

**VALUE CHAIN ANALYSIS OF SMALL RUMINANT: THE CASE OF
TAHTAY ADYABO DISTRICT, TIGRAY, ETHIOPIA**

MSc THESIS

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**Value Chain Analysis of Small Ruminant: The Case of Tahtay Adyabo
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ACRONYMS AND ABBREVIATIONS

CSA	Central Statistics Agency
DCSI	Dedebit Credit and Saving Institution
FAO	Food and Agricultural Organization
GDP	Gross Domestic Product
GMM	Gross Marketing margin
IFAD	International Fund for Agricultural Development
Masl	Meters above sea level
NGO	Non Governmental Organization
OLS	Ordinary Least Square
OoARD	Office of Agricultural and Rural Development
OoTI	Office of Trade and Industry
SMARC	Shire – Mitsebri Agricultural Research Center
SNNPRS	Southern Nation Nationalities and Peoples Regional State
SRMP	Small Ruminant Market Participation
SRMS	Small Ruminant Market Supply
TADOOARD	Tahtay Adyabo District Office of Agriculture and Rural Development
TADOOI	Tahtay Adyabo District Office of Information
TGMM	Total Gross Marketing Margin
TLU	Tropical Livestock Unit
UNIDO	United Nations Industrial Development Organization
VIF	Variance Inflation Factor

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Value Chain Analysis of Small Ruminant: The Case of Tahtay Adyabo District, Tigray, Ethiopia

ABSTRACT

This study was aimed at evaluating value chain of small ruminant in Tahtay Adyabo District of Tigray National Regional State with specific objectives of identify small ruminant value chain actors and their roles; develop value chain maps of small ruminant and examine market performance of the chain; analyzing factors determining farmers' participation in small ruminant marketing and marketed surplus in the study area. The data were collected from both primary and secondary sources. Primary data were collected from a randomly selected 138 sample households, 26 traders, 5 butchers, 7 hotels/restaurants and 11 consumers interviewed through a semi-structured questionnaire and from key informant interview. The value chain analysis revealed that the major actors in the district being input suppliers, small ruminant producers, farmers, collectors, small traders, large traders, hotels/restaurants, butchers and consumers. Producer's share of the consumer's price was highest along producers – consumers, producers – farmers (for breeding purpose) and producers – small traders – consumers in both goat and sheep market channels. Hotels/restaurants and butchers have the highest gross marketing margin whereas collectors have got the lowest gross marketing margin in both goat and sheep market channels. Heckman two step procedures was used to identify factors affecting farmers' participation decision in small ruminant marketing and quantity marketed in the study area. The result indicated that small ruminant market participation decision significantly affected by experience in small ruminant production, access to market information, family size, non/off farm income, access to veterinary service, distance to the nearest livestock market, distance to all weather roads and other livestock owned. Quantity supplied of small ruminant to market is significantly affected by experience in small ruminant production, access to credit, access to veterinary service, non/off farm income, distance to all weather roads and distance to the nearest livestock market. Therefore, policy aiming at developing the skills what farmers have through experience, increasing the dimension of access to formal financial systems, provision of timely and adequate veterinary services, provision of timely and accurate market information and developing and improving infrastructure are recommended to accelerate the chain's development in the study area.

Key words: Actors, Small ruminant, Value chain, Tahtay Adyabo, Tigray, Ethiopia.

1. INTRODUCTION

1.1. Background of the Study

Ethiopia is endowed with huge livestock resource, natural resource and diverse agro-ecological zones suitable for livestock production. These potentials make the country prominent repository for animal genetic diversity (Hussen *et al.*, 2015). Livestock production plays an important role to smallholder farmers and the national economy of the country. It contributes 15 to 17 percent of GDP and 35 to 49 percent of agricultural GDP and 37 to 87 percent of the household income (Gebremariam *et al.*, 2010).

Ethiopia has 29.33 and 29.11 million sheep and goats population respectively. From the total small ruminant population 99.8% of the sheep and nearly all goat population of the country are local breeds (CSA, 2015). They are important components of the livestock sub-sector and sources of cash income, meat, milk, wool, manure and saving or risk distribution for smallholders in different farming systems and agro-ecological zones of the country (Tibbo, 2006, Endeshaw, 2007 and Getahun, 2008). Small ruminants are also sources of foreign currency (Gebremedhin *et al.*, 2007). Moreover, due to their high fertility, short generation interval, adaptation in harsh environment and their ability to produce in limited feed resource they are considered as investment and insurance (Tsedeke, 2007).

Demand for Ethiopian sheep and goat meat has dramatically increased after market promotion by development projects in close collaboration with the government. This has created an opportunity for sheep and goat producers to sell more animals at better prices (Legese *et al.*, 2014). The increase in international demand for meat in general and the high demand for sheep and goat meat in the Middle East are another incentive for sheep and goat production in the country (Hassen *et al.*, 2013). As the country development is characterized by rise in income, combined with rapid population growth of major cities in general, the demand for meat products with quality as well as value-added products such as special meat cuts is increasing as ever (Legese and Fadiga, 2014).

Tigray region has suitable agro-ecology for small ruminant production. There are about 4.2 and 1.8 million goats and sheep population respectively in the region (CSA, 2015). Small

ruminant production has significant contribution for household income, as source of food (meat and milk) and manure in the region. Tahtay Adyabo District is one of the potential areas for small ruminant production and marketing. Moreover, Begait breeds of small ruminant which are utilized both for meat and milk production belongs to this district (Tesfay *et al.*, 2012). Tahtay Adyabo District has 158,418 goat and 32,433 sheep population (TADOoARD, 2015). Different actors are participating along the chain of small ruminant in the district. Even though, the study area is the center of production of small ruminant and have access to domestic markets, research regarding evaluation of small ruminant value chain has not been conducted which can guide stakeholders to be able to use the potential of the resource optimally. Since there was information gap on set of actors and their roles, market performance of small ruminant and factors determining farmers' participation in small ruminant marketing and marketed surplus, this study was conducted to solve those problems.

1.2. Statement of the Problem

Ethiopia owns large and diverse livestock resources which are genetically diverse. However, the contributions of the livestock subsector in the country, at either the macro or micro level is below potential. The levels of foreign exchange earnings from livestock and livestock products are much lower than would be expected, given the size of the livestock population. A number of fundamental constraints underlie these outcomes, including inadequate veterinary services, feed shortages, poor infrastructure, insufficient financial services and low levels of technical inputs (Gebremedhin *et al.*, 2007; Gizaw *et al.*, 2010). The existing livestock marketing system in Ethiopia is fragmented and disorganized and the supply chain linking smallholder producers with domestic consumers and export markets is long and extended. This depresses farm gate prices and prevents producers from receiving better revenues, since a vast array of middlemen tap a large proportion of the price paid by consumers and exporters (Legese and Hordofa, 2011). This is because of the entire livestock supply chain in the country is further characterized by numerous actors. This makes the supply chain unnecessarily long with increased transaction costs and without significant value added activities (Negassa, *et al.*, 2011).

Due to limited value addition in the livestock sector, exports remain dominated by live animals, thus hampering the sector's potential to ease high unemployment in rural and urban areas (Legese and Fadiga, 2014). Value chain analysis is essential to explain the connection between all the actors in a particular chain of production and distribution and it shows who adds value and where, along the chain. It helps to identify pressure points and make improvements in weaker links where returns are low (Schmitz, 2005).

In Ethiopia, there is a general increase in demand for sheep and goat meat both in the domestic and export markets. However, the supply of small ruminant to both markets is not well strategized as production is not market-oriented. Moreover, there is no livestock market information system that informs farmers which animals are needed, who are the potential buyers, and prices for the different class of animals. Developing efficient input delivery systems, knowledge-based animal husbandry (including feeding, breeding, housing and health care), cost-effective marketing, and efficient and equitable supply chains are important interventions (Legese *et al.*, 2014).

Study on sheep production system in Tahtay Adyabo District has been carried out by Tesfay *et al.*, 2012. However, Small ruminant value chain analysis has not been studied in the study area. In this regard, small ruminant value chain analysis is an important process that has not been investigated in the study area. The set of actors and their activities and organizations in the small ruminant value chain of the study area was not known. Therefore, this study was conducted to evaluate small ruminant value chain, as there is research gap in relation to Tahtay Adyabo District.

1.3. Objective of the Study

The general objective of the study was to evaluate the value chains of small ruminant in the study areas. The specific objectives of the study were:

1. To identify small ruminant value chain actors and their roles in the study area
2. To develop value chain maps of small ruminant and examine market performance of the chain
3. To analyze factors determining farmers' participation in small ruminant marketing and marketed surplus in the study area.

1.4. Significance of the Study

Value chain analysis is essential to an understanding of markets, the risks and the added value in each step, the participation and organization of different actors, and the factors that limit the income and competitiveness of farmers. This study provides information on the marketing margin and benefit share of actors of small ruminant value chain in the study area. It also provided a holistic picture of existing challenges, opportunities and entry points in the small ruminant value chain. The information that was generated can help a number of organizations including research and development organizations, traders, producers, policy makers, input suppliers, government and non-governmental organizations to assess their activities and ultimately influence the design and implementation of policies and strategies.

1.5. Scope and Limitations of the Study

This study used important information from sample households and value chain actors involved in the subsector in Tahtay Adyabo District. Hence, the study was limited spatially as well as temporally. Furthermore, even though value chain analysis includes from input suppliers to the end users covering wide range of geographical areas stretching from local to global markets due to shortage of logistics, the study did not represent the whole value chain of small ruminant in the country. However, it may be useful for areas with similar context with the study area.

1.6. Organization of the Study

With the above brief introduction, the remaining part of the study is organized as follows. Chapter 2 presents review of literature on value chain analysis from different sources. Subsequently, description of the study area and methodologies are presented in Chapter 3. In Chapter 4, both descriptive and econometric results are presented and discussed in detail. Chapter 5, summarizes the main findings of the study and draws conclusion and appropriate recommendations.

2. LITERATURE REVIEW

In this part of the study the basic concepts of value chain, importance of value chain analysis, value chain governance, market performance, small ruminant contribution to Ethiopia economy and empirical reviews would be discussed.

2.1. Definitions and Concepts

Supply Chain: is used to encompass every logistical and procedural activity involved in producing and delivering a final product or service, from the supplier's supplier to the customer's customer (Feller *et al.*, 2006). It is about making the chain as efficient as possible through better flow scheduling and resource use, improving quality control throughout the chain, reducing the risk associated with food safety and contamination (Dunne, 2001).

Value Chain: describes the full range of value-adding activities required to bring a product or service through the different phases of production, including procurement of raw materials and other inputs, assembly, physical transformation, acquisition of required services and ultimately to consumers (Kaplinsky and Morris 2002). It include all of the vertically linked, interdependent processes that generate value for the consumer, as well as horizontal linkages to other value chains that provide intermediate goods and services. Value chains focus on value creation typically via innovation in products or processes, as well as marketing and also on the allocation of the incremental value (Webber and Labaste 2010).

Value chain system contains value chain actors, value chain service providers and the institutional environment. Value chain actors exercise ownership of the product or its value addition, thus bearing the risk in handling a commodity. Value chain service providers provide service to value chain actors, either at cost or for free. In some cases, a value chain actor may provide service to its own operation. In such cases, the service becomes part of the value chain actor activities. Both value chain actors and value chain service providers operate under given institutional environments comprising formal institutions (written laws and regulations) and informal institutions (Gereffi, 1995).

Value chain analysis normally identifies many potential upgrading strategies. These are nodes which, if addressed, will have the highest impact in upgrading the value chain. Value chain development is about implementation of upgrading interventions (Anandajayasekeram and Gebremedhin, 2009).

Value chain is differentiated from a production/supply chain because participants in the value chain have a long-term strategic vision, disposed to work together, oriented by demand and not by supply, shared commitment to control product quality and have a high level of confidence in one another that allows greater security in business and facilitates the development of common goals and objectives. It is a strategic network between a numbers of independent business organizations. The terms production chain, supply chain, market chain are synonymously used to describe all participants involved in an economic activity which uses inputs and services to enable a product to be made and delivered to a final consumer (Hobbs *et al.*,2000).

Value Chain Actors: are as those individuals who take ownership of a product, through the exchange of money or equivalent goods or services, during the transaction process of moving the product from conception to end consumer. Similarly, those individuals or firms providing a service without taking ownership of the product are classified as service providers (Filip, 2006).

Mapping the Value Chain: Mapping a chain refers creating a visual representation of the connections between businesses in value chains as well as other market players. It provides tools on how to capture the different dimensions of a value chain. Mapping a value chain eases a clear understanding of the series of activities and the main actors and relationships involved in the value chain (UNILO,2009 as cited in Quader, 2012). Moreover, making a value chain map is a way of making what is seen and encountered more easily understood: “A picture is worth a thousand words” (M4P, 2008)

Value-Added: For a particular industry, such as agriculture, value added is equal to the value of its output minus the value of intermediate inputs it buys from other industries (FAO,

2011). It is a measure for the wealth created in the economy. Total value-added is equivalent to the total value of all services and products produced in the economy for consumption and investment, net of depreciation. To arrive at the value-added generated by a particular value chain, the cost of bought-in materials, components and services has to be deducted from the sales value. The total sum of value added in value chains equals purchase inputs and then adds value which then becomes part of the cost of the next stage of production. (Linden *et al.*, 2009).

Value added is created at different stages and by different actors throughout the value chain. It may be related to quality, costs, delivery times, delivery flexibility, innovativeness, etc. The size of value added is decided by the end-customer's willingness to pay. Opportunities for a company to add value depend on a number of factors, such as market characteristics (size and diversity of markets) and technological capabilities of the actors (Trienekens, 2011).

Market Chain: It refers a series of linked intermediary traders between the producer, of livestock or other commodities, and the final consumer. The series is also linked back 'upstream' from the producer to the input suppliers. Branching may occur at any stage of the chain. Market chain is the system that consists of actors and organizations, relations, functions, and product, cash and value flows that make possible the transfer of goods or services from the producer to the final consumer. Functions conducted in a marketing chain have three things in common; they use up scarce resources, they can be performed better through specialization, and they can be shifted among channel members (FAO, 2005).

Marketing Channel: A marketing channel is a business structure of interdependent organizations that reach from the point of product or origin to the consumer with the purpose of moving products to their final consumption or destination (Kotler and Armstong, 2003). This channel may be short or long depending on kind and quality of the product marketed, available marketing services, and prevailing social and physical environment (Islam *et al.*, 2001).

2.2. Importance of Value Chain Analysis

Value chains are a key framework for understanding how inputs and services are brought together and then used to grow, transform, or manufacture a product; how the product then moves physically from the producer to the customer; and how value increases along the way. The value chain perspective provides an important means to understand business-to-business relationships that connect the chain, mechanisms for increasing efficiency, and ways to enable businesses to increase productivity and add value. It also provides a reference point for improvements in supporting services and the business environment and contribute to pro-poor initiatives and better linking of small businesses with the market. Increasingly, the value chain approach is being used to guide and drive high-impact and sustainable initiatives focused on improving productivity, competitiveness, entrepreneurship, and the growth of small and medium enterprises (Webber and Labaste 2010).

Value chain analysis reveals the dynamic flow of economic, organizational and coercive activities involving actors within different sectors. It shows that power relations are crucial to understand how entry barriers are created, and how gain and risks are distributed and it analyses competitiveness in a global perspective. By revealing strengths and weaknesses, value chain analysis helps participating actors to develop a shared vision of how the chain should perform and to identify collaborative relationships which will allow them to keep improving chain performance (UNIDO, 2009).

Value chain analysis is essential to an understanding of markets, their relationships, the participation of different actors, and the critical constraints that limit the growth of livestock production and consequently the competitiveness of farmers. It is also important for networks and linkages in value chains that link production systems, markets and consumers constitute a contact network (IFAD, 2007).

The value chain approach thus provides a framework to analyze the nature and determinants of competitiveness in value chains in which small farmers can participate. It also provides the basic understanding needed for designing and implementing appropriate development

programs and policies to support their market participation. Indeed, many development interventions now utilize the value chain approach as an important entry point for engaging small farmers, individually or collectively, in high-value export markets. The value chain approach can be used to enhance economic development and poverty reduction by ensuring farmers access to the full range of necessary inputs, facilitating access to cheaper or better inputs, strengthening delivery of business and financial services, enabling the flow of information, facilitating improved market access or increasing access to higher value markets or added products (Mogoa *et al.*, 2014)

2.3. Value Chain Governance

The term governance is used to denote the ways in which transactions, at different points in the chain, are conducted. The choice of type of contract influences the transactions costs, market efficiency and equity. Alternatives range from simple face to face exchanges, through an array of different types of informal or formal contract, to vertical integration and amalgamation of activities into a single organization (Humphrey and Napier, 2005).

Governance in a value-chain refers the structure of relationships and coordination mechanisms that exist between actors in the value-chain. It is important from a policy perspective by identifying the institutional arrangements that may need to be targeted to improve capabilities in the value-chain, remedy distributional distortions, and increase value-added in the sector (M4P, 2008). Governance plays a large part in determining and explaining various firms' market power. However, commercial competence, market forces, and technical capabilities also determine the market power of value chain participants (Webber and Labaste 2010).

Value chains can be classified into two based on the governance structures: buyer-driven value chains, and producer-driven value chains (Kaplinisky and Morris, 2000). Buyer-driven value chains refer to a market context where producers have few options for selling their goods or services and these chains typically have low barriers to entry at the producer level. In such cases, buyer has an advantage because these numerous producers compete to offer goods and services at the lowest cost. Buyer-driven value chains are often characteristic of labor intensive industries like agriculture and buyers undertake the lead coordination activities and influence

product specifications. Producer-driven value chains are often characterized by knowledge intensity, relatively higher levels of technology or skills, high levels of marketing, or capital intensive production practices. These high-level factors and differentiations produce barriers to entry for competition include the large amounts of capital needed for investment. In producer-driven value chains, producers are usually controlling key technologies, influence product specifications and play the lead role in coordinating the various links.

According to Legesse and Hordofa (2011), in value chain governance, vertical and horizontal linkages are the two basic strategies that value chain actors can use to improve their incomes. Vertical linkages refer to coordination between players engaged in different functions or different levels of the value chain, critical for moving a product or service to the end market. Vertical cooperation reflects the quality of relationships among vertically linked firms up and down the value chain. More efficient transactions among firms that are vertically related in a value chain increase the competitiveness of the entire industry. In addition, vertical linkages facilitate the delivery of benefits and embedded services and the transference of skills and information between firms up and down the chain. Horizontal linkages refers both formal as well as informal coordination between firms at all levels in a value chain and they can reduce transaction costs, create economies of scale, and contribute to the increased efficiency and competitiveness of an industry. In addition to lowering the cost of inputs and services, horizontal linkages can contribute to shared skills and resources and enhance product quality through common production standards.

2.4. Market Performance

Marketing is the performance of all business activities involved in the flow of goods and services from the point of production until they are in the hands of the ultimate consumer (Panda, 2011). Agricultural marketing is the process by which agricultural products flow physically and economically from the producers to the consumers in order to affect exchange of goods and services that satisfy the needs of individuals, groups or the entire society. In the process of marketing, buyers and sellers are linked together and can react to current situations of supply and demand. Participants thereby generate income which enhance their welfare. Generally, an effective and efficient marketing system enhances consumption, output and

economic development (Olukosi and Isitor, 1990). In a subsistence economy, agricultural marketing may be of little significance since farmers only produce food for their household to eat leaving very little or nothing for the market. But as agriculture is moving into commercial production, agricultural marketing becomes very important (Adegeye and Dittoh, 1985).

Market performance is defined as the strategic end result of market adjustment engaged in by buyers and sellers. It is the appraisal of the extent to which the interactions of buyers and sellers in a market stimulate results that are consistent with social purposes (Ajala and Adeshinwa, 2008). Moreover, it refers to the composite of end results which firms in the market arrive at by pursuing whatever lines of conduct they use that results in the dimensions of price, output, production and selling cost, product design, and so forth (Wolday, 1994).

According to Stern *et al.* (1996), market performance is a multi-dimensional concept that can be assessed by considering a number of dimensions including effectiveness, equity, productivity and profitability. It refers to economic results: product suitability in relation to consumer preferences (effectiveness); rate of profits in relation to marketing costs and margins; price seasonality and price integration between markets (efficiency). Market performance can be evaluated by analyzing costs and margins of marketing agents in different channels. A commonly used measure of system performance is the marketing margin or price spread (Mendoza, 1995). The profit range accruable to the market participants gives an indication of market performance. This benefits that accrue to the individual participants may be incentives or disincentives to continue in the business. (Achoga and Nwagbo, 2004).

Marketing Margin: A marketing margin measures the share of the final selling price that is captured by a particular agent in the marketing chain. It refers to the difference between prices at different levels in the marketing system. The total marketing margin is the difference between what the consumer pays and what the producer/farmer receives for his produce. In other words, it is the difference between retail price and farm price (Cramers and Jensen, 1982). At each intermediary level, it is the difference between the price received on resale and the purchase price. A wide margin means usually high prices to consumers and low prices to producers. The total marketing margin may be subdivided into different components: all the costs of marketing services and the profit margins or net returns. The marketing margin in an

imperfect market is likely to be higher than that in a competitive market because of the expected abnormal profit. But marketing margins can also be high, even in competitive market due to high real market cost (Wolday, 1994).

Marketing margins provide neither a measure of farmers' well-being nor of marketing firms' performance. However, they give an indication of the performance of a particular industry or an indication of the market's structure and efficiency. Marketing margins are the result of demand and supply factors, marketing costs, and the degree of marketing channel competition. Thus, margins reflect aggregate processing and retailing firm behavior which influence the level and variability of farm prices and may influence the farmer's share of the consumer food dollar (Tomek and Robinson, 1990).

Marketing Cost: Agricultural marketing costs are costs incurred between the moment an agricultural product leaves the farm and the moment it is purchased by end users of consumers. These costs vary widely across agricultural commodities, depending for example on the extent of processing or the distance between production areas and consumption centers. The main costs incurred are in time, form, place and possession. These could include payment for all initial assemblage, storage, processing, transporting, warehousing and retailing (Wandschneider and Yen, 2006).

2.5. Small Ruminant Contribution to Ethiopian Economy

Small ruminants in Ethiopia are produced under two major production systems—the sedentary mixed crop–livestock production system and the nomadic pastoral or agro pastoral production system. The former is based on limited communal and/or private grazing areas, industrial by-products, crop residues, cultivated forage and naturally grown bushes and shrubs. The pastoral production system is based on extensive communal grazing, while agro pastoralists are characterized by combination of pastoral and mixed crop–livestock systems (Alemayehu, 2006).

Sheep and goats have lower feed requirements compared to cattle because of their small body size. This allows easy integration of small ruminant into different farming systems. The

increased domestic and international demand for Ethiopian sheep and goats has established them as important sources of revenue as well as foreign currency. This increased demand also creates an opportunity to substantially improve food security of the population and alleviate poverty. Small ruminant contribute a quarter of the domestic meat consumption; about half of the domestic wool requirements; about 40% of fresh skins and 92% of the value of semi-processed skin and hide export trade of the country. They also represent only 7% of the average total capital invested in livestock in the mixed crop-livestock production system, but they account on average for 40% of the cash income earned by farm households and 19% of the total value of subsistence food derived from all livestock production and 25% of total domestic meat consumption (Hirpa and Abebe, 2008).

Sheep and goats production is an important activity for smallholders, particularly for resource poor farmers in many parts of Ethiopia. They are widely reared in a crop-livestock farming systems and are distributed across different agro-ecological zones of the country. They provide their owners with a vast range of products and services such as immediate cash income, meat, milk, skin, manure, risk spreading or management and social functions (Adane and Girma, 2008). According to CSA (2015), the main sheep and goat producing regions are Oromia (33% sheep and 27% goats), Amhara (34.2% sheep and 20% goats), SNNP (16% sheep and 17.5% goats) and Tigray (6.2% sheep and 15% goats).

Small ruminants are mainly kept for income generation in many parts of Ethiopia to obtain cash income for household expenses, such as buying grains for household consumption, buying agricultural inputs such as fertilizer and seed and paying the medical and school expenses of household members (Tsedeke, 2007; Getahun, 2008; Belete, 2009 and Urgessa *et al.*, 2012). However, traditional small ruminant production technologies and practices render the production and productivity as well as benefits to producer falls below expectations. This is due to health constraints, inadequate feed, low genetic potential and various management problems. Infectious diseases pose major constraints to small ruminant production in the country (Tibbo, 2006 and Gizaw *et al.* 2010).

Demand for Ethiopian small ruminant has increased both for local and export markets. Sheep and goat meat is consumed by domestic and foreign consumers. Over 90% of the meat exported to different countries is sheep and goat meat. Ethiopian sheep and goat meat is exported mainly to the Middle East and North Africa. However, domestic demand for sheep and goat meat is quite seasonal as it follows the religious calendar of fasting periods and festivities such as New Year, Christmas, Easter, Ramadan and Arafa. Sheep and goat milk and milk products are consumed by domestic consumers. Consumption of small ruminant milk gives high nutritional value and considers it as a medicine and consumed either in its fresh state (boiled whole milk) or skimmed milk (legese *et al.*, 2014).

2.6. Review of Empirical Studies

2.6.1. Value chain analysis

A number of studies have employed on value chain analysis using the value chain approach. A study conducted on goat value chain analysis by Desta *et al.* (2013) in Tanqua Abergele District used value chain approach to map and identify the actors participating in the goat value chain and their distribution of benefits, opportunities and constraints in the value chain. The study found that the producers' share of final price was higher when the animal was sold to butchers passing through small traders and large traders. Among the major constraints of goat value chain in the area were shortage of adequate veterinary services, drugs and equipment supply, weak vertical and horizontal linkages between producers and the actors, lack of formal and adequate market information, seasonality of supply and demand for good quality goats and shortage of supply of export quality animals.

Similarly, sheep value chain analysis conducted by kidanu *et al.* (2013) in Atsbi-Wenberta District was used value chain approach to map and identify actors and their distribution of benefits, opportunities and constraints in the value chain. Accordingly, the major actors in the value chain of sheep are farmers, small traders, large traders, butchers/hotel/restaurant owners, export abattoirs, farmers buying for breeding purposes and consumers. The study also found that the producers' share of final price was the least when the animal sold to hotels passing

through small traders. This channel was less efficient than when animals are sold to butchers and export abattoirs. In terms of value added, hotels and butchers add more value to sheep than traders and exporters. Among the constraints related to input supply, production and marketing of sheep value chain analysis were shortage of veterinary services and drug supply, feed shortage, high incidence of disease and parasites, lack of vertical and horizontal linkage of sheep producers and seasonality of demand for sheep.

Study conducted by Abraham (2013) on vegetable value chain analysis in Habro and Kombolcha Districts was used value chain approach to map and identify actors and their distribution of benefits, opportunities and constraints in the value chain. Accordingly, vegetables produced in the area pass through collectors, wholesalers and retailers, with little value being added before reaching the end-users. The study also identified some of the production and marketing constraints like diseases and pests, limited access to agricultural inputs, low price of products, lack of storage and low quality of products.

2.6.2. Determinants of market participation decision and marketed surplus

A number of studies were done to identify factors that affect market supply of different agricultural commodities. Some of these studies which consider two dependent variables which are market participation decision and marketed volume are stated below.

Regarding factors affecting market participation decision and marketed surplus, different studies used Heckman two-step estimation procedure for different agricultural commodities.

Woldemichael (2008) conducted a study on dairy marketing chains analysis in Shashemane, Hawassa, and Dale District's milk shed. The study used Heckman two-step estimation procedure to identify factors that determine milk market participation decision and volume of milk sale of the farm household. The study revealed that milk market participation decision is affected by age of the household head, family size, education level, experience in dairy production, number of cross breed milking cows owned and distance from milk market center. Except that of distance from milk market center and experience in dairy production, these variables influenced milk market participation decision positively. In addition, the marketed

milk volume was found to be positively and significantly affected by the number of cross breed milking cows owned, family size, education level, age and annual non-dairy income of sampled dairy households.

Dawit (2010) conducted a study on market chain analysis of poultry in Alamata and Atsbi-Wenberta District. The study used Heckman two step econometric estimation procedure to identify factors that determine market participation decision and value of poultry sales. The study revealed that the sex of the household head, distance to district market, family size and education status of the household heads being the variables negatively and significantly influencing the market participation decision of poultry market.

Embaye (2010) conducted a study on analysis of Butter supply chain in Alamata and Atsbi-Wenberta District. The study used Heckman two step econometric estimation procedures to identify factors that determine market participation decision and butter sale volume of the farm household. The study found that quantity of butter produced, number of extension visit and market information access influence market participation of butter positively, and family size, distance to nearest market and distance to extension service center influencing market participation of butter negatively. Similarly, quantity produced, distance to nearest market and distance to extension service center were significant factors affected level of butter supply. Except that of quantity produced, distance to nearest market and distance to extension service center were influenced level of butter supply negatively.

Berhanu (2012) used Heckman two step econometric estimation procedure to identify factors determining household's decision and level of participation to add values to milk. The study found that milk yield in liter per day, distance from urban centers, age, poor access to livestock extension services, shelf life, social factors (holidays and fasting), and labor availability determined household's decision to add values to milk. Most of the factors determining decision of participation in milk value addition also determined the level of participation.

Similarly, Demissie *et al* (2014) used Heckman two stages econometric estimation procedure to identify factors that determine market participation decision and marketed surplus of cow

milk of the households in Gursame and Babile districts. The study revealed that milk market participation decision affected by number of milk cow, access to market information, family size and income from non dairy sources positively. In addition, the marketed milk volume was found to be positively and significantly affected by number of milk cow, access to milk market information, financial income from non dairy sources, Market price of cow milk. Access to livestock extension service being the variables negatively and significantly influencing the marketed milk volume.

Factors affecting market participation and volume and/or quantity of supply can differ from one commodity to the other depending on the nature of the commodity under consideration. Therefore, this study was intended to analyze factors determining farmers' participation in small ruminant marketing and quantity supply of small ruminant, which are important animals to smallholders. Since there can be selectivity bias in the study, this study used Heckman two-step procedure to analyze those factors.

3. RESEARCH METHODOLOGY

This chapter discusses the research methodology used in the study including location and description of the study areas, data types and data sources, methods of sampling, methods of data collection and analysis.

3.1. Description of the Study Area

Tahtay Adyabo District is one of the eight district found in north western Zone of Tigray Regional State. The district is composed of 17 rural kebeles and 1 urban kebele. Tahtay Adyabo District is located about 405 kilometers from Mekelle and 95 kilometer from Shire-Endaslase Town, the capital of North Western Zone of Tigray Region. It is bounded by the District of Laelay Adyabo to the east, Kafta Humera and Eritrea to the west and, Asgede Tsimbla to the south and Eritrea to the north. Geographically, it is located between $37^{\circ}21'13''\text{E}$ to $38^{\circ}10'33''\text{E}$ longitude and $14^{\circ}31'34''\text{N}$ to $14^{\circ}51'42''\text{N}$ latitude (TADOoI, 2015).

The district has total population of about 100,958, of which 50,924 and 50,034 were males and females respectively (CSA, 2015). The district has area coverage of 253,655 hectare out of which 60,017 hectare is crop land, 42,778 hectare is covered by forest and the rest is homestead and wasteland. The district is divided in to three major agro-ecological zones, viz., hot to warm semi-arid low lands (70%), hot to warm sub-moist low lands (11.25%), and tepid to cool moist mid highlands (18.75%). The average annual temperature of the district is 31°c and found at an elevation of 800-1500 masl (TADOoARD, 2015).

According to TADOoARD (2015), the economy of the district is dominated by crop farming mixed with livestock husbandry. The major crops produced in the district include sesame, sorghum, finger millet, maize and vegetables. The important cash crop commodity in this area is sesame. The district is suitable for livestock production especially for goats, sheep and cattle which belongs to begait breeds. The livestock populations of the district are 236861cattle, 158418 goats, 32433 sheep, 46 mules, 24424 donkeys and 4811 camels.

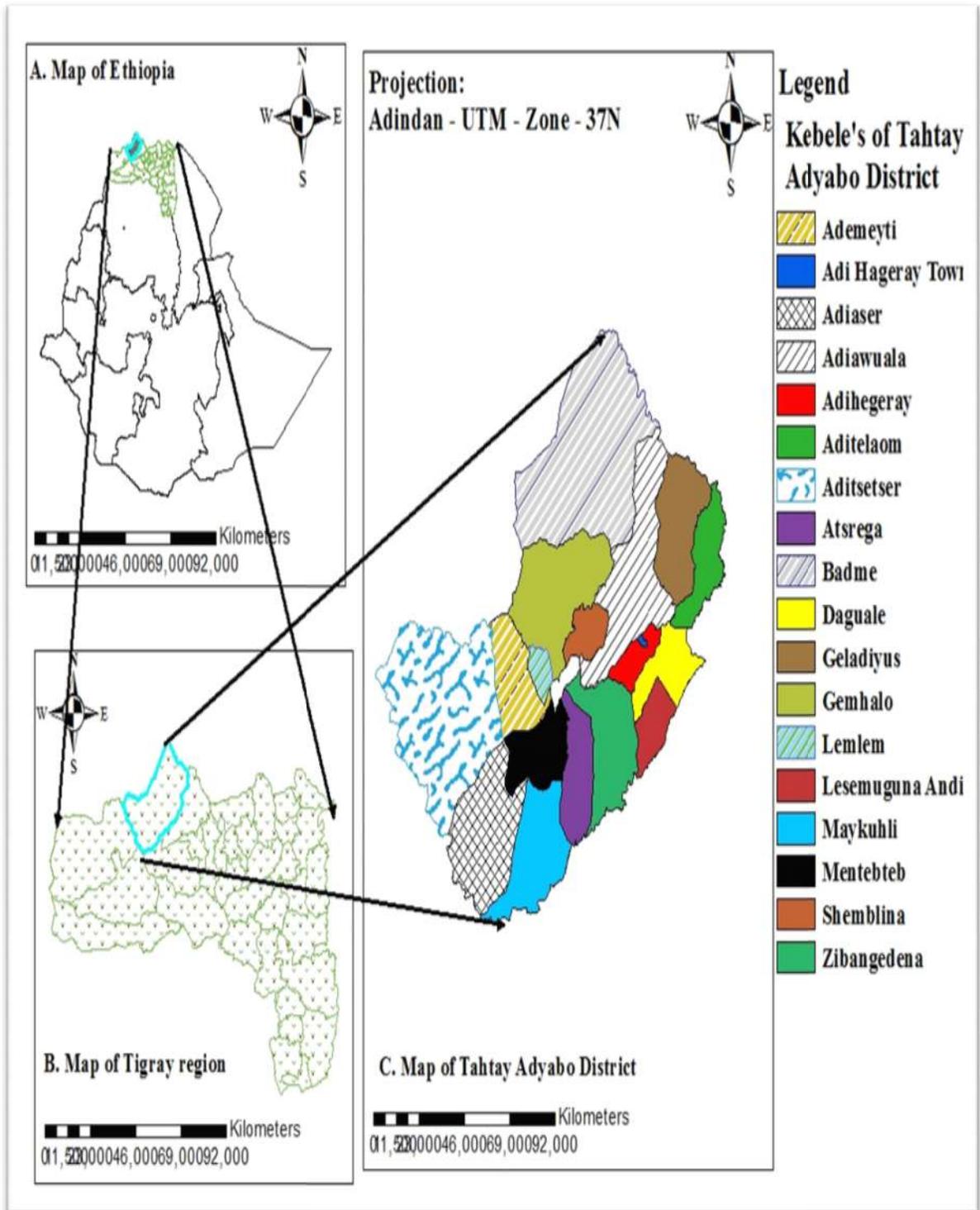


Figure 1: Geographical location of Tahtay Adyabo District

3.2. Data Types, Sources and Method of Data Collection

Information on different variables such as small ruminant marketed, lagged prices of small ruminant, distance to all weather roads, distance to the nearest livestock market, age of the household head, experience of the household head in small ruminant production, small ruminant market participation, number of extension contact, educational status of the household head, family size, access to market information, other livestock owned, non/off farm income, credit facility and access to veterinary services was collected.

The study used two types of data. Primary data were collected using informal and formal surveys. The informal survey used key informants interview and visual observations. Specific checklists were used to guide key informants interviews. The formal survey was undertaken through formal interviews with randomly selected farmers, traders, hotels and restaurants, butchers, and consumers using a pre-tested semi-structured questionnaire for each group. The secondary data were collected from Central Statistical Authority (CSA), Office of Agriculture and Rural Development (OoARD), and other sources.

3.3. Sampling Procedure and Sample Size

Multi-stage random sampling technique was used to select representative small ruminant producer kebeles and sample households. In the first stage, out of 18 kebeles of the district 10 small ruminant producer kebeles were purposively selected based on the level of production. In the second stage, from the 10 small ruminant producer rural kebeles, four sample kebeles namely Adi-Aser, Gemhalo, Mentebteb and Zban-Gedena were selected randomly. In the third stage, total of 138 sample households were selected randomly using probability proportional to population size-sampling technique based on Cochran (1977) formula.

$$n = \frac{z^2 p(1 - p)}{e^2} \quad (1)$$

Where,

n is the sample size

p is the estimated proportion of small ruminant producers from the total population

$Z = 1.96$ and $e = 0.05$

$$n = \frac{1.96^2 \times 0.9(0.1)}{0.05^2} = 138$$

Table 1: Sample size distribution in the sample kebeles

Name of selected kebeles	Total number of small ruminant producers	Number of sample households
Adi Aser	328	30
Gemhalo	383	35
Mentebteb	292	27
Zban Gedena	494	46
Total	1497	138

Source: Own computation from kebele administration data

For this study, data from traders were also collected. The sites for the trader surveys were market towns in which a good sample of small ruminant traders are available. The lists of 6 large traders were obtained from the District Office of Trade and Industry (OoTI) and for other traders there is no recorded list. A total of 6 large traders, 12 small traders and 8 collectors were randomly selected constituting a total of 26 traders from Sheraro, Tekeze, Adi- Hageray and Shmelba markets. Furthermore, 5 butchers, 7 hotels/restaurants and 11 consumers were interviewed from the district by selecting randomly.

3.4. Methods of Data Analysis

Descriptive statistics and econometric analysis were used to analyze the data collected from small ruminant producers, traders, hotels/restaurants, butchers and consumers.

3.4.1. Descriptive analysis

Descriptive statistical methods of data analysis was used for the use of means, standard deviations, percentages, t-test, χ^2 -test and maps to examining and describing household characteristics, services and marketing functions.

3.4.1.1. Value chain analysis

The following four steps of value chain analysis were applied to this study:

Mapping the value chain: - involves understanding the characteristics of the chain actors and the relationships among them including the study of all actors in the chain, the flow of small ruminants through the chain, the destination of domestic sales. This information was obtained by conducting surveys, and key informant interviews as well as by collecting secondary data from various sources.

Identifying the distribution of actors' benefits in the chain: - this involves analyzing the margins and profits within the chain and therefore analyzing who benefits from participating in the chain and how much was the benefit, and who would need support to improve performance and gains.

Defining upgrading needed within the chain:- by assessing profitability within the chain and identifying chain constraints, intervention options to improve the productivity of animals and their quality (according to consumer's requirement) could be defined.

Emphasizing the governance role: - within the concept of value chain; governance is the structure of relationships and coordination mechanisms that exist among chain actors. By focusing on governance, the analysis identified actors that may require support to improve capabilities in the value chain, increase value added in the sector and correct distributional distortions. Analyses of vertical and horizontal linkage of smallholder small ruminant producers with each other and with other actors were identified.

Following the above procedure, the main aspects of small ruminant value chain analysis was done by applying some quantitative and qualitative analysis. First, value chain actors were identified, and then value chain map of small ruminant was drawn which depicts the structure and flow of the chain in logical clusters. This exercise was carried out in qualitative terms through graphs presenting the various actors of the chain, their linkages and all operations of the chain from supply of inputs to consumption. After having developed the general

conceptual map of the value chain, the next step is analyzing the performance of market and benefit share of actors.

3.4.1.2. Analysis of small ruminant market performance

Estimates of the marketing margins are the best tools to analyze market performance. Marketing margin was calculated by taking the difference between the final price paid by the consumer and the price received by the producer. Calculating the total gross marketing margin was done by using the following formula. Computing the Total Gross Marketing Margin (TGMM) is always related to the final price paid by the end buyer and is expressed as a percentage (Mendoza, 1995).

$$TGMM = \frac{\text{Final Consumer price} - \text{Producer Price}}{\text{Final Consumer Price}} \times 100 \quad (2)$$

Where TGMM=Total Gross Marketing Margin

It is useful to introduce here the idea of “producer participation”, “farmer’s portion” or “producer’s gross margin” (GMM) which is the portion of the price paid by the end consumer that belongs to the farmer as a producer. It should be emphasized that growers that as middlemen also receive an additional marketing margin. The producer’s margin or share in the consumer price (GMM_p) is calculated as:

$$GMM_p = \frac{\text{Final Consumer Price} - TGMM}{\text{Final Consumer Price}} \times 100 \quad (3)$$

Where GMM_p=Gross Marketing Margin of the producer

The consumer price share/portion of market intermediaries is calculated as:

$$GMM = \frac{\text{Selling Price} - \text{Buying Price}}{\text{Final Consumer Price}} \times 100 \quad (4)$$

Where: GMM = Gross Marketing margin of intermediaries

According to Mendoza (1995), precise marketing costs are frequently difficult to determine in many agricultural marketing chains. The reasons are that these costs are often both cash costs and imputed costs, the gross and not the net marketing margin is advised to be calculated. In similar way, in this study, gross marketing margin was considered instead of net marketing margin, as it was difficult to estimate the implicit costs incurred during transaction of small ruminant.

3.4.2. Econometric Analysis

Econometric model was used to identify factors that affect farmers' participation decision and quantity of small ruminant supply in small ruminant market. Ordinary Least Square (OLS) is applicable when all households participate in the market. In reality not all households participate in a specific commodity market. Some households may not prefer to participate in a particular market in favor of another, while others may be excluded by market conditions. If the OLS regression is estimated excluding the nonparticipants from the analysis, a sample selectivity bias is introduced into a model. Such a problem can be overcome by following a two-step procedure as suggested by Heckman (1979). Heckman has developed a two-step estimation procedure that corrects for sample selectivity bias. This procedure allows the producer to decide whether to participate in a particular market, and if so, to supply animals to the market. The first step of the Heckman procedure a 'participation equation', attempts to capture factors affecting market participation decision. This equation is used to construct a selectivity term known as the 'inverse Mills ratio', which is added to the second step 'outcome' equation' that explains factors affecting quantity of small ruminant supplied. The inverse Mill's ratio is a variable for controlling bias due to sample selection.

Specification of the Heckman two-step procedure was written in terms of the probability of Small Ruminant Market Participation (SRMP), and Small Ruminant Market Supply (SRMS)

The participation equation/selection equation

The first step of Heckman procedure establishes the probability of participation in the small ruminant market. For the individual producer, the decision to participate or not to participate in small ruminant marketing can be formulated as:

$$SRMP = y_{1i}^* = x_{1i} \beta_1 + \mu_{1i} \quad (5)$$

$$SRMP = 1 \text{ if } y_{1i}^* > 0$$

$$SRMP = 0 \text{ if } y_{1i}^* \leq 0$$

Where: y_{1i}^* represents the binary latent variable of small ruminant market participation

(observed if $y_{1i}^* > 0$, 0 otherwise)

x_{1i} represents vectors that are assumed to affect the probability of sampled household small ruminant market participation.

β_1 represents vector of unknown parameters in participation equation.

μ_{1i} residuals in the selection equation

The observation equation/ the supply equation

SRMS is regressed on the explanatory variables x_{2i} and the vector of inverse Mills ratios (λ_i) from the selection equation.

$$SRMS = y_{2i} = x_{2i} \beta_2 + \lambda \left(\frac{\phi(x_{1i} \beta_1)}{\Phi(x_{1i} \beta_1)} \right) + \mu_{2i} \quad (6)$$

Where: y_{2i} is the outcome variable and observed if and only if SRMP=1

x_{2i} is factors assumed to affect the quantity of small ruminant supplied.

β_2 is vector of unknown parameter in the quantity of small ruminant supply equation

λ is the coefficient on the Mills ratio

ϕ denotes standard normal probability density function

Φ denotes the standard normal cumulative distribution function

μ_{2i} residuals in the observation equation

It is important to check multicollinearity problems before running the model. Multicollinearity problem arises due to a linear relationship among explanatory variables; and becomes difficult to identify the separate effect of independent variables on the dependent variable because there exists strong relationship among them (Gujarati, 2003). Variance inflation factors (VIF) technique was employed to detect multicollinearity in explanatory variable. According to Gujarati (2003) VIF (X_j) can be defined as:

$$VIF(X_j) = \frac{1}{1 - R_j^2} \quad (7)$$

Where, R_j is the multiple correlation coefficients between X_j and other explanatory variables.

If the value of VIF is 10 and above, the variables are said to be collinear.

3.5. Hypothesis and Definition of Variables

To identify factors influencing small ruminant market participation and quantity supply to the market, the main task is to explore which factors potentially influence and how (the direction of the relationship) these factors are related with the dependent variables. Therefore, variables which are supposed to influence small ruminant market participation and quantity of small ruminant marketed, needs to explain. Accordingly, the major variables expected to have influence on both the farmers' participation decision and small ruminant supplies are explained as follows:

3.5.1. Dependent Variables

Market Participation Decision (SRMP): It is dummy variable that represents the decision to participate or not to participate by the household in small ruminant marketing. This variable was regressed in the first stage of two step estimation procedure. Respondents who

participated in small ruminant market take the value of 1 where as the value of 0 were assigned for the respondent who did not participate in small ruminant market.

Quantity of Small Ruminant Supply (SRMS): It is continuous dependent variable representing the actual quantity of small ruminant marketed by farm households measured in terms of Tropical Livestock Unit (TLU) which was selected for regression analysis in the second stage of Heckman selection model.

3.5.2. Independent Variables

Sex of the household head (SEXHH): This variable is a dummy variable with values of 1 if the household head is male and 0 otherwise. Due to obstacles such as lack of capital and decision making between male and female household, the participation decision in small ruminant market and supply of small ruminant to the market was also assumed to differ between male and female household head. Accordingly, this study hypothesized that, female headed households were less likely to participate in small ruminant market and supply of small ruminant to the market in the study area.

Access to market information (MKTINF): This variable is a dummy variable taking a value of 1 if small ruminant producing farmer had access to market information and 0 otherwise. Farmers marketing decisions are based on updated information available on the market. Demissie *et al.* (2014) found that access to milk market information increase the probability of milk market participation and marketed milk volume. Therefore, this variable was expected to have positive relation with market participation decision and small ruminant supply.

Distance to nearest livestock market (DISMKT): is a continuous variable that measures the distance of the small ruminant producer households from the nearest small ruminant market and it is measured in hours of walking time. The closer the small ruminant market, the lesser would be the transportation charges, reduced walking time, and reduced other marketing costs, better access to market information and facilities. This improves return to labour and capital; increases farm gate price and the incentives to participate in economic transaction. According

to Gebremedhin *et al.* (2015), far from livestock market decreases the participation of small ruminant selling. Therefore, in this study, distance from nearest small ruminant market was expected to have negative effect on market participation decision and small ruminant supply.

Education level of the household head (EDUC): It is a dummy variable that takes a value of 1 if small ruminant producers are literate and 0 if illiterate. Education increases farmers' ability to get and use information, broadens farmers' intelligence and enables them to perform the farming activities intelligently, accurately and efficiently. Moreover, better educated farmers tend to be more innovative and are therefore more likely to adopt the marketing systems. Small ruminant producers who have better knowledge are expected to be early adopters. Study by Woldemichael (2008) conducted on dairy marketing showed that education level showed a positive effect on milk market participation. Therefore, this variable was expected to have positive relation with market participation decision and small ruminant supply.

Access to credit (CREDIT): This is a dummy variable with values 1 if the household has access to credit on small ruminant production and 0, otherwise. Access to credit would enhance the financial capacity of the farmer to purchase the small ruminants. Gebremedhin *et al.* (2015) found that use of credit services increase the probability of small ruminant market participation. Further, Muhammed (2011) found access to credit increasing the amount of wheat supplied to market. Therefore, access to credit was expected to have positive relation with market participation decision and quantity of small ruminant supply.

Experience of the household head in small ruminant production (EXPR): It is a continuous variable and measured in the number of years experience in small ruminant production of the household head. Abay (2007) illustrated as farmer's experience increases, the decision to participate in the production and marketing as well as volume of tomato supplied to the market increases. Therefore this variable was expected to have positive effect to small ruminant market participation and small ruminant supply.

Non/off farm income (OFFINC): It is a dummy variable measured in terms of whether the household obtained income from off and non-farming activities. It is 1 if the household is involved in non/off farm activities and 0 otherwise. Through improving liquidity, this income makes the household to expand production and the probability of participating in the market and small ruminant supply will increase. It also strengthens the household position in coping with different forms of risks. According to Abraham (2013) off farm income increasing the amount of cabbage supplied to market. Therefore this variable was expected to have positive effect to small ruminant market participation and small ruminant supply.

Family size (FAMSZ): This variable is a discrete explanatory variable and measured in terms of number of family members in the household. Families with more household members tend to have more labor which in turn increase small ruminant production and then increase market participation decision and small ruminant supply. According to Woldemichael (2008), family size was affected the milk market participation and marketed milk volume positively. Therefore, this study was expected to have positive relation with market participation decision and small ruminant supply.

Distance to all weather roads (DISROD): is a continuous variable measured by the distance of small ruminant producer from all weather roads, measured in hours of walking time. The higher the distance to all weather roads the higher will be the trekking time, transport and other related costs.

Access to veterinary service (VETER): This is a dummy variable with values 1 if the household has access to veterinary service and 0, otherwise. Small ruminant are very prone to livestock disease and needs proper management and timely treatment. In addition, veterinarians can comment the farmers to use recommended drug sources and type or even can supply themselves to the farmers. Gezahagn (2015) found that receiving veterinary service for beef cattle increase the probability of participation in markets. Further, Embaye (2010) found availability of veterinary service determining farmers' probability to have access to crossbreed cows and minimize loss of livestock. Therefore, access to veterinary service was expected to have positive relation with market participation decision and small ruminant supply.

Lagged price of small ruminant (PRICE): This is a continuous variable that measures annual average lagged price per animal in the previous year and measured in Birr. If market prices were relatively high in the previous year, there is a possibility of increasing market participation decision and small ruminant supply to the market. Study by Shambel (2013) on cattle value chain found that lagged price of cattle having positive effect on cattle market participation and value of cattle marketed. Therefore, this variable was expected to have positive influence on market participation decision and small ruminant supply.

Other livestock owned (OTHTLU): This is a continuous independent variable indicating total livestock holding of the household measure in tropical livestock unit, which excludes small ruminant. Households with larger total livestock unit size are supposed to be less concern about the small ruminant. Therefore, this variable was expected to affect market participation and small ruminant supply negatively.

Number of extension visit (EXTEN): is a continuous variable measure by the number of visits made by extension agent in the year. It is expected that extension service widens the household's knowledge with regard to the use of improved technologies and has positive impact on small ruminant market participation and quantity of sales. Thus, number of extension visits improves the household's intellectual capitals, and improves also small ruminant production. According to Embaye (2010), number of extension visit was significant factor affected market participation of butter positively. Similarly, Gebremedhin *et al.* (2015) found involvement in livestock extension service increases the probability of producers to participate in small ruminant market. Therefore, number of extension visits is expected to influence market participation and small ruminant supply positively.

Table 2: Summary of variable definitions, measurements and expected signs

S. No.	Variable notation	Variable label	Type	Variable measurements	Expected sign
1	SEXHH	Sex of household head	Dummy	Male=1, female=0	+
2	MKTINF	Access to market information	Dummy	Have access=1, otherwise=0	+
3	DISMKT	Distance to nearest livestock market	Continuous	Hour	-
4	EDUC	Education level of household head	Dummy	Literate=1, illiterate=0	+
5	CREDIT	Access to credit	Dummy	Have access=1, otherwise=0	+
6	EXPR	Experience of household head in small ruminant production	Continuous	Number of years	+
7	OFFINC	Non/off farm income	Dummy	Involved=1, otherwise=0	+
8	FAMSZ	Family size	Discrete	Number	+
9	VETER	Access to veterinary services	Dummy	Have access=1, otherwise=0	+
10	PRICE	Lagged price of small ruminant	Continuous	Birr	+
11	OTHTLU	Other livestock owned	Continuous	Tropical Livestock Unit	-
12	EXTEN	Number of extension visit	Continuous	Number	+
13	DISROD	Distance to all weather roads	Continuous	Hour	-

4. RESULTS AND DISCUSSION

This chapter presents the major findings of the study. It has five main sections. The first section deals with descriptive of the sample households. The second section presents value chain analysis of small ruminant which includes value chain map, actors and their roles, and value chain governance. The third section presents market performance of small ruminant which includes marketing costs and margins and benefit shares of actors in the value chain. The fourth section presents results of econometric analysis which contains the determinants of farmers' participation decision in small ruminant marketing and marketed surplus in the study area using Heckman's two-stage estimation procedure. The fifth section deals with the opportunities and constraints of small ruminant value chain in the study area.

4.1. Descriptive Statistical Results

For the descriptive statistics, sample smallholders were divided into participants and non-participants of small ruminant marketing. The objective is to assess the differences and similarities among sellers and non sellers of small ruminant producers in terms of their demographic and socio-economic characteristics.

4.1.1. Demographic and socio-economic characteristics of sample households

Tables 3 and 4 present demographic and socioeconomic characteristics of the sample respondents. The total sample size of farm respondents handled during the survey was 138. Of the total sample respondents, 84% were male-headed households and 16% were female-headed for participants and 71.9% were male-headed households and 28.1% were female-headed for non participants. With regards to educational status of sample respondents, 60.4% and 62.5% were literate for participants and non participants, respectively. Regarding their marital status, 2.2% of the total sample households were single, 88.4% were married, 7.2% were divorced and 2.2% were widowed. In addition to the farming activities, 74.5% of participants and 31.3% non participants, have also engaged in off/non-farm activities like in petty trading activities and daily labor. There was significant difference in engagement in non/off farm activities between participants and non participants at 1% significance level.

Table 3: Demographic and socioeconomic characteristics of samples (categorical variables)

Variables	Items	Participants (N =106)		Non- Participants (N =32)		Total sample (N =138)		χ^2 -test
		N	%	N	%	N	%	
Sex	Male	89	84	23	71.9	112	81.2	2.3485
	Female	17	16	9	28.1	26	18.8	
Education	Literate	64	60.4	20	62.5	84	60.9	0.0465
	Illiterate	42	39.6	12	37.5	54	39.1	
Marital Status	Single	3	2.8	0	0	3	2.2	1.3434
	Married	94	88.7	28	87.5	122	88.4	
Off/non farm income	Divorce	7	6.6	3	9.4	10	7.2	20.1043***
	Widowed	2	1.9	1	3.1	3	2.2	
	Involved	79	74.5	10	31.3	89	64.5	
	Not involved	27	25.5	22	68.7	49	35.5	

N is number of respondents. SD is standard deviation.

Note: *** is statistically significant at 1% significant level.

Source: Own computation from survey result, 2015

Table 4: Demographic and socioeconomic characteristics of sample households (continuous variables)

Variables	Participants (N =106)		Non- Participants (N =32)		Total sample (N =138)		t-value
	Mean	SD	Mean	SD	Mean	SD	
Age	43.77	10.13	45.53	11.25	44.18	10.39	0.8377
Family size	6.2	2.07	4.68	1.49	5.84	2.08	-3.8311***
Experience	12.69	8.69	4.18	3.29	10.72	8.56	-5.4085***
Land size	2.35	1.18	2.16	1.0	2.3	2.16	-0.8492

N is number of respondents. SD is standard deviation.

Note: *** is statistically significant at 1% significant level.

Source: Own computation from survey result, 2015

The average age of sampled respondents was 44 years. Small ruminant market participants were on average 44 years old, while non-participants were 45 years old. The average family size of the total sample respondents was found to be 6 and 5 persons for participants and non participants, respectively. Family size between participants and non participants showed variation at 1 percent significance level. The average years of experience related to small ruminant production was 12.69 and 4.18 years for participants and non participants, respectively. There was significant difference in small ruminant production experience

between participants and non participants at 1 percent significant level. The survey result with respect to land holding of the respondents reveals that an average size of land holding per household was 2.35 and 2.16 hectare for participants and non participants, respectively.

Table 5: Summary statistics of the independent variables

Variables	Mean	Std. Dev.	Min	Max
DISMKT	2.032971	1.129005	0	5
DISROD	1.659058	1.210194	0	4
FAMSZ	5.847826	2.05011	1	13
OTHTLU	10.61079	6.698868	.052	42.65
EXPR	10.72464	8.56812	1	35
EXTEN	3.23913	2.146307	0	7
PRICE	866.3043	135.647	600	1250

Source: Own computation from survey result, 2015

4.1.2. Means of livelihood of sample respondents

Mixed crop livestock production is the main occupation and source of livelihood for all sample farmers in the study area.

Table 6: Annual income by sample households (Birr/HH)

Income sources	Participants (N =106)		Non- Participants (N =32)		Total sample (N =138)		t-value
	Mean (Birr)	SD	Mean (Birr)	SD	Mean (Birr)	SD	
Crops	2571.6	3778.6	2937.6	3108.6	2656.5	3626.7	0.49
Other livestock	1193.9	1736.8	1620.4	1783.9	1292.8	1750.7	1.2
Non/off farm	2051.7	2193.6	1343.7	2253.7	1887.5	2219.7	-1.59
Small ruminant product	44.02	69.55	29.25	50.64	40.59	65.78	-1.11
Live small ruminant	1658.7	2230.1	0	0	1274.1	2074.9	- 4.1***
Total income	7519.9	7003.3	5931	4107.1	7151.5	6469.9	-1.21

N is number of respondents. SD is standard deviation.

Note: *** is statistically significant at 1% significant level.

Source: Own computation from survey result, 2015

In addition to the farming activities, some respondents have also engaged in non-farm activities like in petty trading activities and daily labor. Crop production plays a major role in income generation in the area and cereals such as sorghum, finger millet and maize and oil crop such as sesame are the major crops grown. For the total sample respondents, the average annual income generated from selling of crops and other livestock than small ruminant was 2656.5 and 1292.8 Birr respectively. The average annual income which is obtained from other non/ off farm income sources (salary, pension, petty trade, remittance, etc) of the sampled respondents was 1887.5 Birr. Similarly, the average annual income which is obtained from selling of small ruminant products such as hides and skins of the sampled respondents was 65.8 Birr. The average annual income from small ruminant for those who participate in small ruminant marketing was 1658.7 Birr with an average price of 887 Birr per animal.

The main source of cash income for the majority of the respondents in the study area was sesame production. Small ruminant and other livestock production is also considered as the second and third sources of income of the respondents in the study area (Appendix table 4).

4.1.3. Small ruminant production overview

Of the total sample respondents, 26.4% of them owned sheep, 33% of them owned goats and 40.6% of them owned both sheep and goats for participants and 25% of them owned sheep, 43.75% of them owned goats and 31.25% of them owned both sheep and goats for non participants (Table 7).

Table 7: Types of small ruminant owned by sample households

Types of small ruminant owned	Participants (N =106)		Non- Participants (N =32)		Total sample (N =138)		χ^2 -test
	N	%	N	%	N	%	
Sheep	28	26.4	8	25	36	26.1	1.37
Goat	35	33	14	43.75	49	35.5	
Sheep and goat	43	40.6	10	31.25	53	38.4	

N is number of respondents.

Source: Own computation from survey result, 2015.

Small ruminants are kept for different purposes in the study area (Appendix Table 5). Sample respondents sell live small ruminants to obtain cash income for household expenses, such as buying grains for household consumption, buying agricultural inputs such as fertilizer and seed and paying the medical and school expenses of household members. The second main reason for keeping small ruminant was for manure. Although its amount is small, most sample households prefer small ruminant manure to cattle manure. Keeping small ruminant for household consumption as meat and milk were also as third and fourth important reason. Other important reasons include for saving and insurance and sale of animal products such as hide and skin.

In the study area all of the sampled respondents confine small ruminant in separate house. Of the total sample households 55.7% of the respondents used open ended without roof during dry season at night and constructed from stone or wood walls with soil roof which is locally called *hdmo* during rainy season at night for confined space for small ruminant (Appendix table 6).

4.2. Value chain analysis

4.2.1. Actors and their roles in small ruminant value chain

In the study area, small ruminant value chain actors are those individuals who exchange money as well as animals or product, which generally increases in value with each transaction.

4.2.1.1. Primary actors

The primary actors in small ruminant value chain in the study area were input suppliers, farmers, collectors, small traders, large traders, hotels and restaurants, butchers and individual consumers.

Input suppliers: - Input suppliers are the first actor in the small ruminant value chain and provide inputs to producers. At this stage of the value chain, there are many stockholders who

are involved to supply input like breeding stock and veterinary drugs which are essential inputs in the production of small ruminants in the study area. Currently OoARD, NGO (Save the Children) and Private veterinary clinics and pharmacies are the main source of input supply. Small ruminant producers also highly participated in this stage especially for supplying breeding stock. In the study area, the survey result showed that only 26.8 and 6.5 percent of participants and non participants of sample respondents respectively. With regard to source of breed out of 46(33.3%) sampled farmers who obtained breed, 39(28.2%) sample respondents obtained breed from other farmers/neighbors and 7(5.1%) sample respondents from NGO (Save the Children) (Appendix Table 7).

Producers: - small ruminant producers are the major actors who perform most of the value chain functions right from inputs preparation on their homesteads and procurement of the inputs from other sources to marketing. The major value chain functions that small ruminant producers perform include housing, feeding, herding and breeding. Producers usually sell their small ruminants to any buyer in the village, market places and on the road to the market.

Collectors: - collectors are smallholder farmers who buy small ruminant from remote rural markets and villages for the purpose of resell it to small and large traders. They use either their own capital or large and small trader's money and their knowledge of local conditions and relationships to buy animals. Collectors are actors in the small ruminant value chain, responsible for the trading of 34.8 and 46.2 percents of goats and sheep respectively from producers to small and large traders in the study area (Figure 3 and Figure 4).

Small traders: - small traders are intermediate traders who purchase up to 20 small ruminant in a market from collectors and directly from producers and supply them to butchers, hotels/restaurants and consumers in the study area. They purchase small ruminant from producers and sell 20.9 and 23.2 percent of goats and sheep respectively to individual consumers and bulk consumers such as defense force. They are also responsible for trading of 42.4 Percent of goats and 45.7 Percent of sheep to butchers and 57.6 percent of goats and 54.3 percent of sheep to hotels/restaurants from producers and collectors in the study area (Figure 3 and Figure 4).

Large traders: - large traders are mainly involved in buying up to 60 small ruminant from collectors in the study area. In most cases, they use collectors to buy large number of animals and are actively involved in small ruminant marketing throughout the year. They buy larger number of small ruminant than any other actors use Isuzu trucks to transport small ruminant and are permanent suppliers of big hotels and restaurants in large towns like Shire-Endaslase and Humera. They are responsible for trading of 62.3 Percent of goats and 41.2 Percent of sheep to Shire hotels/restaurants and 37.7percent of goats and 58.6 percent of sheep to Humera hotels/restaurants from collectors in the study area (Figure 3 and Figure 4).

Hotels and restaurants: - Hotels and restaurants are important actors in the small ruminant value chain for the study area. They buy to slaughter small ruminants from producers, small traders and larger traders. When buying small ruminant, they give serious consideration to body size and condition. They slaughter small ruminant and process them into different local dishes like *keywot*, *tibis*, *misto*, *minchet*, *kikil*, *dullet* and *gubet kulalit* and sell them to their customers.

Butchers: - Butchers are important actors in the small ruminant value chain for the study area and buy to slaughter small ruminants from producers, small traders and large traders. When buying small ruminant, they give serious consideration to body size and condition. They slaughter small ruminant and serve both raw and cooked meat at their premises. In the study area, butchers sell raw meat for take away locally known as “*medeb*” other than on kilogram basis to individual consumers.

Consumers: - Individual consumers are actors that buy either live animals or meat for their own household consumption. They buy live sheep and goats from producers and small traders to slaughter for religious festivals and special occasions. Individual consumers usually buy slaughter goats and sheep for special festivities, such as the Ethiopian New Year, Christmas, Easter, Ramadan and Arefa. Some households also buy slaughter goats and sheep for special occasions, such as weddings and other ceremonies. The type of animals bought by individual consumers depends on their income and the occasion for which the animal is required.

Generally, wealthy households buy fattened male sheep and goats (*mukit*), while lower income groups buy male yearlings. Individual consumers in rural areas usually purchase live small ruminant from producers and in the cities, they buy from any seller. Individual consumers in the study area also buy raw meat from butchers locally known as “*medeb*” other than on kilogram basis.

Similarly, bulk consumers in the study area are Ethiopian defense forces. They buy live small ruminant from small traders and producers. The major suppliers to such bulk consumers are small traders, who are able to provide these clients with large numbers of animals at a time. In order to collect the required number of animals, those traders use a network of collectors. Farmers also make important segment of the consumers since they consume part of their produces.

Farmers (for breeding purpose):- Farmers are both producers and buyers of sheep and goat in the study area. They buy young female sheep and goat mainly for breeding purpose when they need to increase their herd size. Their preferred sources of animals are farmers from known locations since they want to make sure whether the animal will adapt to their situation. Regarding the time of purchases, farmers usually buy animals after crop harvesting from the end of October to December. Because they get cash by selling cash crops and other grains and availability of grazing pasture and crop residues.

4.2.1.2. Supporting institutions

Supportive institutions are those who provide supportive services including training and extension, market information, veterinary services, financial and research services. Office of Agriculture and Rural Development, Dedit Credit and Saving Institution, NGO (Save the Children) and Shire-Maitsebri Agricultural Research Center are main supporting institutions who play a central role in the provision of such services in the study area.

Veterinary services

The survey result showed that 67 and 31.25 percent of participants and non participants of sample respondents respectively have got veterinary services (Table 8). Unlike the households nearer to towns, who can sometimes get veterinary service from private veterinary pharmacies and specialists, majority of the households get veterinary service from OoARD. Out of 81 sampled farmers who have got veterinary services, 65(47.1%) farmers got veterinary services from OoARD and 16(11.6%) farmers from private veterinary specialists and pharmacies (Appendix table 8).

Table 8: Access to services by sample respondents

Variables	Items	Participants (N =106)		Non-Participants (N =32)		Total sample (N =138)		χ^2 -test
		N	%	N	%	N	%	
credit	Have access	53	50	10	31.25	63	45.7	3.4829*
	Don't have access	53	50	22	68.75	75	54.3	
Veterinary	Have access	60	56.6	21	65.6	81	58.7	12.94***
	Don't have access	35	33	22	68.75	57	41.3	
Market information	Have access	79	74.5	14	43.75	93	67.4	10.59***
	Don't have access	27	25.5	18	56.25	45	32.6	

Note: *** and *are statistically significant at 1% and 10% significant levels respectively.

Source: Own computation from survey result, 2015

Credit services

In the study area, Debit Credit and Saving Institution (DCSI) and informal lenders have been identified as source for credit on a cash basis. The survey result showed that 50 and 31.25 percent of participants and non participants of sample respondents respectively taking credit (Table 8). With regard to credit source out of 63 sampled farmers who took credit, 54(39.1%) farmers took credit from DCSI, 5(3.6%) farmers from cooperatives and 4(2.9%) from credit and saving groups (Appendix Table 9). Sources of credit for all the interviewed traders, hotels/restaurants and butchers are also DCSI.

Market information

Before selling their animals, producers search for information about market conditions through self-assessment by going to the markets and asking their neighbors. The source of the information was information from the previous week's market. The survey result showed that 74.5 and 43.75 percent of participants and non participants of sample respondents respectively got market information. Out of 93 sampled farmers who got market information, 57(41.3%) farmers got market information from other farmers who are neighbors and friends and 36 (26.1%) farmers through personal observation (Table 8).

Development agents, DOoARD experts, SMARC and NGO were the main sources of small ruminant extension service in the study area. DOoARD through its DA is the major actor who provides information and advisory service on small ruminant production. The type of extension service with regard to small ruminant was technical advice and training applied to small ruminant production and marketing.

4.2.2. Value chain governance

Value chain actors determine the flow of small ruminant and level of prices. In effect they govern the value chain and most other chain actors subscribe to the rules set in the marketing process. In most cases, the business relations between the various operational actors are of free market exchange and uncoordinated.

In the study area, the general pattern in small ruminant market is for producers to sell to different traders each time they go to the market. Producers do not have any longstanding customer relationship with any of these buyers and they sell their products to anyone they can. Even the most frequent buyers of small ruminant in the markets do not have any contractual supply agreement with producers. This indicates absence of vertical linkage between producers and any buyer in the small ruminant value chain in the district. This is mainly because the production system is not market-oriented and producers are not following demand or the quality requirements of important market actors. As a result, there is low level of

transfer of skills and knowledge from the buyers to producers. Overall, the governance of the small ruminant value chain is buyer driven.

The relationship between collectors and small traders, collectors and large traders, small traders and large traders, small traders and hotels/restaurants/butchers, large traders and hotels/restaurants/butchers, small traders and bulk consumers (defense forces) has complementarily of sorts since there is a long-standing mutual relationship between them. These relations are based on trust, without any formal contract. Those actors can sell sheep and goats on credit and also take advance payments without any formal signature. This strengthens their relationship and also provides an opportunity for all actors to expand their business activity.

In the study area, there are no producers and buyers cooperatives. Farmers lack strong horizontal linkages with each other and cause their poor bargaining power in the market. The horizontal linkages among traders are primarily by the use of common trucks for transportation of sheep and goats to the next level of the market. Since they collect a small number of sheep and goats from different markets, it is not economical to hire a truck on an individual basis.

4.2.3. Value chain map of small ruminant in Tahtay Adyabo District

The value chain map of small ruminants in Tahtay Adyabo District is depicted in Figure 2.

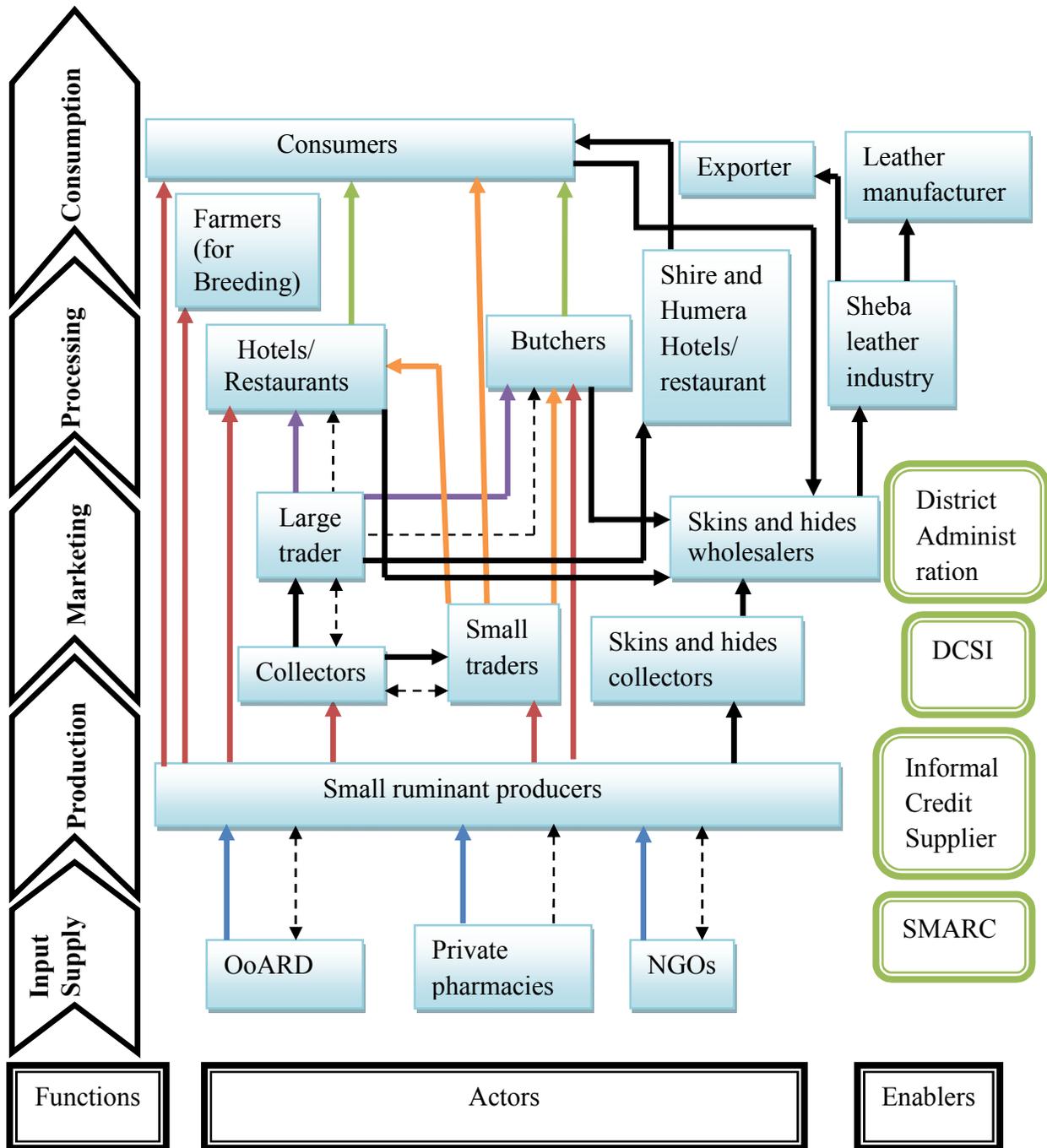


Figure 2: Value chain map of small ruminant
 Source: Own sketch from survey result, 2015

4.3. Performance of Small Ruminant Market

The performance of small ruminant market was evaluated by considering associated costs, returns and marketing margins. The analysis of marketing channels is intended to provide a systematic knowledge of the flow of goods and services from its origin of production to final destination. The flow of small ruminant from the production centers to the consumer end depends on the distance and market proximity, availability of infrastructures and the need and purchasing power of consumers. In the marketing channel of goat and sheep the quantity sold to different actors and price of animals is different. Thus, the market channel and margin analysis was done separately on goat and sheep.

Goat marketing channels

Nine main alternative channels were identified for goat marketing. Small ruminant market participant of sample respondents were supplied 137.28 TLU of goats to the market. The main receivers from producers were collectors and small traders with an estimated percentage share of 34.8% and 20.9%, respectively (Figure 3). Channel comparison was made based on total of goat that passed through each channel. Accordingly, the channel of producers – small traders – consumers carry on the largest followed by producers – collectors – large traders – Sire hotel/restaurants – consumers; and producers – hotels/restaurants – consumers carry a quantity of 28.69 TLU, 21.96TLU and 18.8 TLU respectively.

- I. Producers → Consumers (**17.02 TLU**)
- II. Producers → Farmers (for breeding purpose) (**10.71TLU**)
- III. Producers →Butchers → Consumers (**14.3 TLU**)
- IV. Producers → Hotels/Restaurants → Consumers (**18.8 TLU**)
- V. Producers → Small traders → Consumers (**28.69 TLU**)
- VI. Producer →Collectors → Small trader → Butchers → Consumer (**5.3 TLU**)
- VII. Producers→ Collectors → Small traders → Hotels/Restaurants → Consumers (**7.2TLU**)
- VIII. Producers→ Collectors → Large traders→ Humera Hotels/Restaurants → Consumers (**13.29 TLU**)

IX. Producers → Collectors → Large traders → Shire Hotels/Restaurants → Consumers
 (21.96TLU)

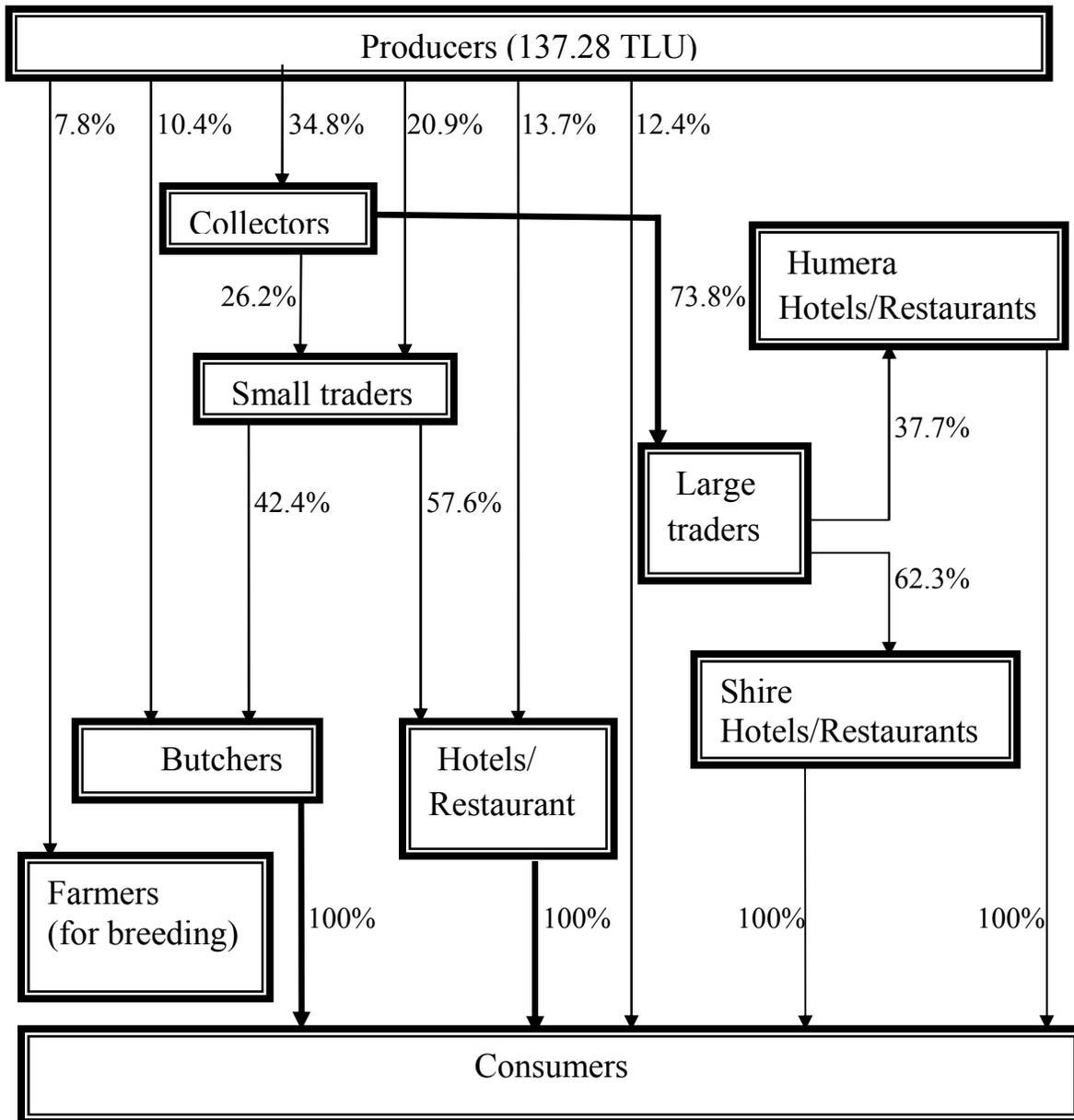


Figure 3: Goat market channel
 Source: Own sketch from survey result, 2015

Each of the goat value chain actors adds value to the product as the product passes from one actor to another. In a way, the actors change the form of the product through creates place, time and form utility. Table 9 indicates different types of marketing cost related to the transaction of goat

by collectors, small traders, large traders, butchers and hotels/restaurants; and the benefit share of each marketing actors.

Table 9: Goat marketing costs and benefit share of actors

Items (Birr/goat	Producers	Collectors	Small traders	Large traders	Butchers	Hotels/ Restaurants
Purchase price	325	870	938	1043	1062	1085
Production cost						
Feed cost	151	-	-	-	-	-
Labour cost	77	-	-	-	-	-
Herding cost	50	-	-	-	-	-
Veterinary cost	85	-	-	-	-	-
Total production cost	688					
Marketing cost						
Feed cost	-	4	22	16	-	-
Labor cost	-	5	5	5	40	50
Herding cost	-	-	11	7	-	-
Veterinary cost	-	5	9	8	-	-
Transport cost	15	-	12	42	5	5
Rope	-	2	2	2	2	2
Tax payment	-	-	5	5	5	5
Slaughtering cost	-	-	-	-	30	30
Cost of spices	-	-	-	-	43	89
Injera cost	-	-	-	-	52	105
House rent	-	-	-	-	7	11
Total marketing cost	-	16	66	85	184	297
Total cost	703	16	66	85	184	297
Sale prices	910	965	1132	1255	1517	1690
Selling price of hides and skins					23	23
Total selling price	910	965	1132	1255	1540	1713
Gross profit	207	79	128	127	294	331
% share of profit	17.7	6.8	11	10.9	25.2	28.4

All the values in each cell are in terms of average ETB per goat. A tax value of butchers, hotels and restaurants does not include value added tax (VAT).

Source: Own computation from survey result, 2015

Compared to farmers, other actors (collectors, small traders, large traders, butchers and hotels/restaurants) operating expense was 48% but their gross profit was higher than producers. That means by simply buying from the farmers and selling to consumers, other actors took 82.3% of the total gross profit. While producers, doing all the work of producing goat and bearing the

associated risks, took 17.7% of the gross profit margin. Collectors, small traders, large traders, butchers and hotels/restaurants are responsible for added 6.8%, 11%, 10.9%, 25.2% and 28.4% of the total value of goat in the district respectively.

Marketing Margins of goat in different channels

The margin calculation was done to show the distribution throughout the various actors as small ruminant move from production to collectors, small traders, large traders, butchers, hotels and restaurants and finally to consumers. The relative size of various market participants' gross margins can indicate where in the marketing chain value is added or profits are made. In order to calculate the marketing margin of an agent, the average price of small ruminant for that particular agent was taken. Marketing margins of goat in the nine channels for each group of market player are shown in Table 10.

Table 10: Marketing margins of actors in different marketing channels of goat

Marketing margins	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.
TGMM	0	0	40	46.1	19.6	40	46.1	40	46.1
GMMp	100	100	60	53.9	80.4	60	53.9	60	53.9
GMMc	-	-	-	-	-	3.6	3.2	3.6	3.2
GMMst	-	-	-	-	19.6	11	9.9	-	-
GMMlt	-	-	-	-	-	-	-	19.1	17.2
GMMb	-	-	40	-	-	25.4	-	17.3	-
GMMh/r	-	-	-	46.1	-	-	33	-	25.7

Note: TGMM is total gross marketing margin.

GMMp, GMMc, GMMst, GMMlt, GMMb and GMMh/r are gross marketing margins of producers, collectors, small traders, large traders, butchers and hotels/restaurants, respectively

Source: Own computation from survey result, 2015.

The total gross marketing margin (TGMM) was found highest in channel IV, VII and IX, which is about 46.1%. Producer's share (GMMp) of the consumer's price was found to be highest along producers – consumers and producers – farmers (for breeding purpose) market channels (marketing channel I and II) followed by producers – small traders – consumers (marketing channel V) which is about 80.4%. Producer's share (GMMp) of the consumer's price was found

to be lowest along producers – hotels/restaurants – consumers market channel (marketing channel IV) and producers – collectors – large traders –hotels/restaurants – consumers market channel (marketing channel IX), which is about 53.9%. Hotels/restaurants and butchers have got the highest gross marketing margin in channel IV and III respectively, whereas collectors have got the lowest gross marketing margin in channel VII and IX.

Sheep marketing channels

Nine main alternative channels were identified for sheep marketing. Small ruminant market participant of sample respondents were supplied 107.25 TLU of sheep to the market. The main receivers from producers were collectors and small traders with an estimated percentage share of 46.2 % and 23.2%, respectively (Figure 4). the channel of producers– small traders –consumers carry on the largest followed by producers – collectors – large traders – Humera hotels/restaurants - consumers and producers – consumers; carry a quantity of 24.9 TLU, 19.04 TLU and 16.1 TLU respectively.

- I. Producers → Consumers (**16.1 TLU**)
- II. Producers →Farmers (for breeding purpose) (**5.9 TLU**)
- III. Producers →Butchers → Consumers (**5.7 TLU**)
- IV. Producers →Hotels/Restaurants → Consumers (**5.15TLU**)
- V. Producers →Small traders → Consumers (**24.9 TLU**)
- VI. Producer →Collectors→Small traders → Butchers →Consumer (**7.8 TLU**)
- VII. Producers→Collectors →Small traders → Hotels/Restaurants →Consumers (**9.26 TLU**)
- VIII. Producers→Collectors→Large traders→ Humera Hotels/Restaurants →Consumers (**19.04 TLU**)
- X. Producers→Collectors→Large traders→ Shire Hotels/Restaurants →Consumers (**13.4TLU**)

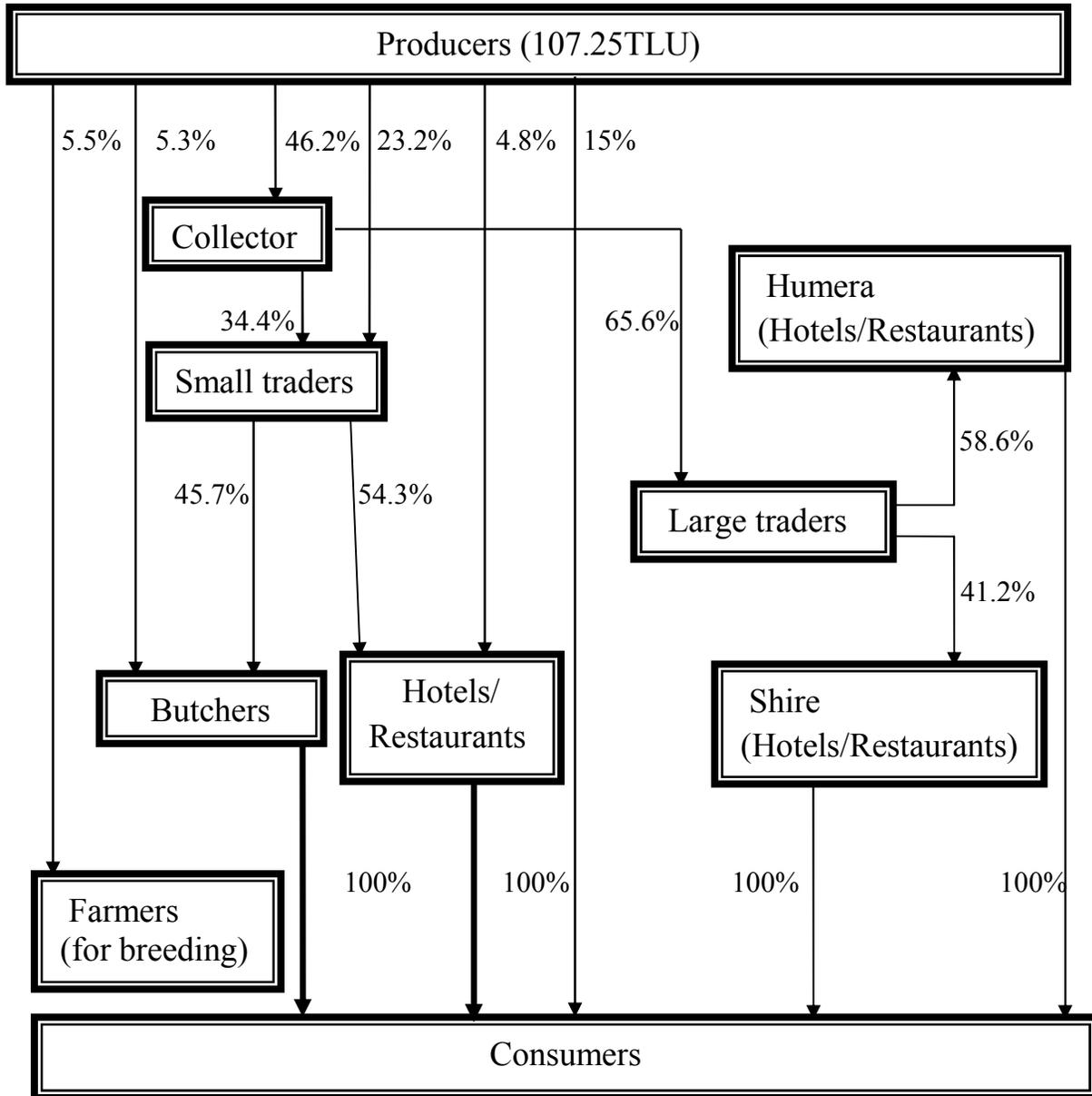


Figure 4: Sheep market channel
Source: Own sketch from survey result, 2015.

Sheep value chain has the same value adding behavior as goat value chain. Table 11 indicates different types of marketing cost related to the transaction of sheep by collectors, small traders, large traders, butchers and hotels/restaurants; and the benefit share of each marketing actors.

Table 11: Sheep marketing costs and benefit share of actors

Items (Birr/sheep	Producers	Collectors	Small traders	Large traders	Butchers	Hotels/ Restaurants
Purchasing price	312	815	890	965	1020	1035
Production cost						
Feed cost	165	-	-	-	-	-
Labour cost	77	-	-	-	-	-
Herding cost	40	-	-	-	-	-
Veterinary cost	85	-	-	-	-	-
Total production cost	679					
Marketing cost						
Feed cost	-	4	26	20	-	-
Labor cost	-	5	5	5	40	50
Herding cost	-	-	7	3	-	-
Veterinary cost	-	5	9	8	-	-
Transport cost	15	-	12	42	5	5
Rope	-	2	2	2	2	2
Tax payment	-	-	5	5	5	5
Slaughtering cost	-	-	-	-	30	30
Cost of spices	-	-	-	-	29	71
Injera cost	-	-	-	-	31	81
House rent	-	-	-	-	7	11
Total marketing cost	15	16	66	85	149	255
Total cost	694	16	66	85	149	255
Selling prices	864	938	1045	1138	1375	1512
Selling price of hides and skins					28	28
Total selling price	864	938	1045	1138	1403	1540
Gross profit	170	107	89	88	234	250
% share of profit	18.1	11.4	9.5	9.4	24.9	26.7

All the values in each cell are in terms of average ETB per sheep. A tax value of butchers, hotels /restaurants does not include value added tax (VAT).

Source: Own computation from survey result, 2015

Compared to farmers, other actors (collectors, small traders, large traders, butchers and hotels/restaurants) operating expense is 45% but their gross profit was higher than producers. This indicates that by simply buying from the farmers and selling to consumers, other actors took 81.9% of the total profit margin. While producers, doing all the work of producing sheep and bearing the associated risks, took 18.1% of the gross profit margin. Collectors, small traders,

large traders, butchers and hotels/restaurants are responsible for added 11.4%, 9.5%, 9.4%, 24.9% and 26.7% of the total value of sheep in the district respectively.

The performance of small ruminant market analyzed using marketing margins supplemented with analysis of costs incurred and gross profits generated for different actors, showed poor performance of the market. Therefore, producers must strengthen horizontal linkages with other producers and vertical linkages with other actors to get higher gross profit.

Marketing Margins of sheep in different channels

Marketing margins of sheep in the nine channels for each group of market player are shown in Table 12. The total gross marketing margin (TGMM) was found highest in channel IV, VII and IX, which is about 42.8%. Producer's share (GMMp) of the consumer's price was found to be highest in marketing channel I and II followed by marketing channel V, which was about 82.7%. Producer's share (GMMp) of the consumer's price was found to be lowest in marketing channel IV, VII and IX, which was about 57.2%.

Table 12: Marketing margins of actors in different marketing channels of sheep

Marketing margins	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.
TGMM	0	0	37.2	42.8	17.3	37.2	42.8	37.2	42.8
GMMp	100	100	62.8	57.2	82.7	62.8	57.2	62.8	57.2
GMMc	-	-	-	-	-	5.4	4.9	5.4	4.9
GMMst	-	-	-	-	17.3	7.8	7	-	-
GMMlt	-	-	-	-	-	-	-	14.6	13.2
GMMb	-	-	37.2	-	-	24	-	17.2	-
GMMh/r	-	-	-	42.8	-	-	30.9	-	24.7

Note: TGMM is total gross marketing margin.

GMMp, GMMc, GMMst, GMMlt, GMMb and GMMh/r are gross marketing margins of producers, collectors, small traders, large traders, butchers and hotels/restaurants, respectively.

Source: Own computation from survey result, 2015.

Hotels/restaurants and butchers have got the highest gross marketing margin in channel IV and III, respectively whereas collectors have got the lowest gross marketing margin in channel VII and IX.

4.4. Factors Affecting Small Ruminant Market Participation and Level of Participation

Heckman two step procedure results for both outcome and selection variables are presented and discussed in the next subsection. It is important to check multicollinearity problem before running the model for the independent variables. The usual measure of multi co-linearity among independent variables is Variance Inflation Factor (VIF). The values of variance inflation factor for the independent variables were in the ranges of 1.08 and 1.40. To check the multicollinearity problem STATA 12 was employed and the VIF result shows that multicollinearity was not a problem among the hypothesized independent variables (Appendix Table 2).

4.4.1. Determinants of small ruminant market participation decision

Thirteen explanatory variables were hypothesized to determine the household small ruminant market participation decision. Among the hypothesized variables, eight of them influenced small ruminant market participation decision significantly. Experience in small ruminant production, family size, access to market information, non/off farm income and access to veterinary service affects positively and significantly small ruminant market participation decision where as other livestock owned, distance to the nearest livestock markets and distance to all weather roads reduces the probability of small ruminant market participation (Table 13). The marginal effect involves taking the partial derivatives that measures the change in the probability of small ruminant market participation decision per unit change in the independent variable.

Access to market information (MKTINF): This variable influenced small ruminant market participation decision positively and significantly at 5% significance level. Having access to small ruminant market information increases the probability of participation of producers in small ruminant marketing by 11.5%. This could be because of the fact that, market information increases small ruminant market participation and leads to an understanding of the working of the market. This result is in line with Demissie *et al.* (2014) who indicated that access to milk market information increasing the probability of producer's participation in milk market.

Experience in small ruminant production (EXPR): As hypothesized, this variable influenced small ruminant market participation decision positively and significantly at 1% significance level. The result shows that as farmers experience in small ruminant production increase by a year, the probability of households' participate in small ruminant marketing increases by 1.6%. This might be due to the reason that, experienced farmers have long time knowledge of season of markets when small ruminants become expensive and their forecasting ability based on last experiences. This is in line with Abay (2007) who illustrated as farmer's experience increased the decision to participate in tomato production and marketing increased.

Access to veterinary service (VETER): This variable affected small ruminant market participation decision positively and significantly at 10% significance level. Having access to small ruminant veterinary services increases the probability of participation of producers in small ruminant marketing by 8.9%. This result is in line with Gezahagn (2015) who found that access to veterinary service increasing the probability of producer's participation in cattle market.

Non/off farm Income (OFFINC): This variable influenced small ruminant market participation decision positively and significantly at 5% significance level. Having involved in non/off farm activities increases the probability of participation of producers in small ruminant marketing by 10.4%. This is mainly due to the fact that, farmers participating in petty trading activities are business oriented farmers and the income obtained from non/off farm activities makes the household to expand small ruminant production and increases participating in small ruminant marketing.

Family Size (FAMSZ): As hypothesized, this variable influenced small ruminant market participation decision positively and significantly at 5% significance level. The result shows that as family size increase by a number, the probability of households' participate in small ruminant marketing increases by 3.8%. This might be due to the reason that, more household members represent labor resources for better management of small ruminant and are posited to be directly related to engagement in production and marketing activities. This is in line with Woldemichael

(2008) who illustrated that family size increasing the probability of producer's participation in milk marketing.

Table 13: Results of Heckman first-step of determinants of small ruminant market participation decision

Variables	Coefficient	Std. Err.	Z	P> z	Marginal effect
SEXHH	.3173277	.4655742	0.68	0.496	.0429112
EDUC	-.6547125	.4337301	-1.51	0.131	-.0885347
DISMKT	-.5215025***	.1988968	-2.62	0.009	-.0705212
DISROD	-.3376008**	.1653571	-2.04	0.041	-.0456527
FAMSZ	.2809883**	.1188334	2.36	0.018	.0379972
OTHTLU	-.0720013**	.0334706	-2.15	0.031	-.0097365
EXPR	.1253702***	.0476337	2.63	0.008	.0169534
CREDIT	.0892218	.4241347	0.21	0.833	.0120652
VETER	.6587288*	.3899552	1.69	0.091	.0890779
MKTINF	.8540453**	.3796299	2.25	0.024	.1154899
EXTEN	.1310989	.0913784	1.43	0.151	.0177281
PRICE	-.0017048	.0016379	-1.04	0.298	-.0002305
OFFINC	.7757043**	.3813707	2.03	0.042	.1048961
_cons	.8552085	1.802821	0.47	0.635	-

Dependent variable is SRMP

Note: ***, ** and * are statistically significant at 1%, 5% and 10% significance levels respectively.

Source: Own computation from survey result, 2015

Other livestock owned (OTHTLU): As expected, this variable influenced farmer's participation decision in small ruminant marketing negatively and significantly at 5% significance level. As other livestock owned increase by one TLU the probability of the household to participate in small ruminant marketing reduces by 0.97%. This is mainly due to the fact that farmers with more number of livestock other than small ruminant tend to disregard the importance of small ruminant as means of cash generating activity.

Distance to the nearest livestock market (DISMKT): This variable affected farmer's participation decision in small ruminant marketing negatively and significantly at 1% significance level. As distance to the nearest livestock market increase by one foot hour the probability of the

household to participate in small ruminant marketing reduces by 7.05%. This might be due to the reason that the further the household resides from the nearest livestock market; the less likely it will be involved in selling small ruminant due to long trekking time and higher marketing costs. This is in line with Gebremedhin *et al.* (2015) who found that distance to nearest livestock market decreases the participation of small ruminant selling.

Distance to all weather roads (DISROD): As expected, this variable influenced farmer's participation decision in small ruminant marketing negatively and significantly at 5% significance level. As the distance to all weather roads increase by one foot hour the probability of the household to participate in small ruminant marketing reduces by 4.5%. This might be due to the reason that the further the household resides from all weather road decrease to participate in small ruminant market due to long trekking time and lack of transport.

4.4.2. Determinants of quantity of small ruminant marketed

With the Heckman two-step estimation procedure, the first step is to estimate a probability of household participation in small ruminant market as a function of both those variables that likely also determine small ruminant supplied to the market as well as one or more exclusion restriction variables. This study used market information access as selection variable in participation equation which was found to affect small ruminant market participation decision but has no significant impact on quantity of small ruminant supplied to the market in order to predict inverse of the Mills' ratio correctly. The results of second-step Heckman selection estimation for the quantity of small ruminant supplied to the market are given in Table 14. The coefficient of Mills ratio (λ) in the Heckman second-step estimation is significant at the probability of 5%. This indicates sample selection bias, existence of some unobservable farmer characteristics determining farmer's likelihood to participate in small ruminant market and thereby affecting the quantity of small ruminant supplied to the market. The chi-square test indicate that the overall goodness of fit for the Heckman selection model (Appendix Table 3). This shows that jointly the independent variables included in the selection model regression explain the level of participation. Therefore, Heckman two step sample selection model was relevant model for this study.

Among the hypothesized variables, six of them influenced quantity of small ruminant supplied to the market significantly. Experience in small ruminant production, access to credit, non/off farm income and access to veterinary services affects positively and significantly quantity of small ruminant marketed where as distance to the nearest livestock market and distance to all weather roads have negative impact on the level of small ruminant sales.

Access to credit (CREDIT): This variable affected marketed supply of small ruminant positively and significantly at 1% significance level. Holding other explanatory variables constant, the result showed that if small ruminant producers have access to credit, small ruminant supplied to the market increased by 0.48 TLU compared to farmers who do not have access to credit. This suggests that access to credit would enhance the financial capacity of the farmer to purchase small ruminant which in turn increase the production and supply of small ruminant to the market. This is in line with Mohammed (2011) who illustrated that access to credit increasing the amount of wheat supplied to market in Halaba District.

Experience in small ruminant production (EXPR): It influenced small ruminant market supply positively and significantly at 1% significance level. Holding other explanatory variables constant, as farmer's experience in small ruminant increased by a year, small ruminant supplied to market increased by 0.05 TLU. This is in line with Abraham (2013) who illustrated as farmer's experience in potato production increased the volume of potato supplied to the market increased.

Distance to all weather roads (DISROD): It affected quantity of small ruminant market supply negatively and significantly at 5% significance level. Holding other explanatory variables constant, the result shows that as the distance to all weather roads increased by one foot hour, the quantity of small ruminant supplied to the market decreased by 0.16 TLU. This may be due to the fact that the further the road; long trekking time and may have no opportunity to transport their small ruminant and reduces small ruminant supply to market.

Table 14: Results of Heckman second-step of determinants of quantity of small ruminant supplied

Variables	Coefficient	Std. Err.	Z	P> z
SEXHH	.0877124	.2321139	0.38	0.706
EDUC	.0514353	.1702259	0.30	0.763
DISMKT	-.2892034***	.0858373	-3.37	0.001
DISROD	-.1601728**	.0726016	-2.21	0.027
FAMSZ	.0231866	.0475671	0.49	0.626
OTHTLU	.0045944	.0146568	0.31	0.754
EXPR	.0483463***	.0116154	4.16	0.000
CREDIT	.479139***	.1731777	2.77	0.000
VETER	.7404937***	.1955771	3.79	0.000
EXTEN	.0341155	.0405805	0.84	0.401
PRICE	.0008708	.000614	1.42	0.156
OFFINC	.4295292**	.2033617	2.11	0.035
_cons	-1.185582	.745884	-1.59	0.112
Lambda	.7147894**	.3339389	2.14	0.032
Rho	0.86082			
Sigma	.83035883			

Dependent variable is SRMS

Note: *** and ** are statistically significant at 1% and 5% significance levels respectively.

Source: Own computation from survey result, 2015

Non/off farm income (OFFINC): It influences quantity of small ruminant supply significantly and positively at 5% significance level. This is because most of non/off farm activities that are farmers participating in are pity cash trading. This is mainly due to the fact that, non/off farm income makes the household to expand production and purchase from market in turn the quantity of small ruminant supply to the market increase. Holding other explanatory variables constant, the result showed that if small ruminant producers have non/off farm income, small ruminant supply increased by 0.43 TLU compared to farmers who do not have non/off farm income. This is in line with Abraham (2013) who illustrated that off farm income increasing the amount of cabbage supplied to market.

Access to veterinary service (VETER): This variable affected marketed supply of small ruminant positively and significantly at 1% significance level. Holding other explanatory variables constant, the result showed that if small ruminant producers have access to veterinary

service, small ruminant supplied to the market increased by 0.74 TLU compared to farmers who do not have access to veterinary service. This suggests that farmers whom have access to veterinary services have higher chance to get timely treatments which in turn increase the production and supply of small ruminant to the market.

Distance to the nearest livestock market (DISMKT): This variable influences quantity of small ruminant market supply negatively and significantly at 1% significance level. Holding other explanatory variables constant, the result shows that as the distance from the nearest market increased by one foot hour, the quantity of small ruminant supplied to the market decreased by 0.29 TLU. This may be due to the fact that the further the market increased trekking time; the higher would be the transportation charges and other marketing costs, less access to market information and facilities. This is in line with Embaye (2010) who indicated that distance to market caused market surplus of butter to decline in Alamata and Atsbi-Wenberta Districts.

4.5. Opportunities and Constraints in Small Ruminant Value Chain

4.5.1. Opportunities in small ruminant value chain

Availability of high performance of local breeds, increasing their price and demand for live small ruminant and meat in local markets due to a rising population and increase in income of consumers and their uses as source of income, manure, meat and milk for household consumption were some of the opportunities of small ruminant production by most of the producers.

The district is endowed with diverse browse local herbs, shrubs and grazing lands which can be potential feed sources for small ruminant. Furthermore, provision of infrastructure facilities like financial institutions are the infrastructural advantages that facilitate the production and marketing of small ruminant in the study area. There are also various organizations such as DCSI, Save the Children and Shire-Mitsebri agricultural research center that provide production inputs and technical services to the farmers. Moreover, Tahtay Adyabo District has better market access to Shire-Endaslase and Humera towns which are the capital-city of north western and western zone.

4.5.2. Constraints in small ruminant value chain

There are factors that hinder the production of small ruminant in the study area. The majority of the sample producers indicated animal diseases, inadequate animal health services, shortage of feed, land, labor and predators as major constraints of small ruminant production. The major constraints of small ruminant production are discussed in Table 15.

Diseases and parasites are reported as the major constraints to small ruminant production by causing high mortality of small ruminant. Among the total sample of respondents, 58.7% replied animal diseases as their production problem. This is caused mainly due to inadequate veterinary service delivery and shortage of drugs.

Table 15: Production constraints of small ruminant producers in Tahtay Adyabo District

Production constraints	Total sample (N=138)	
	N	%
Animal diseases	81	58.7
Inadequate animal health services	18	13
Shortage of feed	15	10.9
Shortage of land	13	9.4
Shortage of labor	7	5.1
Predators	4	2.9

Source: Own computation from survey result, 2015

The drugs and veterinary services provided by OoARD of the district to small ruminants, such as treating illness, and vaccinations are not enough as compared with demand and high population of small ruminant. This inadequate of veterinary services and drug supply was caused high mortality of small ruminant and there by low productivity. The major diseases and parasites of sheep and goats in the study area are Pasteurellosis, sheep and goat pox, anthrax, Brucella, Peste des Petits Ruminants (PPR), and Mange mites/skin diseases.

Small ruminant producers and traders also identified major constraints regarding to small ruminant marketing in Tahtay Adyabo District. Lack of livestock market information, seasonality

of small ruminant demand, distance to livestock market and low market price are some of the constraints in the study area. Among the total sample of respondents, 57.98% replied lack of livestock market information as their marketing problem (Table 16). Most producers get market information from their neighbors, who sold small ruminant a week earlier. Due to this small ruminant producers depend on actual market day information or depend on previous market information for price decisions.

Table 16: Marketing constraints of small ruminant producers

Marketing constraints	Total sample (N=138)	
	N	%
Lack of livestock market information	80	57.98
Seasonality of small ruminant demand	41	29.71
Distance to livestock market	14	10.14
Low market price for small ruminant	3	2.17

Source: Own computation from survey result, 2015

Among the total sample of respondents, 29.71% replied seasonality of small ruminant demand as their marketing problem. Demand for small ruminant varies according to the seasons and fasting times. Since the majority of the population in the area follows Orthodox Christianity, demand for small ruminant varies with the fasting seasons. Demand is high during cultural and religious holydays, and during the two to three weeks before and after the Ethiopian New Year, Christmas and Easter. Thus, small ruminant producers are forced to sell their animals during these months to meet their cash needs. Demand for small ruminant declines during the fasting seasons, when the followers of Ethiopian Orthodox Christianity do not consume any animal-based food.

The major small ruminant marketing constraints mentioned by traders are related with unlicensed (informal) traders, seasonality of supply and problem in information flow (Appendix Table 10). Among the total sample of traders, 61.5% replied unlicensed (informal) traders as their marketing problem. Most of the traders in the study area in small ruminant markets are informal operators who have no trade license. Formal business operators are discouraged since they have to compete with informal operators who do not pay tax. Among the total sample of traders, 27% replied

seasonality of small ruminant supply as their marketing problem. Small ruminant supply increases during August, September, November and January, due to an improvement of body condition in small ruminant at this time, and an increase in demand linked to holidays such as Christmas and New Year. However, during April, May and June, farmers do not sell their small ruminants because the animals lose body weight due to feed shortages. The major constraints mentioned by small ruminant value chain actors in the chain and recommended interventions are summarized in Table 17.

Table 17: Constraints and recommended interventions in small ruminant value chain

Stages of value chain	Constraints	Recommended intervention
Input supply	-Inadequate supply of veterinary services and drugs	-Allocation of adequate budget for procurement of drugs and provision of regular vaccination and treatment for small ruminant.
Production	-Animal diseases -Land shortage for feed production -Feed shortage in drought times	-Training at different level in small ruminant disease prevention and control and Provision of regular vaccination and treatment. -Integrating high yielding improved forage crops with soil and water conservation activities. -Training farmers in conservation of locally available feed sources and their efficient utilization and link forage development to soil and water conservation structures.
Marketing	-Lack of livestock market information -Long distance to livestock markets -Seasonality of small ruminant demand -Seasonality of small ruminant supply -Weak horizontal linkage among small ruminant producers -Lack of vertical linkage of small ruminant producers to the other market actors -Unlicensed traders	-Provision of timely and adequate market information. -Establishment of livestock markets with all necessary facilities. -Establishment of meat processing and export abattoirs around the area to create non seasonal demand that can also encourage small ruminant producers to supply animals regardless of seasons. -Create awareness to farmers about improved forage species and supplementary feeding -Establishing small ruminant producer cooperatives. -Discuss with stockholders about major marketing problems, find common solutions and creating market linkage between small ruminant producers and other actors -Enforce government rules and regulations on business registration and licensing

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary and Conclusions

This study was aimed at evaluating value chain of small ruminant in Tahtay Adyabo District of Tigray National Regional State. The specific objectives of the study were identifying small ruminant value chain actors and their roles; developing value chain maps of small ruminant and examining market performance of the chain; and analyzing factors determining farmers' participation in small ruminant marketing and marketed surplus in the study area. The data were generated from both primary and secondary sources. The primary data were collected from individual interview using pre-tested semi-structured questionnaire and checklist. The primary data for this study were collected from a randomly selected 138 sample households, 26 traders, 5 butchers, 7 hotels/restaurants and 11 consumers. Specific checklists were used to guide key informants interviews. The analysis was made using descriptive statistics and econometric model. All the sampled households were small ruminant producers. Market participation decision and quantity of small ruminant supply are found to be important elements in the study of small ruminant value chain. Therefore, Heckman two step procedures was used to identify factors influencing small ruminant market participation decision and quantity of small ruminant supply of the sample households in the study area. The findings of this study are summarized as follows.

Of the 138 interviewed small ruminant producing households, 84% were male headed and the rest 16% were female headed households for participants and 71.9% were male headed and the rest 28.1% were female headed households for non participants. The average ages of the sampled respondents were 44 and 45 years for participants and non participants respectively. The average family size of the sampled respondents was 6 and 5 persons for participants and non participants, respectively. The average years of experience related to small ruminant production was 12.69 and 4.18 years for participants and non participants, respectively.

Small ruminant value chain analysis of the study areas revealed that the main value chain actors being input suppliers, small ruminant producing farmers, collectors, small traders, large traders farmers (for breeding purposes), hotels/restaurants, butchers and consumers. Small ruminant

producers, OoARD, private veterinary pharmacies and NGO (Save the Children) were the main actors and institutions involved in the small ruminant production and input supply activities. Collectors are engaged in buying small ruminant from village markets and sell to small and large traders. Small traders buy small ruminant from producers and collectors and sell to hotels/restaurants, butchers and consumers. Large traders buy small ruminant mainly from collectors and sell to hotels/restaurants and butchers. There are also governmental and nongovernmental supportive institutions that support small ruminant value chain directly or indirectly. Value chain supporters or enablers provide facilitation tasks like creating awareness; provide credit, facilitating building strategy and the coordination of support. The main supporters of the small ruminant value chain in the study area are office of agricultural and rural development (OoARD), Office of Trade and Industry (OoTI), District administrations, Dedebit Saving and Credit Institution (DSCI), Shire- Maitsebri Agricultural Research Center (SMARC) and informal credit suppliers.

Small ruminant in this area passes through collectors, small and large traders, hotels/restaurants and butchers, with value being added before reaching the end-users. The study indicates that the area has nine marketing channel of small ruminant. The intermediate buyers obtain the animals from the farmers at a lower price and they sell to the consumers at a higher price. The research result indicated the absence of organized institution and group marketing for small ruminant, have made other actors in a better position to dominate the pricing. This hands the power to buyers and due to this its governance is buyer driven. Each of the small ruminant value chain actors adds value to the product as the product passes from one actor to another. Collectors, small traders, large traders, butchers and hotels/restaurants were added 6.8%, 11%, 10.9%, 25.2% and 28.4% of the total value of goat and 11.4%, 9.5%, 9.4%, 24.9% and 26.7% of the total value of sheep in the district respectively. The highest total gross marketing margins were 46.1% and 42.8% for goat and sheep marketing channels respectively. Producer's share of the consumer's price was highest along producers – consumers, producers – farmers (for breeding purpose) and producers – small traders – consumers in both market channels. Hotels/restaurants and butchers have the highest gross marketing margin whereas collectors have got the lowest gross marketing margin in both market channels.

Heckman's two-step procedure was used to analyze factors affecting farmers' small ruminant market participation decision (selection equation) and quantity marketed (observation equation) in the study area and market information access was taken as exclusion restriction variable and included in the participation equation but not in the observation equation. The result indicated that small ruminant market participation decision is significantly affected by experience in small ruminant production, access to market information, family size, non/off farm income, access to veterinary service, distance to the nearest livestock market, distance to all weather roads and other livestock owned. Quantity supplied of small ruminant to market is significantly affected by experience in small ruminant production, access to credit, access to veterinary service, non/off farm income, distance to all weather roads and distance to the nearest livestock market. Therefore, these variables require special attention if both small ruminant market participation decision and quantity of small ruminant supply are required to be increased.

Constraints hindering the development of small ruminant production were animal diseases (58.7%), inadequate animal health services (13%), shortage of feed (10.9%), shortage of land (9.4%), shortage of labor (5.1%) and predators (2.9%). On marketing side, lack of livestock market information (57.98%), seasonality of small ruminant demand (29.71%), distance to livestock market (10.14%) and low market price for small ruminant (2.17%) are the major marketing problems of small ruminant producers. Unlicensed traders (61.5%), seasonality of supply (27%) and problem in information flow (11.5%) are the major marketing problems mentioned by traders. Supply of low quality small ruminant is the major constraint mentioned by butchers, hotels and restaurant owners.

5.2. Recommendations

The recommendations to be drawn from this study are stated as follows:

- By developing the skills of farmers through training can increase market participation in small ruminant marketing and market supply.
- Provision of adequate and timely veterinary services, by supporting experts by giving continuous capacity building trainings and by fulfilling the equipment and drugs can increase the participation of the producers in small ruminant market participation and market supply.

-Giving opportunities to farmers to involve in nonfarm activities such as petty trade business and other off/nonfarm income sources as side line to production of small ruminant can increase the participation of the producer in small ruminant market and marketed supply.

-Provision of timely and accurate market information is essential to participate in small ruminant market and to increase market supply.

-Increasing the dimension of access to formal financial institutions is critical in increasing small ruminant supply to the market.

-Developing market infrastructure such as building market places and improving road to reduce trekking time, transportation costs and other marketing costs can improve livestock market access and increase small ruminant supply to the market.

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7. APPENDICES

Appendix A. Tables

Appendix Table 1: Conversion factors used to compute tropical livestock units (TLU)

Livestock Category	Conversion factor
Calf	0.25
Weaned calf	0.34
Heifer	0.75
Cow or Ox	1.00
Horse/Mule	1.10
Donkey adult	0.70
Donkey young	0.35
Camel	1.25
Sheep or Goat adult	0.13
Sheep or Goat young	0.06
Chicken	0.013
Bull	0.75

Source: Storck, *et al.*, 1991

Appendix Table 2: The result of multicollinearity test

Variable	VIF	1/VIF
EXPR	1.40	0.714320
VETER	1.33	0.750765
FAMSZ	1.28	0.781843
DISMKT	1.26	0.790641
OTHTLU	1.25	0.798991
CREDIT	1.22	0.819821
OFFINC	1.22	0.822776
SEXHH	1.17	0.855089
MKTINF	1.15	0.870185
PRICE	1.14	0.874587
DISROD	1.14	0.878000
EDUC	1.11	0.901531
EXTFQ	1.08	0.922722
Mean VIF	1.21	

Source: Own computation from survey result, 2015

Appendix Table 3: The result of Heckman selection model

Number of observations = 138
 Censored observations = 32
 Uncensored observations = 106
 Wald χ^2 (12) = 85.26
 Prob > χ^2 = 0.0000

	Coefficient	Std. Err.	Z	P> z
SRMS				
SEXHH	.0877124	.2321139	0.38	0.706
EDUC	.0514353	.1702259	0.30	0.763
DISMKT	-.2892034	.0858373	-3.37	0.001
DISROD	-.1601728	.0726016	-2.21	0.027
FAMSZ	.0231866	.0475671	0.49	0.626
OTHTLU	.0045944	.0146568	0.31	0.754
EXPR	.0483463	.0116154	4.16	0.000
CREDIT	.479139	.1731777	2.77	0.000
VETER	.7404937	.1955771	3.79	0.000
EXTEN	.0341155	.0405805	0.84	0.401
PRICE	.0008708	.000614	1.42	0.156
OFFINC	.4295292	.2033617	2.11	0.035
_cons	-1.185582	.745884	-1.59	0.112
SRMP				
SEXHH	.3173277	.4655742	0.68	0.496
EDUC	-.6547125	.4337301	-1.51	0.131
DISMKT	-.5215025	.1988968	-2.62	0.009
DISROD	-.3376008	.1653571	-2.04	0.041
FAMSZ	.2809883	.1188334	2.36	0.018
OTHTLU	-.0720013	.0334706	-2.15	0.031
EXPR	.1253702	.0476337	2.63	0.008
CREDIT	.0892218	.4241347	0.21	0.833
VETER	.6587288	.3899552	1.69	0.091
MKTINF	.8540453	.3796299	2.25	0.024
EXTEN	.1310989	.0913784	1.43	0.151
PRICE	-.0017048	.0016379	-1.04	0.298
OFFINC	.7757043	.3813707	2.03	0.042
_cons	.8552085	1.802821	0.47	0.635
Mills				
lambda	.7147894	.3339389	2.14	0.032
Rho	0.86082			
Sigma	.83035883			

Source: Own computation from survey result, 2015

Appendix Table 4: Income source in Tahtay Adyabo District

Income source	Rank as					Total
	1 st	2 nd	3 rd	4 th	5 th	
Sesame production	35	10	6	4	2	57
Small ruminant production	11	25	2	1	0	39
Other livestock production	4	5	9	2	2	22
Petty trading activities	2	1	3	7	1	14
Grain production	0	1	0	2	3	6
Total sample households	52	42	20	16	8	138

Source: Own computation from survey result, 2015

Appendix Table 5: Purposes of small ruminant keeping

Income source	Rank as					Total
	1 st	2 nd	3 rd	4 th	5 th	
Sell of live animals	53	10	4	3	1	71
Manure	9	16	7	4	3	39
Household consumption (meat and milk)	3	2	8	1	0	14
Saving and insurance	0	0	2	5	2	9
Sale of animal products	0	0	0	1	4	5
Total sample households	65	28	21	14	10	138

Source: Own computation from survey result, 2015

Appendix Table 6: Types of shelter used for small ruminant

Type of shelter	Total sample (138)	
	N	%
Both open ended and <i>hdmo</i>	77	55.8
Made of stone with wood and soil roof (<i>hdmo</i>)	34	24.6
Made of mud/wood walls with leaf roof	22	16
Only fenced area without roof	5	3.6

Source: Own computation from survey result, 2015

Appendix Table 7: Source of breeds by sample households

Sources	Participants (N =106)		Non- Participants (N =32)		Total sample (N =138)	
	N	%	N	%	N	%
farmers/neighbors	30	28.3	9	28.1	39	28.2
NGO	7	6.6	-	-	7	5.1

Source: Own computation from survey result, 2015

Appendix Table 8: Sources of veterinary services by sample farm households

Sources	Participants (N =106)		Non-Participants (N =32)		Total sample (N =138)	
	N	%	N	%	N	%
OoARD	49	46.2	16	50	65	47.1
Privet veterinary specialists and pharmacies.	11	10.4	5	15.6	16	11.6

Source: Own computation from survey result, 2015

Appendix Table 9: Source of credit by sample farm households

Sources	Participants (N =106)		Non- Participants (N =32)		Total sample (N =138)	
	N	%	N	%	N	%
DCSI	39	36.8	15	46.9	54	39.1
Cooperatives	3	2.8	2	6.25	5	3.6
Credit and saving group	3	2.8	1	3.1	4	2.9

Source: Own computation from survey result, 2015

Appendix Table 10: Marketing problems mentioned by traders

Marketing problems	Total sample (N=26)	
	N	%
Unlicensed traders	16	61.5
Seasonality of supply	7	27
Problem in information flow	3	11.5

Source: Own computation from survey result, 2015

Appendix B. Interview Questionnaire

Producers Interview Questionnaire

Questionnaire number: _____

Name of Enumerator: _____ Signature: _____

Date of interview: ____/____/____

Instructions for Enumerators

- Make brief introduction before starting any question, introduce yourself to the farmers, greet them in local ways and make clear the objective of the study.
- Please ask each question clearly and patiently until the farmer gets your points.
- Please fill the interview schedule according to the farmers reply (do not put your own feeling).
- During the process;
 1. Write the answer of the respondent on the space provided,
 2. Encircle the chosen answer;
- Prove that all the questions are asked and the interview schedule format is properly completed.

I. General Information

1. Name of the respondent: _____

2. Kebele: _____

3. Age of the respondent (in years): _____

4. Sex of the respondent: 1. Male 2. Female

5. Education level of the respondent:

1. Literate 2. Illiterate

6. Marital status: 1. Single 2. Married 3. Divorce 4. Widowed

7. Distance of your residence from the nearest market center: _____ km or _____ hours walk

8. Distance to all weather roads: _____ km or _____ hours walk

9. What is your major means of income generation? (Rank in order of importance)

- | | |
|-------------------------------|-----------------------------|
| 1. Sesame production | 8. Sesame trading |
| 2. Grain production | 9. Grain trading |
| 3. Fruit production | 10. Fruit trading |
| 4. Pulses production | 11. Pulses trading |
| 5. Vegetable production | 12. Vegetable trading |
| 6. Small ruminant production | 13. Small ruminant trading |
| 7. Other livestock production | 14. Other livestock trading |
| | 15. Others (specify) ___ |

II. Household and Resource Data

- Family size: Male _____ Female _____ Total _____
- Apart from small ruminant, do you have other livestock? 1. Yes 2. No
- If your answer for **Q. 2** is yes, please give the total number (regardless of sex/age) of all other types of animals owned: Cattle: ___ Camels: ___ Poultry: ___ Donkeys: ___ Horses: ___ Mule: _____ Beehives: ___ others: _____
- Do you own the cultivated land? 1. Yes 2. No
- If your answer for **Q. 4** is yes, what is your size of land allocated (ha)? _____ hectare.

III. Small ruminant production

- Have you owned? 1. Sheep 2. Goats 3. Both
- How many do you have?
Adult: Sheep _____ goats _____ Total _____
Young: Sheep _____ goats _____ Total _____
- How long have you practiced in the production of small ruminant? _____ Years
- What are the main purposes for which you hold sheep and/or goats? (Rank in order of importance)

1. Household consumption (meat and milk)	5. Manure
2. Sale of live animals	6. Social prestige
3. Sale of animal products (hides, skins)	7. Wool
4. Saving and insurance	8. Other purposes (specify) _____
- Do you use a shelter or other confined space to keep your small ruminants? 1. Yes 2. No

6. If your answer for Q. 5 is yes, Please describe the shelter.

1. Only fenced area without roof
2. Made of mud/wood walls with leaf roof
3. Made of mud/wood walls with iron roof
4. Made of stone with wood and soil roof (*hdmo*)
5. Both open ended and *hdmo*
6. Other (specify): _____

7. What type of feed did you used most of the time for your small ruminant? _____

8. How is the trend of small ruminant production during the past 5 years?

Small ruminant	Increasing	Decreasing	Same
Goat			
Sheep			

9. If the production increases, what are the reasons? _____

10. If the production decreases, what are the reasons? _____

11. What are the constraints related to small ruminant production?

- | | |
|----------------------------------|-----------------------------------|
| 1. Shortage of feed | 5. Animal diseases |
| 2. Shortage of labor | 6. Lack of animal health services |
| 3. Cost of inputs / feed, labour | 7. Shortage of land |
| 4. Not access to water | 8. Predators |
| | 9. Others (specify) ___ |

IV. Production services

4.1. Input supply

1. Did you obtain any improved breeds before? 1. Yes 2. No

2. If your answer for Q. 1 is yes, from which source did you obtain breeds?

- | | |
|--------------------|-----------------------------|
| 1. OoARD | 4. Other farmers/neighbours |
| 2. NGOs (specify) | 5. Traders |
| 3. Research center | 6. Others (specify) |

3. How did you get the breeds?

- | | |
|---------------------|---------------------|
| 1. Through purchase | 3. Through exchange |
| 2. As gift | 4. Others (specify) |

4. If you got through purchase, how much cost did you spend? (Birr) _____

5. If your answer for **Q.1** is No, what was the main reason behind? _____

4.2. Access to Credit

1. Did you borrow money for any small ruminant related activities last year? 1. Yes 2. No

2. If your answer for **Q.1** is yes, who provided the credit/loan to you?

- | | |
|------------------------------|----------------------------|
| 1. Micro-finance institution | 6. Friend or neighbor |
| 2. Bank (specify) | 7. Relative |
| 3. NGO (specify) | 8. Sheep or goat trader |
| 4. Cooperative / union | 9. Money lender |
| 5. Credit and saving group | 10. Others (specify) _____ |

3. Have you paid the loan? 1. Yes 2. No

4. If your answer for **Q. 1** is No, what is the reason? _____

5. Did you face any problem in accessing credit? 1. Yes 2. No

6. If your answer for **Q. 5** is yes, what was the problem? _____

7. How did you solve these problems? _____

4.3. Access to veterinary service

1. Did you receive health services and drugs for your small ruminant last year?

1. Yes 2. No

2. If your answer for **Q. 1** is yes, from whom did you get animal health services and drugs?

1. OoARD 2. Private specialists and drug shops/markets 3. others (specify) ____

3. Did you get the service and drug on time? 1. Yes 2. No

4. How was the service and drug quality? 1. High quality 2. Low quality

5. What are the major goat/sheep diseases and parasites in your locality?

S. No	Goat diseases	Sheep diseases
1.		
2.		
3.		
4.		
5.		

Type of small ruminant		Number of animals sold	Where	To	Average price/ animal (in birr)	Total cash income from sell(in Birr)
Goat	Adult			1. At farm gate 2. On local markets 3. Road side 4. On urban markets 5. Other, specify:	1. Farmers 2. Collectors 3. Small traders 4. Large traders 5. butchers 6. Hotels/ restaurants 7. Other, specify:	
	Young					
Sheep	Adult					
	Young					

4. To which marketing center do you have access? _____

5. Did you face difficulty in finding buyers when you want to sell goat/sheep? 1. Yes 2. No

6. If your answer for Q.7 is Yes, due to:

- | | |
|-------------------------------|----------------------|
| 1. Inaccessibility of market | 3. Low price offered |
| 2. Lack of market information | 4. Others |

7. How much was the average lagged price of small ruminant?

for goat _____ for sheep _____

8. How is the trend of price per animal of sales of small ruminant during the past 5 years?

Small ruminant	Increasing	Decreasing	Same
Goat			
Sheep			

9. If increasing, why? _____

10. If decreasing, why? _____

11. How do you transport small ruminant to the market most of the time?

- | | |
|-------------------------------|---|
| 1. On foot, trekking, herding | 4. Car, pickup truck |
| 2. On animal-drawn carts | 5. Bus or public transport |
| 3. Motorcycle | 6. Lorry or truck (e.g. Isuzu) 7. Other, specify: _ |

12. How long does it take to transport your small ruminant (products) to the market or other place of sale? _____ hours & _____ minutes OR _____ km

13. What are the constraints related to small ruminant marketing?

1. Seasonality of small ruminant demand
2. Lack of formal livestock market/price information
3. Distance to livestock market
4. Low demand for animals
5. Too much competition
6. Low market prices
7. Others (specify) ____

14. Indicate your purchasing price, selling price and average cost incurred per animal in the production process of small ruminant.

Cost components	Small ruminant	
	goat	sheep
Purchase price		
Feed cost		
Labour cost		
Herding cost		
Veterinary cost		
Transport cost		
Other cost (specify)		
Total cost		
Selling price (Birr/animal)		

15. How much hides and skins are you sold last year?

Goat hides and skins _____ pieces and average price _____ Birr

Sheep hides and skins _____ pieces and average price _____ Birr

VI. Income other than small ruminant

1. Apart from small ruminant, please give the total number (regardless of sex/age) of all other types of animals sold and cash income from sell in the last year.

Type of livestock owned	Number of animals sold	Cash income from sell (in Birr)
Cattle		
Camels		
Poultry		
Donkeys		
Horses		

Mule		
Bee hives		
Other (specify)		

2. Did you engage in crop production last year? 1. Yes 2. No
3. If your answer for **Q.2** is yes, please list the most important staple crops you produced?
1. Sorghum 4. Pulses 7. Teff
 2. Finger Millet 5. Wheat 8. Barley
 3. Sesame 6. Maize 9. Other, specify: _____
4. Have you grown any crops which are mainly designated for cash income?
 1. Yes 2. No
5. If your answer for **Q.4** is yes, which crops?
1. Sorghum 4. Pulses 7. Teff 10. Fruits
 2. Finger Millet 5. Wheat 8. Barley 11. Other (specify)____
 3. Sesame 6. Maize 9. Vegetables
6. How much income did you get from those sold crops last year? _____ Birr.
7. Did you practice non/off-farm activities at household level last year? 1. Yes 2. No
8. If your answer for **Q.7** is yes, what are those activities?

S. No	Off-farm activities	monthly income

9. Do you have any other income source at household level? 1. Yes 2. No
10. If your answer for **Q. 9** is yes, what are those income sources?
1. Salary 2. Pension 3. Remittance 4. Others (specify) _____
11. How much do you get per month from those income sources? (Birr) _____.

Thank you

Name of enumerator: _____ Signature: _____ Date: / /2015

Traders Interview Questionnaire

I. General Information

1. Name of trader: _____ Age _____ Sex _____
2. Address: Kebele _____ Town _____
 1. Marital status 2. Single 3. Married 4. Divorced 5. Widowed
3. Family size: Male _____ Female _____ Total _____
4. Educational level of the respondent:
 1. No formal education 4. Certificate
 2. 6th grade or less 5. Diploma
 3. 7th to 12th grade 6. Degree
5. Type of trader:
 1. Collector 2. Small trader 3. Large trader 4. Other
6. How long you have been operating the business? _____ Years
7. Did you trade alone or in partnership? 1. Alone 2. Partnership 3. Other (specify)
8. If partnership, how many are you in the joint venture? _____ Persons.
9. Do you participate in small ruminant trading year round? 1. Yes 2. No
10. If your answer to **Q.10** is No, at what period of the year do you participate?
 1. When purchase price becomes low 3. During festival
 2. During high supply 4. Other (specify)
11. Do you practice trading other than small ruminant? 1. Yes 2. No
12. If your answer to **Q.12** is yes, what are they? _____
13. In how many number of market days in a week do you participate? _____
14. What was the amount of your initial working capital when you start this small ruminant trade business? _____ Birr.
15. What is the amount of your current working capital? _____ Birr.
16. What is your source of working capital?
 1. Own 2. Loan 3. Gift 4. Share 5. Others (specify)

17. If it was loan, from whom did you borrow?

- | | |
|---------------------------|------------------------------|
| 1. Relative/family | 5. Other traders |
| 2. Private money lenders. | 6. Micro finance institution |
| 3. NGO (specify) | 7. Bank |
| 4. Friends | 8. Others |

18. How much was the rate of interest? ____ (%) or birr for formal, ____ (%) or birr for informal.

19. What was the reason behind the loan?

- | | |
|--|-----------------------------|
| 1. To extend small ruminant trading | 4. To buy feed |
| 2. To purchase small ruminant transporting vehicles | 5. For shelter construction |
| 3. for small ruminant health service and for drug expenses | 6. Others |

20. How is the repayment schedule?

- | | | |
|--------------|------------------|-----------------------|
| 1. Monthly | 3. Semi-annually | 5. When you get money |
| 2. Quarterly | 4. Annually | 6. Others (specify) |

21. How is the change in accessing finance for small ruminant trade now days?

- | | | |
|-------------|-----------------|--------------|
| 1. Improved | 2. Deteriorated | 3. No change |
|-------------|-----------------|--------------|

22. How did you transport small ruminant from point of purchase to point of sale?

- | | |
|-----------------------------------|--------------------------------|
| 1. On foot, trekking, herding | 4. Bus or public transport |
| 2. On animal-drawn carts/vehicles | 5. Lorry or truck (e.g. Isuzu) |
| 3. Car, pickup truck | 6. Other (specify):_ |

23. How much did you pay per animal to transport small ruminant from point of purchase to point of sale? _____ Birr.

24. Do you stay the purchased small ruminants in the shelter house? 1. Yes 2. No

25. If your answer to Q.25 is yes, for how many days do you stay in the shelter house from the time of purchasing until sale?

- | | | | |
|-------------------------|-------------|-----------------------------|------------------|
| 1. Less than five day's | 2. One week | 3. From one week to a month | 4. Above a month |
|-------------------------|-------------|-----------------------------|------------------|

I. Buying practice

1. From which market place and supplier do you buy small ruminant? (*Multiple market area is possible).

Small Ruminant	Where	1. At farm gate 2. On local markets 3. Roadside 4. On urban markets 5. Other, specify:	From	1. Farmers 2. Collectors 3. Small traders 4. Large traders 5. Other, specify:	Number of animals buy	Average price/animal	Payment 1. Cash 2. Credit 3. Advance payment
Goat							
Sheep							

2. Are all the purchasing market centers accessible to transport? 1. Yes 2. No
3. If your answer to **Q.2** is No, what proportions are accessible? _____%
4. Who sets the purchase price?
1. Myself 2. Set by demand and supply 3. Sellers 4. Other (specify)
5. Which are the months of the year when prices of small ruminants are lowest?
6. Which are the months of the year when prices of small ruminants are highest?
7. How many regular suppliers do you have? producers _____, collectors _____, small-traders _____, large-traders _____, others _____
8. Have you ever stopped purchasing due to lack of fund? 1. Yes 2. No
9. If your answer to **Q.8** is Yes, for how long? _____ years
10. Have you ever stopped purchasing due to lack of supply? 1. Yes 2. No
11. If your answer to **Q.10** is Yes, for how long? _____ years

II. Selling Practices

1. To which market and to whom did you sell small ruminant. (Multiple market area is possible)

Small Ruminant	Where	1. On local markets 2. Roadside 3. On urban markets 4. Other, specify:	To	1. Farmers 2. Collectors 3. Small traders 4. Large traders 5. Other, specify:	No of animals sold	Average price/animals	Payment 1. Cash 2. Credit 3. Advance payment
Goat							
Sheep							

2. How many regular buyers do you have? Producers _____, Collectors _____, small-traders _____, large-traders _____ others _____
3. What is your source of information? _____

6. If your answer to **Q.5** is Yes, How much did you pay for small ruminant trade license for the beginning? _____ birr

7. How much is the yearly renewal payment? _____ birr

8. If you do not have specific small ruminant trading license what is your joint trading license?

1. General 2. Consumers supply license 3. Others (specify)

9. Are there restrictions imposed on unlicensed small ruminant traders? 1. Yes 2. No

10. Are you organized in any organization? 1. Yes 2. No

11. If your answer to **Q.10** is yes, what are these organizations?

1. Social association (iqub, idir etc) 3. Trade association
2. Market cooperative 4. Others (specify)_____

12. What is the name of the organization? _____

13. What is the benefit of the organization?

1. Accesses to credit 5. Coordinate purchase and sale
2. Encourage to save 6. No benefit
3. Facilitate joint marketing 8. Others (specify)_____

4. Got market information

14. Are there charges (taxes) imposed by government or community officials at the market?

1. Yes 2. No

15. If your answer to **Q.14** is yes, what are they and what is the basis of payment)

16. Are there problems on small ruminant marketing? 1. Yes 2. No

17. What are the constraints related to small ruminant marketing?

1. Low quality of animal 3. Low supply of animals 5. Lack of market information
2. Informal traders 4. Seasonality of 6. Others (specify)_____

Thank you

Name of enumerator: _____ Signature: _____ Date: / /2015

Butchers, Hotels and Restaurants Questionnaire

I. General Information

1. Name of the respondent: _____ Age _____ Sex _____
2. Address: kebele _____ Town _____
 1. Marital status 2. Single 3. Married 4. Divorced 5. Widowed
3. Family size: Male _____ Female _____ Total _____
4. Educational level of the respondent:
 1. No formal education 4. Certificate
 2. 6th grade or less 5. Diploma
 3. 7th to 12th grade 6. Degree
5. Type of processor:
 1. Butcher owner 2. Hotel owner 3. Restaurant owner 4. Other
6. What is your source of working capital?
 1. Own 2. Loan 3. Gift 4. Share 5. Others (specify)
7. If it was loan, from whom did you borrow?
 1. Relative/family 5. Other traders
 2. Private money lenders. 6. Micro finance institution
 3. NGO (specify) 7. Bank
 4. Friends 8. Others
8. From which supplier do you buy small ruminant?

Small Ruminant	from	1. Farmers 2. Collectors 3. Small traders 4. Large traders 5. Other, specify:	Number of animals buy	Average price/ animal	Payment 1. Cash 2. Credit 3. Advance payment
Goat					
Sheep					

9. How many regular suppliers do you have? Producers _____, Collectors _____,

Small traders _____, large traders _____

10. What is your main role/what kind of tasks you undertake? _____

11. Do you have any integration with other actors in the chain? 1. yes 2. no

12. If yes, please mention that actor/s and the kind of interaction you have? _____

13. Indicate your purchase price, average cost incurred per animal and selling price in the process of small ruminant.

Cost components	Cost incurred in birr/animal	
	goat	sheep
Purchase price per animal		
Labour cost		
Rope		
Transport cost		
Tax payment		
Slaughtering cost		
Cost of spices		
Injera cost		
House rent		
Total cost		
Selling price per animal		
Average selling price of hides and skins		

14. What are the challenges and opportunities you faced in undertaking those roles?

Thank you

Name of enumerator: _____ Signature: _____ Date: / /2015

Consumers Interview Questionnaire

I. General Information

1. Name of Respondent: _____ Kebelle: _____ Age _____
2. Sex of the respondent: 1. Male 2. Female
3. Education level of the respondent :
 1. No formal education 4. Certificate
 2. 6th grade or less 5. Diploma
 3. 7th to 12th grade 6. Degree
4. Marital status : 1. Married 2. Unmarried 3. Divorce 4. Widowed
5. Distance to nearest market: _____ km OR _____ hrs walk (on foot)
6. What is your major means of income generation?
 1. Farming 2. Trade 3. Employment 4. Others _____
7. How much do you earn per year (estimate based on weekly, monthly income): _____ Birr
8. Do you produce and consume or buy small ruminant?
 1. Buy 2. Produce
9. If you buy, what is the proportion of your income used for purchase of small ruminant?

II. Demand for small ruminant

1. What type of small ruminant purchased for consumption? (Multiple responses are possible)
 1. Castrated sheep/goat 4. Fattened sheep/goat
 2. Old female sheep/goat 5. Others (specify) _____
 3. Young sheep/goat
2. At which months are you may buy small ruminant at lower price? _____
3. How much do you paid at lower price (Birr/animals)? _____ Birr
4. At which months are you may buy small ruminant at higher price? _____
5. How much do you paid at higher price (Birr/animals)? _____ Birr
6. From whom do you buy small ruminant for consumption? _____
7. Do you consider any quality requirements to purchase small ruminant? 1. Yes 2. No
8. If yes, what quality requirements do you consider for?

For Goats _____

For Sheep _____

9. What are the constraints hindering consumption of small ruminant? Rank (1= most severe, 2= second severe and etc)

- | | |
|--------------------|-------------------------------|
| 1. Supply shortage | 4. Poor Quality |
| 2. Income shortage | 5. Lack of market information |
| 3. High price | 6. Others(specify)_____ |

10. Do you know the benefits of consuming small ruminant product? 1. Yes 2. No

11. Do you think there is a problem with consumption of small ruminant product? 1.Yes 2.No

12. What should be done to increase small ruminant product consumption?

Thank you

Checklist for Key Informants Interview

1. Name of the key informant _____
2. Location and contact information: Kebele _____ Telephone _____
3. Role of the interviewee in the organization:
4. Type of the organization: public/private/NGO.
5. Organizational mission, vision and objectives
6. What is the role of your organization in small ruminant value chain in the study area?
7. What are the challenges and opportunities you faced in undertaking those roles assigned to your organization?
8. Linkage /interaction/ partnership/ coordination between actors

Thank you very much for responding to the questions.