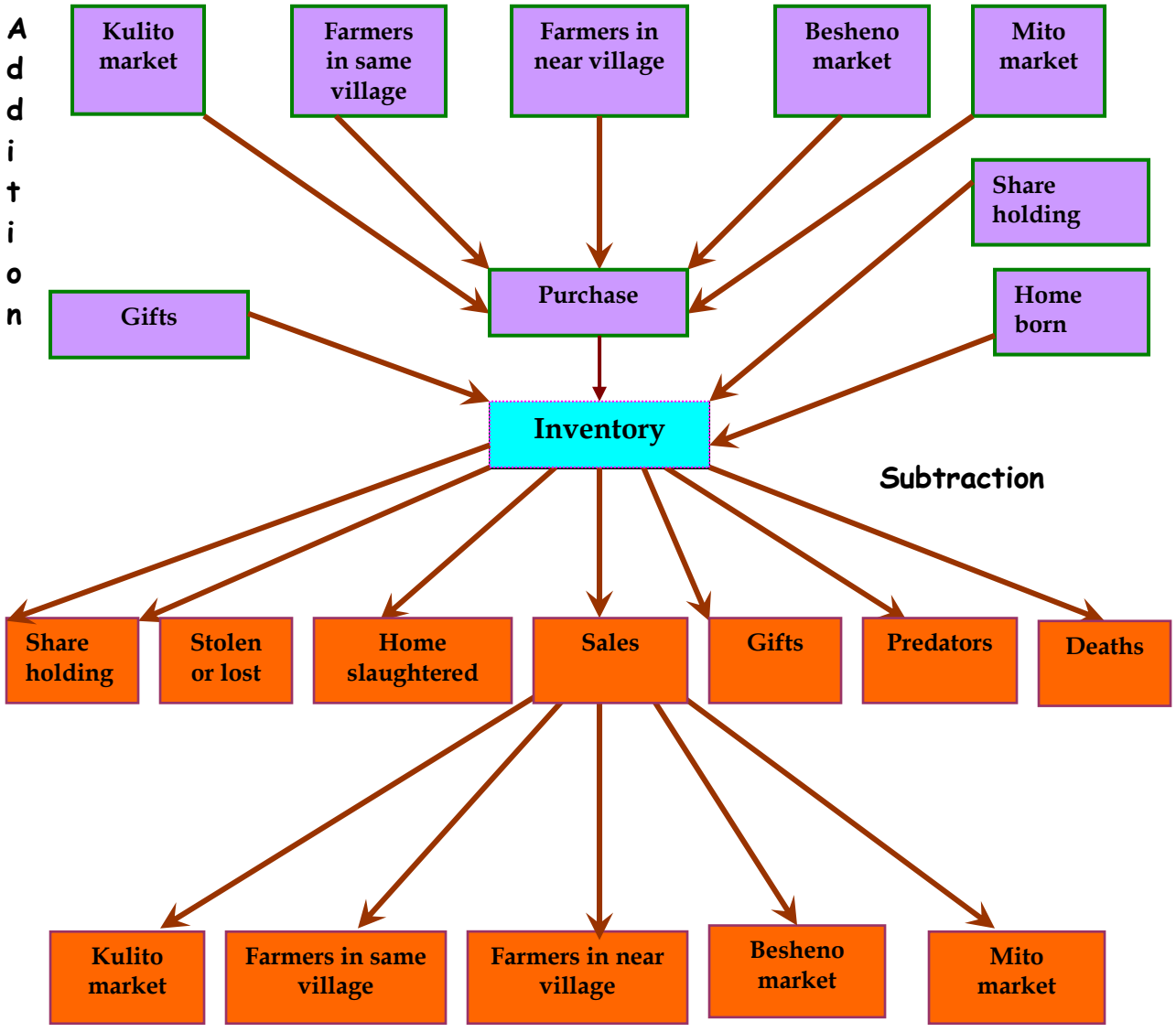
Appendix 13: *Conversion equivalents of sub-Saharan Africa livestock into TLU (Gryseels; 1988; ILCA, 1990; FAO, 2002).*

Species	TLU
Oxen/bull	1.1
Local cow	0.8
Heifers	0.5
Immature males	0.6
Calves	0.2
Sheep/goats	0.1
Horses/mules	0.8
Donkeys	0.5
Chicken	0.01

Appendix 14: *Yearly sheep and goat skin production.*

Years	Sheepskin	Goatskin	Total
1991	12561	8756	21317
1992	18967	12110	31077
1993	24370	19276	43646
1994	28359	21562	49921
1995	39276	31256	70532
1996	29352	20153	49505
1997	31588	25216	56804
1998	24310	10568	34878
1999	28781	12617	41398
2000	22629	18597	41226
2001	43889	26546	70435
2002	33826	24392	58218
2003	52008	48654	100662
2004	67154	52562	119716
2005	53169	48070	101239
2006	56434	47169	103603
Total	**566673**	**427504**	**994177**

Source: Desk of Livestock and Fisheries Development, Alaba Special Woreda OoARD



Appendix 15: *Routes of flock entry and exit.*

BIOGRAPHICAL SKETCH

The author of the present thesis was born in 1978 in Dawuro Zone of SNNPR, Ethiopia. He attended elementary and junior secondary schools between 1985 and 1992 in Dawuro. He attended the senior secondary schools in Agaro and Addis Ababa between 1993 and 1996.

He then joined the Alemaya University of Agriculture in 1996 where he studied Animal Sciences. He graduated in July 2000 with the Bachelor of Sciences in Agriculture (Animal Sciences).

Between 2001 and 2005 he was employed by the Areka Agricultural Research Center, SNNPR. He worked as a livestock researcher in the Department of Animal Science Research.

He was admitted to the School of Graduate Studies of University of Hawassa in 2005 for his graduate studies in the specialization of Animal Production.