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COLLEGE OF VETERINARY SCIENCES

**Assessment of Dairy Value Chain and Dairy Production Systems in Southern and South
Eastern Zone, Tigray, Ethiopia**

By

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**A Thesis Submitted to the College of Veterinary Sciences, Mekelle University, in Partial
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Processing Technology**

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DECLARATION

I hereby certify that I have read and evaluated this Thesis is entitled “Assessing of Current Dairy value chain and Production Systems in Southern and South Eastern Zones, Tigray, Ethiopia” prepared under my guidance by Haftu Kahsay. I recommend that it be submitted as fulfilling the thesis requirement.

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DEDICATION

This thesis paper is dedicated to my wife Taemo Mehary, our children Medhanit, Meron, and Thomas Haftu, as well as to my entire family for their unwavering support, compassion, and constant encouragement during my academic career.

TABLES OF CONTENTS

	Pages
DECLARATION.....	i
DEDICATION.....	i
LISTS OF TABLES.....	iv
LIST OF FIGURES	v
ACKNOWLEDGMENTS	vi
CHAPTER 1: INTRODUCTION.....	1
1.1. Backgrounds and Justification	1
1.2. Statement of the Problem	3
1.3.1. General objective	4
1.3.2. Specific objectives	4
1.4. Research Questions	4
1.5. Significance of the Study	4
1.6. Scope and Limitations of the Study	5
CHAPTER 2: LITERATURE REVIEW	6
2.1. Dairy Production Systems in Ethiopia	6
2.1.1. Urban production system.....	6
2.1.2. Peri-urban milk production system.....	7
2.1.3. Rural milk production system.....	7
2.2. Productivity of dairy Cattle	8
2.3. Dairy value chain analysis.....	9
2.3.1. Value chain	10
2.3.2. Supply chain	10
2.3.3. Value chain actors	10
2.3.4. Value chain mapping	10
2.3.5. Service providers.....	10
2.4.1. Informal milk trade.....	11
2.4.2. Formal milk trade	11
2.5. Dairy product processing.....	12
2.6. Challenge and opportunities.....	13
2.6.1. Challenges of dairy production and marketing.....	13
2.6.2. Opportunities of dairy product marketing	14

CHAPTER 3: MATERIALS AND METHODS	15
3.1. Descriptions of the Study Area	15
3.2. Study Design	16
3.3. Sampling Procedure	16
3.2. Method of Data Collection Instruments	17
3.3. Methods of Data Analysis	17
CHAPTER 4: RESULTS	18
4.1. Socio-economic Characteristics of Households in Study Areas	18
4.2. Husbandry Practices in Study Areas	21
4.2.1. Purpose of keeping dairy cattle breed.....	21
4.3. Labor use and dairy farm practice in the study areas.....	24
4.4. Feeding and feed resources	24
4.4.1. Water sources for dairy cows.....	25
4.5. Milk and Milk Products Marketing.....	25
4.5.1. Consumption of dairy products.....	27
4.6.1. Opportunities	28
4.6.2. Major constraints of milk production	28
CHAPTER 5: DISCUSSION.....	30
CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS.....	34
6.1. Conclusions	34
6.2. Recommendations	34
6. REFERENCES	36

LISTS OF TABLES

	Pages
Table 1. Socio-economic characteristics of household in the study area	18
Table 2: Respondents occupation and experience in dairy farming	19
Table 3. Mode of transport and market distance.....	20
Table 4. Land holding (ha) and land use pattern per household in the study areas	20
Table 5. Primary purposes for keeping dairy cattle in the study areas	21
Table 6. Respondents' knowledge about dairy farming in the study areas	21
Table 7. Reason to start dairy production and family practice in dairy farms.....	22
Table 8. Milking frequency and milk hygiene controls in the study areas	22
Table 9. Milk churning and storage material used in the study areas.....	23
Table 10. Dairy product processing in the study areas	23
Table 11. Labour division of households in dairy production system.....	24
Table 12. Main feed resources used for dairy cattle in the study area.....	25
Table 13. Sources of water for the dairy production in the study area	25
Table 14. Milk product marketing in the study area.....	26
Table 15. Source of milk product marketing information in the study area.....	27
Table 16. Dairy products consumption in the study area.....	27
Table 17. Major opportunities for dairy productions in the study area	28
Table 18. Major constraints of milk productions in the study areas	29

LIST OF FIGURES

	Pages
Figure 1. Map of the study area -----	16
Figure 2. Sampling frame of the individual interviewers-----	17

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LIST OF ABBREVIATIONS

AIBP	Agro Industrial by Product
AI	Artificial Insemination
ATVET	Agricultural Technical Vocational Education Training
CSA	Central Statistical Agency/Authority
DDE	Dairy Development Enterprises
DCSI	Dedebit Credit and Saving Institute
DA	Development Agent
FAO	Food and Agricultural Organization
FTCs	Training Centers
FGD;	focused group desiccation
GDP	Gross Domestic Product
KII	key informants interview
IDF	International Dairy Federation
LMD	Livestock Market Development
M.a.s.l	Meter above sea level
MCC	Milk Collection Centers
MoARD	Ministry of Agriculture and Rural Development
BoTA	Bureau of Trade Agency
RCSC	Rural Credit and Saving Cooperative
SZT	Southern Zone of Tigray
VC	Value Chain

ABSTRACT

The purpose of this study was to assess dairy value chain and dairy production systems in selected districts from Southern and South Eastern Zone of Tigray. Primary data was collected by interviewing a total of 110 dairy producers in purposively selected in Mehoni and Hintalo districts. The collected data was analyzed using application of appropriate statistical tools and simple descriptive statistics was used to present the results. Majority of the respondents stated that the family size was small sized with 2 to 5 members. About 68 of the respondents head man occupation in the study areas was dairy farming. In the study areas, most owners had 2-5, 5-7, and 7-9 dairy cows respectively. The available land was mainly used for crop and pasture production. Respondents stated that the main purpose of keeping animals was to be used as asset and the reason to start dairy farm was for household food. In the present study, majority of the respondents mentioned that support by government was the main encouragement to start dairy farming. Manual churning using clay pot was the main churning system in the study areas. As mentioned by majority of the respondents raw milk was the main dairy product produced in the area. The main feed resource in the study area was hay followed by crop residue. The main water source for dairy production was water rain catchment. Development agents were the primary source of dairy products marketing in the study areas. About 38 of the respondents stated that raw milk was the primary dairy product consumed in the study areas. Majority of the respondents (56) stated that livestock/dairy potential was the main opportunity for dairy production in the study areas. Lack of credit, poor genetic potential, animal disease and high feed cost as well as availability problem were the main constraints in the study areas. The present study suggested that establishing of dairy producers should get credit support, extension and veterinary services.

Keywords: Dairy production systems, dairy value chain, urban dairy

CHAPTER 1: INTRODUCTION

1.1. Backgrounds and Justification

Ethiopia has the largest livestock population CSA (2016/17) with an estimated 59.5 million cattle. It contributes 35% of the GDP and 85% of farm cash income and. In this respect, milk production is playing a vital role in the livelihoods of the people of Ethiopia. Despite the abundance of livestock resources and the enormous potential for increasing livestock production, livestock productivity, and commercialization are poor (Mebrat *et al.*, 2019). This livestock sector has been contributing considerable portion to the economy of the country, and still promising to rally round the economic development of the country. It holds latent quality for livestock products. Traditional milk production accounts for 98% of the milk production in the country Yonad (2009). According to CSA (2015/2016) report from 59.5 million total cattle population, the female cattle constitute about 55.38% of the national herd. Out of this total female cattle population, dairy cows are estimated to be around 20% and milking cows are about 12% million heads during the reference period.

It is also estimated that almost 150 million farm households (>750 million people), are engaged in milk production worldwide, the majority of who are in developing countries (FAO, 2010). The dairy sector provides income and employment to many, often poor, people. It is estimated that 12 to 14 % of the world population, or 750-900 million people, live on dairy farms or within dairy farming households and the production of one million liters of milk per year on smallholder dairy farms creates approximately 200 on-farm jobs (FAO, 2010). Dairy sector is a major contributor to economic development mainly among the developing countries used as an engine of growth; it goes increased income, employment, food and foreign exchange earnings as well as better diet (Yilma, *et al.*, 2011).

The traditional system of milk production in Ethiopia, containing small rural and peri-urban farmers, uses local breeds, which produce about 400-680kg of milk per cow per lactation period (Ahmed, 2000). Intensive systems as diverse as state enterprises, small and large private farms use exotic breeds and their crosses, which have the potential to produce 1120-2500 liters over 279-day lactation (Holloway, 2010) It is a developmental tool as it widens and sustains three major mechanisms out of poverty; securing the assets, improving

smallholder and pastoral productivity, and increasing market participation by the poor (Randolph *et al.*, 2007).

Dairy production is practiced almost all over Ethiopia (pastoralists, agro pastoralists and crop livestock farmers) involving a vast number of small scale, medium scale and large scale farms. Based on climate, landholdings and integration with crop production, dairy production systems are classified as small scale rural; per-urban and urban (Mekonen, 2017). Whereas urban and per urban dairy production sector controls most of the country's improved dairy stock and now expanding in the highlands among mixed crop– livestock farmers, those serves as the major milk supplier to the urban market (Gebre *et al.*, 2010). About 83% of the total milk production in Ethiopia is from cows and the remainder is from goats and camels in certain regions particularly in pastoralist areas (Kassa, 2019). As dairying plays significant role in the lives of the urban and per-urban poor households (Yitaye *et al.*, 2007), promotion of the dairy sector in Ethiopia can therefore contribute significantly to poverty alleviation as well as availability of food and income generation.

Dairy value chain in the countries entailed about 500,000 smallholder dairy farmers who produce about 1,130 million liters of milk of which 370 million liters of raw milk, 280 million liters of yoghurt and butter and 165 million liters is consumed by the calves (Mohammed, 2009). Ethiopia has complex dairy value chain, with both formal and informal channels. Only 5% of the milk produced in Ethiopia is sold in commercial markets (LMD, 2012). The consumption of milk and milk products vary geographically between the high land and level of urbanization. In the low land all segments of the population consumes dairy products, while in the high land major consumers include primarily children and some vulnerable groups of women (Mohamed *et al.*, 2004). The most utilize dairy products are raw milk, butter and yoghurt (fermented milk). 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 smallholder farmers and value-chain analysis can play a key role in identifying the distribution of benefits of actors in the chain. One can determine who benefits from participation in the chain and which actors could benefit from increased support or organization. This is particularly important in the context of developing countries (agriculture in particular), given concerns that the poor in particular are vulnerable to the process of globalization (Morris 2001).

Dairy sector has a crucial role in improving the livelihoods of farmers through family income generation, job creation as well as improving the nutritional status of the family in Mehoni and Hintalo districts. Despite of this importance of the sector, little emphasis was given to value chain studies rather scholars continue in dealing marketing related studies of dairy sectors (Belay, 2013). Hence, the present study was designed to address this knowledge gap.

1.2. Statement of the Problem

Dairy production system is crucial in Ethiopia as milk and milk products are an important source of food and income generation. The country is known to have the highest number of cattle in Africa making it one of the biggest potential producers of milk and milk products in the continent. Despite the huge potential, dairy production has not been fully exploited and promoted in the country. In many instances, policy decision on livestock production system and dairy product marketing are taken in the absence of vital information on how they affect dairy producers, traders, exporters, and consumers. Consequently, current knowledge, on dairy product market chain, performance and prices are poor for designing policies and institutions to overcome the perceived problems in the marketing system (Solomon, 2003). (Lemma *et al.*, 2008) and (Yilma *et al.*, 2011) reported that weak linkages among the different actors in the dairy value chain are some of the important factors that contribute to the poor development of Ethiopia's dairy sector.

Dairy farming has an economic contribution in the southern and south eastern zone of Tigray Regional state. It creates job opportunities and source of income for smallholder farmers and other value chain actors. Smallholder dairy farmers and other value chain actors have key economic roll. Dairy value chain analysis of in the central zone of Tigray (Haregeweyni, 2015) and value chain analysis of cow milk, however, there is no study conducted on the Assessment of dairy value chain and dairy production system of smallholders' farmers in the southern and south east zone of Tigray. The linkage amongst the chain actors, the role of each actor, the channel, and the trends and factors which affecting local dairy value chains assessed and overall dairy production system of the study area of smallholder farmers and dairy value chain actors are not clearly understood. For this reason, it has been difficult to formulate and implement the appropriate intervention in relation to dairy value chain development actions in the study area. Therefore, it is imperative to conduct comprehensive studies that can cover to construct viable strategies for smallholder dairy farmers by

analyzing the current dairy value chains system in two selected district of southern and south east zone of Tigray (Getachew, 2015).

1.3. Objectives of the study area

1.3.1. General objective

The general objective of this study was assessment of current dairy value chains and dairy production Systems: in Southern and South Eastern Zones

1.3.2. Specific objectives

- ❖ To assess the overall dairy vale chain in different districts of the study areas.
- ❖ To assess the smallholder dairy production systems in the study area.
- ❖ To identify the major constraints and opportunities of the dairy product value chain and dairy production systems.

1.4. Research Questions

The research seeks to answer the following research questions.

- ❖ What does the existing production systems and dairy value chain systems seems?
- ❖ What are the actors and their functions along dairy value chain in the study area?
- ❖ What are major constraints and opportunities of the dairy production systems?

1.5. Significance of the Study

The study has generated valuable information on the dairy value chain and its strands to construct viable strategies in the study area which might assist policy makers at various levels to make relevant decisions to intervene in the development of dairy cattle milk production, marketing, processing, and designing of appropriate policies and strategies. Furthermore, the study is expected to serve as an important input as baseline information by a governmental and non-governmental organization in its attempt to develop the dairy value chain in the study area. The findings of the study might also be useful to input suppliers, producers, traders, consumers, and marketing agents to make their respective decisions.

1.6. Scope and Limitations of the Study

Due to the constraints of time and financial, this study was conducted in two districts of southern and south eastern zone Tigray. The information was also collected from limited sample households of the districts in the study areas. Besides, scope-wise the value chain analysis only focuses on the existing input– output, services, constraints, opportunities and enhancing strategies. This limitation, however, does not affect the finding's application to another comparable zone or the spatial scope in which the methods are rigorously scientific.

CHAPTER 2: LITERATURE REVIEW

2.1. Dairy Production Systems in Ethiopia

Dairy production is an important part of the livestock production systems in Ethiopia. Cattle, camel, and goats are the major sources of milk and milk products in Ethiopia (MoARD, 2004). According to the same source, cattle produce 83% of the total milk and 97% of cow milk comes from indigenous breeds. Dairy production is practiced almost all over Ethiopia (pastoralists, agro pastoralist's crop-livestock mixed farming, urban and peri-urban farming systems) involving a vast number of small scale, medium scale, and large scale operation farms.

In Ethiopia, different type of milk production system can be identified based on various criteria. According to Tegegne *et al.* (2013), dairy production systems could be identified; urban system, peri-urban system, and rural systems. Each of these systems is defined by its location, agro ecology, their main production objective, resources and resource use, the scale of production and management, market orientation, and access to inputs and services. Likewise, Dereje *et al.* (2005) based on climate, landholdings, and integration with crop production, dairy production systems are classified as small-scale urban, peri-urban and rural.

2.1.1. Urban production system

Urban dairy production system is market oriented like most urban dairying of Ethiopia and focuses on production and sale of fluid milk, with little or no land resources, is characterized by market orientation. As compared to other systems they have relatively better access to input feeds, veterinary, artificial insemination Services provided by the public and private sectors use intensive management (Yigezu, 2003).The types of feed commonly used in this production system include purchased concentrates and roughages of conventional and non-conventional sources and different fruits, wastes and road side grazing were also used. As farmers have limited access to farming or grazing land, they are often based exclusively on livestock under stall feeding conditions (Yitaye Alemayehu *et al.*, 2009).The main feed resources are agro-industrial by-products and purchased roughage. The primary objective of milk production is generating additional cash income (Beted Aneteneh *et al.* 2010). This production system serves as the main milk supplier to the urban market (Alemayehu *et al.*,

2009). Milk is either sold to dairy cooperatives, on the local informal market or directly to consumers from the farmer's gates (Azage Tegegne *et al.*, 2007).

2.1.2. Peri-urban milk production system

Peri-urban dairy production system it is mainly operational in areas where the population density is high agricultural land is shrinking due to expanding urbanization or non-existence and labor cost is on the increase. Economic factors have been dominant in determining the locations of exotic dairy-cattle in these urban and peri-urban areas since the milk-production of exotic cattle far exceeds that of indigenous stock. The animals used in this system are capable of producing 1,120 to 2,005 liters over a 209 day-lactation. Cross-bred and grade animals are used in this production system. The dairy farms in this system rely mainly on purchased feed. They are commercially oriented and will respond to improved technical, input supply and marketing services (Getenet Haile, 2009). This system is located around major cities and towns. It comprises of small sized to medium dairy farms which are also capable of keeping improved and local dairy stock. Cattle are housed in improved shelters made of locally available materials. The Type of housing and facilities in the barn in urban and peri-urban dairy farms are, such that it prevents animals from hot conditions theft and rain (Bekele Aysheshim *et al.*, 2015). The farmers have small size of grazing land; they use semi-grazing systems and also practice under stall feeding conditions for improved animals (Yitaye Alemayehu *et al.*, 2009).

2.1.3. Rural milk production system

The traditional smallholder system represents the rural milk production system and accounts for about 97% of the total national milk production from indigenous stock and 75% of the commercialized milk. This sector is largely dependent on the indigenous zebu breeds of low productivity, which produce about 400–680 liters of milk/cow per lactation period (Zelalem Yilma *et al.*, 2011). Rural dairy production system is part of the subsistence farming system that contribute up to 98% of the total milk production of in Ethiopia, and includes pastoralists, agro-pastoralists, and mixed crop–livestock producers (Land O'Lakes, 2010). Milking cows in the traditional sector have an average lactation length of 190 days and an average milk yield of 1.9 liters/day. Although this sector is largely based on indigenous breeds of low-producing native cattle, some progressive small-scale farmers in the various

milk sheds are now maintaining cross-bred cows that are capable of producing 800 to 1200 liters of milk/cow/lactation and sell milk to co-operative societies and commercial milk collectors (Getenet Haile, 2009). Natural pasture, crop residues, stubble grazing were listed as major feed resources, with minimal contribution of improved forage and local beverage by-products (atela) (Kassahun Gurmessa *et al.*, 2015).

Green grass and concentrates such as Nug-cake and wheat bran are provided as supplements to lactating cows, fattening animals, ploughing oxen and to donkeys when they are at work. Breeding takes place through natural mating using local bulls. About 6% fresh milk is sold to neighbor hoods and the remaining 94% is either home consumed or processed into butter, local cheese (ayib) and whey of which 20% is sold (Girma Debele, 2008). This indicates that fresh milk and butter sales contribution under rural dairy is not a priority; however, their nutritional contribution to households could be of considerable.

2.2. Productivity of dairy Cattle

The estimated numbers of indigenous milking cows in Ethiopia is about nine million and are in the hands of smallholder farmers and pastoralists under traditional contributions of the sector to the country's gross domestic product (GDP) and exports are about 60 and 90%, respectively. In Ethiopia about 300,000 crossbred or upgraded cows are used for milk production under relatively improved management conditions in urban and peri-urban areas. The total milk production from about 11.3 million milking cows is estimated at about 3.2 billion liters, an average of 1.54 liters/cow per day over a lactation period of about 6 months (CSA, 2016).

Gerber kidan Tesfay (2010) reported that, the average daily milk yield of the indigenous local dairy cattle in central zone of Tigray was 2.56 liters. The report indicated that the daily milk yield of indigenous local cattle breed differ with lactation length, management, nutrition genetics of the sample population and parity. The livestock subsector in Ethiopia is less productive in general, and compared to its potential, the direct contribution to the national economy is limited. The poor genetic potential for productive traits, in combination with the substandard feeding, health care and management practices to which animals are exposed are the main contributors to the low productivity (Zegeye Yigezu, 2003).

In the past, most of the interventions to develop the dairy sector focused more on increasing production, especially in the so-called high potential areas and with less attention to input supply and marketing systems and government engagements focused on input supply oriented services aimed at tackling problems of restricting increases in milk production, with little attention to the development of appropriate milk marketing and processing systems. In general, the development of improved marketing system is pivotal to increase production (Tsehay Redda, 2002). Most of the interviewed small scale dairy producers in the study area produce on average 10.5 and 2.6 liters of milk/ day/ cow from cross breed and local cow respectively (Girma Debele and Verschuur, 2014) Productivity of the dairy herd is low with average milk yield of 1.3liters to 1.54liters/day for an average lactation period of 180 to 210 days. Cross-bred cattle have a higher level of production estimated at an average of 10 liter/head/day (EDDP) (Dairy Value Chains, 2010).

According to Girma Dabble and Verschuur (2014) findings revealed that average lactation length of cross breed and local cows in the study area to be 240 and 255 days respectively. Because of this fact some of dairy farmers reported that they have milked their cow even during the whole pregnancy period. On average, crossbreed cows produces 8 liters per day per cow and the indigenous one produces 2 liters per day per cow (Adebayo Kebede, 2009). This could be due to complementary effect to the achievable environment. A number of production constraints are seriously affecting smallholder dairy production. In addition to already highlighted lack of capital to acquire the crossbreeds, many farmers face difficulties in getting full information on the breeds they are going to buy. Other factor hampering milk production include inadequate feed base, high cost of bought-in feeds, shortage of cash to buy concentrate feeds (Belete Antennal, 2006). Milk yield performance of cows as reported by farmers varies across the different dairy production systems in the study area, mainly due to differences in breed and management (Azage *et al.*, 2013).

2.3. Dairy value chain analysis

Dairy value chain analysis: Refers to the various stages through which milk and milk products pass from farm to the final consumers (FAO, 2007). The value chain approach starts from an understanding of the consumer demand and works its way back through distribution channels to the different stages of production, processing, and marketing (Meyer-Stamer and Waltring, 2006).

2.3.1. Value chain

According to Kaplinsky and Morris (2001), the value chain is the full range of activities that are required to create and add value to a finished product or service. This refers to the different phases of production from raw material, processing, distribution, and marketing until the product or service reaches the consumer and is disposed of after use.

2.3.2. Supply chain

Supply chain defines as the network of organizations that are involved, through upstream and downstream linkages (Chandra sekaran, 2010). In the different processes and activities that produce values in the form of products and services in the hands of the ultimate consumer. Likewise, Baily *et al.* (2008) stated that supply chain is concerned with the coordinated flow of materials and services from origins through suppliers into and through the organization and on to the ultimate consumer in such a way as to maximize value added and minimize cost. Milk Supply chain takes the similar orientation as meanings given by the above authors.

2.3.3. Value chain actors

Value chain actors are those involved in supplying inputs, producing, processing, marketing and consuming a particular agricultural product. The actors include directly involved in the value chain (rural and urban farmers, traders, retailers, cafes, and consumers or indirect actors who provide financial or non-financial support services such as credit agencies business services and government researchers and extension workers (Ssango, 2006).

2.3.4. Value chain mapping

A value chain map allows one to depict all activities, actors, and relationships among segments of the chain, and the interactions between producers and intermediaries. Information from a market analysis is used in conjunction with detailed firm data to understand the sourcing, production, and delivery segments of an industry at micro levels (FIAS, 2007).

2.3.5. Service providers

Service providers are individuals or firms providing a service without taking ownership of the product are considered as service providers. Support service providers are essential for value chain development and include sector specific input and equipment providers, financial service, business management service, and market information access and dissemination,

technology suppliers, advisory service, and others important services for smallholders (Kaplinsky and Morris (2000).

2.4. Dairy Product Marketing System in Ethiopia

Dairy products in Ethiopia are channeled to consumers through both formal and informal dairy marketing systems. Until 1991, the formal market of the cold chain, pasteurized milk was exclusively dominated by the DDE (Dairy Development Enterprises) which supplied 12% of the total fresh milk in the Addis Ababa area (Holloway, 2000). Recently, private businesses have begun collecting, processing, packing and distributing milk and other dairy products. However, the proportion of total production being marketed through the formal markets remains small (Muriuki and Thorpe, 2001). Formal milk markets are particularly limited to peri-urban areas and to Addis Ababa. Over 85% of the milk produced by rural households is consumed within the producer households with the proportion marketed being less than 7% (CSA, 2011).

2.4.1. Informal milk trade

According to Yilma *et al.*, (2011) revealed that the milk marketing system in Ethiopia is not well developed giving the large majority of smallholder milk producers, limited access to the market. The informal market involves direct delivery of fresh milk by producers to consumers in the immediate neighborhood and sale to individuals in nearby towns (Kebede, 2009). The term ‘informal’ is often used to describe marketing systems in which governments do not intervene substantially in marketing. Producers sell the surplus milk produced to their neighbors or in the local markets, either as liquid milk or in the form of butter. This system is characterized by no license to operate, low cost of operation, high producer prices as compared with the formal market and no regulation of operation (SNV, 2008). The hygienic condition of milk and milk products channeled through this system is also poor. This is mainly due to the prevailing situation where producers have limited knowledge of dairy product handling coupled with the inadequacy of dairy infrastructure such as cooling facilities and unavailability of clean water in the production areas (O’Lakes, 2010).

2.4.2. Formal milk trade

In the formal system, milk is collected at the cooperative or private milk collection centers and transported to processing plants. In this system, milk quality tests are performed on

delivery, thereby assuring the quality of milk. This has encouraged the producers to improve the hygiene conditions, storage, and transportation of the milk in order to avoid rejection of the product on delivery to the collection center. The formal milk market appears to be expanding during the last decade with the private sector leading the dairy processing industry in Addis Ababa and other major regional towns. However, the share of milk sold in the formal market in Ethiopia (2%) is much less than that sold in neighboring countries: 15% in Kenya and 5% in Uganda (Muriuki and Thorpe, 2001). In fact, the vast majority of milk produced outside urban centers in Ethiopia is processed into products by the farm household and sold to traders or other households in local markets.

2.5. Dairy product processing

Dairy product processing is generally based on ergo (fermented milk), without any defined starter culture or with a natural starter. Milk is either kept at warm temperature to ferment prior to processing (Mogessie, 2002). Milk processing is basically limited to dairy farmer level and hygienic qualities of products are generally poor (Yalta and Faye, 2006). Dairy products require processing to meet consumers' needs and tastes and it can prolong the shelf life of a product, especially for perishable products. For example, processing fluid milk into milk products such as butter, cheese, and other products enables the producer to store the product longer (Gebremedhin *et al.*, 2012).

The dominant milk processing method across Peri-urban dairy production system is traditional home processing method and it involves processing of fluid milk into fermented or sour milk, butter and local cheese (ayib). in the peri-urban highland system, milk is fermented for 3to5 days before it is processed into butter and other milk products (Anteneh,2006).About 0.6kg of butter is produced from 10 liters of milk (approximately 16.5 liters of milk is required to produce 1kg of butter) through the traditional milk processing methods (Tegege *et al.*,2013). For processing, the milk should be fermented either in a plastic container or other local materials made from clay. Butter is the major value added product produced at the units it is used for cash generation, cooking Ethiopian dishes, and medicinal and cosmetic purposes.

2.6. Challenge and opportunities

2.6.1. Challenges of dairy production and marketing

Input supply: in this stage the primary constraints to increase the dairy production under all production system are: inadequate animal feed resources and expensiveness price, limited access and high cost of dairy heifers/cows, limited availability of credit to the dairy farmer and inadequate veterinary and artificial inseminations service provision (O'Lakes, 2010).

Feed is the key input supply for animal productivity and its cost represents more than 60% of operating costs in a commercial dairy business (LMD, 2013). The dairy sector is constrained by an insufficient quantity of forage produced on the farm, insufficient inputs for commercial feeds and lack of quality feed formulation. Seasonal fluctuation in the availability and quality of feed has been a common phenomenon, inflecting serious changed in livestock production. The feed shortage mostly happens in the dry season of the year. Diseases are also the major constraints to improved dairy production in Ethiopia, which caused poor performance across the production system (Ibrahim and Olaloku, 2000). The prevalence of various animal diseases, tick-borne diseases, internal parasites, and infectious diseases affect dairy development programs in varying scales, depending on ecological zones and management levels. The animal health services provided are inadequate; the cost of drugs and acaridae is very high, while the diagnostic services are not readily available to the dairy farmer and Credit facilities/financial support to smallholder farmers who intend to enter into commercial dairy farming are very much limited. The importance of establishing credit facilities is a crucial step to the country's dairy sector as indicated in the livestock development master plan (Yalta *et al.*, 2011).

Marketing access: to the local market is the most important economic determinant to adopt technologies (Zelalem, 2007), and choice of production enterprises. Marketing constraints include fluctuation in demand and supply of dairy products (as a result of feed shortage and different sociocultural reasons), poor infrastructure (Lack of cooling facilities, simple processing equipment and quality testing skills and equipment) and the long time fasting of the members of the Ethiopian Orthodox church (Ulfina *et al.*, 2013). Many people of Ethiopia are Orthodox religion believers and they have a great role in milk marketing constraint during the long fasting period (van der Valk and Tessema, 2010).

2.6.2. Opportunities of dairy product marketing

Large and varied dairy animal genetic resources are abundant in Ethiopia and widely dispersed throughout the countries numerous agro-ecologies and climates. With ongoing urbanization, population growth, milk consumption and demand, generating income, and job opportunities. According to Tegegne *et al.* (2013), there are indications that dairy production will play a significant role in agricultural growth and has the ability to significantly contribute to enhanced income generation, food security, and the creation of job opportunities. The ultimate goal of the intervention in the value chain of milk and dairy production in general is to increase the incomes of urban and per urban dairy producers by increasing the number of these producers who upgrade and derive their livelihood from the dairy industry.

CHAPTER 3: MATERIALS AND METHODS

3.1. Descriptions of the Study Area

The study was conducted in Mehoni and Hintalo districts. The two districts were purposively selected due to their dairy production system and dairy value chain potential.

Raya-Mehoni: is indigenous people living in Tigray and bordered by Raya-Azebo rural-district. Mehoni is the district of Raya people in the southern Tigray Zone. It is located about 644km North of Addis-Ababa and 120 km south of Mekelle. It has an estimated area of 72,224 hectares. The district`s total human population and households numbers are estimated to be 145,125 and 246,155, respectively. Out of the total population size about 71,127 are females (BoARD, 2016). The district`s altitude is estimated to range from 1800 to 3455 m.a.s.l. The average temperature ranges from 11.090 c to 26.540 c. The mean annual rainfall ranges from 700-900 mm and the area is situated on geographic coordinates of 12 0 47' North latitude and 39 0 32' East longitudes (BoARD, 2016). The same sources Raya-Mehoni district is well known for its major type of crop grown potential such as sorghum, maize, millet, Teff, chickpea and barley production and also rich in livestock population the district has an estimated population of 68,805 heads of cattle (CSA, 2012), 76,022 sheep, and 24,445 goats, 401camels, 110, 99 donkeys, 12,525 horses, 2130,916 chickens and 132,126 bee hives.

Hintalo district is also one of the five districts of south-Eastern Tigray zone. It is located about 46km south-Eastern of Mekelle, capital of city of Tigray with 780 km North of Addis-Ababa. Hintalo is bordered by Afar region from the east and by wajerat 2oadi and Algae from the south and Seharti-samre from the west and Enderta from the north. It has an estimated area of 65,242 hectares. The district`s total human population size and households numbers are estimated to be 108, 2455 and 22,674, respectively. Out of the total population size, about 54,626 are females (BoARD, 2016). The district`s altitude range from 1058 to 23143 m.a.s.l. Average temperature ranges from 24 0 c to 500 c. The rainfall amount ranges from 705 to 834mm with an average of 564.12 mm. and the geographically the area lies at 34o 37'East longitude and 11o 14' North latitude and 35 0 34' East longitudes (BoARD, 2016. The same sources Hintalo district is well known for its high crop grown potential such as wheat, chickpea, barley, faba bean and maize production and also rich in livestock resources. According to CSA (2012), the district has an estimated population of 122,342 heads of cattle.

56,021 sheep and 212,186 goats, 490, 99 donkeys, 525 horses, 4130,916 chickens and 33, 06 bee hives.

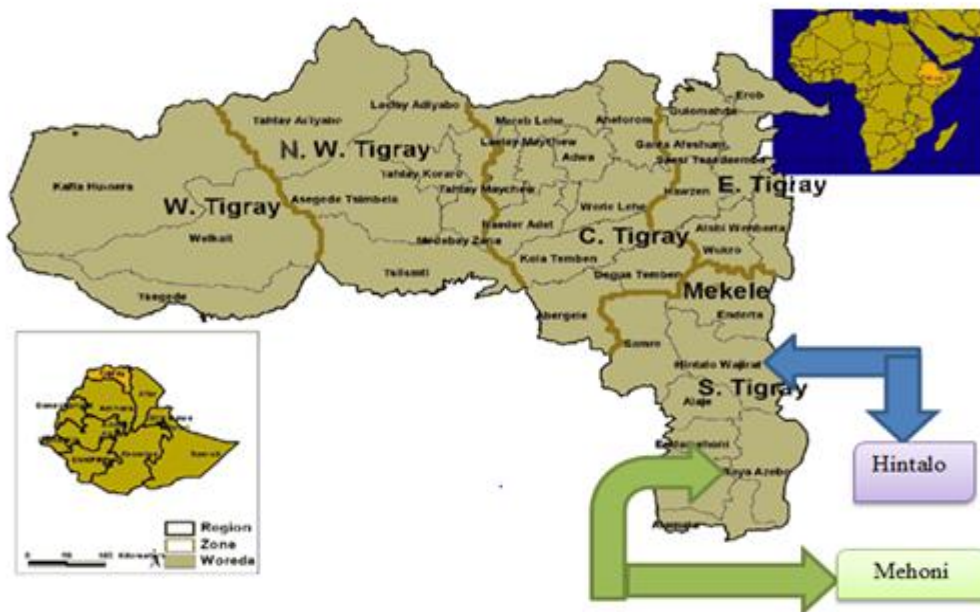


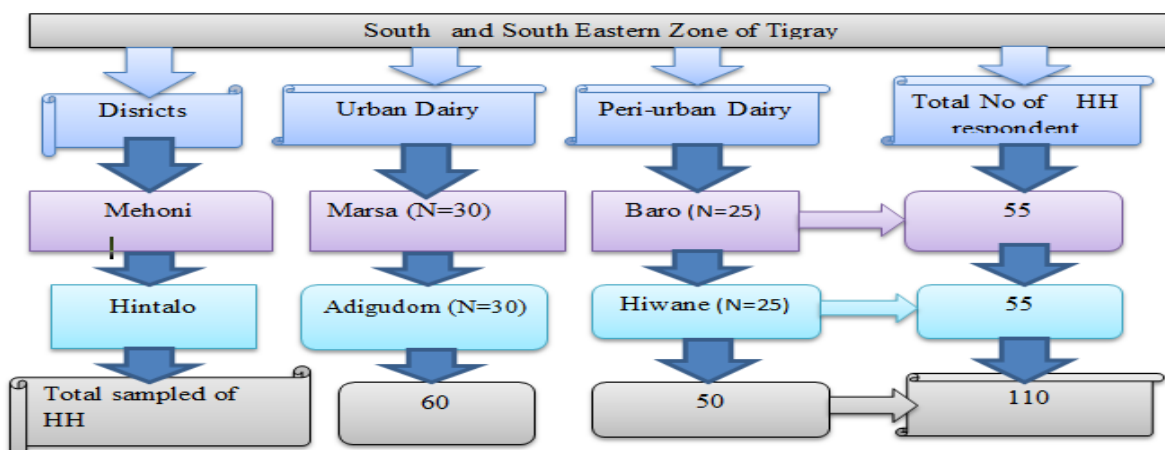
Figure 1. Map of the study area

3.2. Study Design

The study design was cross sectional survey in the two districts

3.3. Sampling Procedure

Multi-stage sampling procedure was employed to undertake the study. In the first stage two districts (Mehoni and Hintalo) were selected purposively considering the potential for dairy farming from south and South Eastern zone of Tigray regional state. Secondly, each district was stratified into urban (crossbreed owning) and peri-urban (local breed owning dairy farming) based on their involvement in the dairy farming. Moreover, for urban dairy production system Marsa and Adigudom and peri-urban dairy production system Hawelti and Hiwane were selected purposively. Dairy farmers who owned 2-5 cows from indigenous and crossbred production system were selected from each study areas. Thirdly, from each selected areas 30 from urban and 25 from per urban households were selected randomly for survey study. Unequal sampling methods were employed to select households. A total sample size of 110 households was selected from the two districts.



N₀=Number HH=Household

Figure 2. Sampling frame of the individual interviewers

3.2. Method of Data Collection Instruments

For this research the main sources of data were collected both from primary and secondary data and quantitative parameters data were used on the production and marketing system collected from dairy producers using semi- structured questionnaires and group discussion with key informants.

The primary data collected using semi-structured questionnaires from smallholder dairy producers were focused on farm household landholding, dairy cattle holding size, income sources, inputs used, milk and butter production, processing and market information, credit access and extension services, constraints and opportunities.

3.3. Methods of Data Analysis

The data collected from different sources were analyzed using SPSS version 20 and Microsoft Excel, 2016. The results were summarized using simple descriptive statistics such as frequency, percentages. The sample size will be calculated using the formula where the total small scale farms of the district. The total numbers of peoples for the study will be calculated based on the Taro Yamane's formula method.

$$n = \frac{N}{1 + N(e)^2}$$

Where: N = Target population / population size
 n = desired sample size
 e = level of statistical significance set or margin of error (standard value is 0.05) and the sample size was 110.

CHAPTER 4: RESULTS

4.1. Socio-economic Characteristics of Households in Study Areas

The age of respondents varied between 18 to >65years. Urban and peri-urban dairy producers were 67 male 43 female which were involved in the study. The present findings indicated that the participation of female household heads had lower than the male household head in both dairy production systems. The overall family size of the respondents in the study areas were 7 single, 53 small size, 37 medium size and 13 large size dairy producers and their education level had 26 primary, 39 secondary, 9Vocational , 11>degree and 25 others (Table1).

Table 1. Socio-economic characteristics of household in the study area

Variable	Category	Total	Dairy Production system U (N-60) PU (N-50)							
			Marsa		Baro		Adigudom		Hiwane	
			Frq	%	Frq.	%	Frq.	%	Frq.	%
Age(year)	18-30	17	7	41.2	2	11.9	5	29.4	3	17.8
	31-45	51	9	17.6	12	23.5	15	29.4	15	29.4
	46-55	23	8	34.8	6	26.1	3	13	6	26.1
	55- 65	13	5	38.5	3	23.1	1	7.7	4	30.8
	>65	6	1	16.7	2	33.3	1	16.7	2	33.3
Gender	Male	67	20	29.6	15	22.4	18	26.9	14	20.9
	female	43	10	23.3	10	23.3	7	16.3	16	37.2
	Single	7	1	14.3	4	57.1	1	14.3	1	14.3
Family size	Small(2-5)	53	12	22.6	12	22.6	13	24.5	16	32.4
	Medium(6-8)	37	9	24.3	7	18.9	12	32.4	9	24.3
	Large(>9)	13	8	61.5	2	15.4	2	15.4	1	7.7
Education al level	Primary	26	7	26.9	4	15.4	8	30.8	7	26.9
	secondary	39	10	25.6	8	20.5	12	30.8	9	23.1
	Vocational	9	1	11.1	3	33.3	1	11.1	4	44.4
	>degree	11	5	45.5	4	36.4	0	0	2	18.2
	Others	25	7	28	6	24	4	16	8	32

N_Q- number of respondents, urn-Urban, Pun- Peri-urban, frq-frequency

About 68 of the respondents in both study areas were involved in dairy farming. From the total respondents about 92 of them use own house for their dairy cows (see Table 2).

Table 2: Respondents occupation and experience in dairy farming

Variable	Category	Total	Dairy Production system UR (N-60) PU (N50)							
			Marsa		Baro		Adigudom		Hiwane	
			Frq	%	Frq.	%	Frq.	%	Frq.	%
Occupation of household head	Dairy farmer	68	18	26.5	15	22.1	18	26.5	17	25
	Other livestock rearing	11	2	18.2	1	9.1	3	27.3	5	45.5
	Crop production	1	1	100	0	0	0	0	1	100
	Gove- employ	11	3	27.3	3	27.3	4	31.4	1	9.1
	Privet employ	11	3	27.3	2	18.2	0	0	6	45.5
	Daily labor	8	3	27.3	4	50	0	0	1	12.5
Number of milking cow (cross and local breeds)	2-5	31	5	16.1	7	22.6	4	12.9	15	48.4
	5-7	29	10	34.5	10	34.5	7	24.1	2	6.9
	7-9	26	6	23.1	4	15.4	9	34.6	7	26.9
	>9	24	9	37.5	4	20.8	5	20.8	6	25
Dairy farm experience (year)	2-5	94.5	27	26	24	23.1	25	24	28	26.9
	5-10	1.8	1	50	1	50	0	0	0	0
	10-15	1	1	100	0	0	0	0	0	0
	>15	3	1	33.3	0	0	0	0	2	66.7
Dairy house/shelter	Own house	92	23	25	20	21.7	21	22.8	28	30.4
	Rented	12	5	41.7	4	33.3	2	16.7	1	8.3
	hosted	6	2	33.3	1	16.7	2	33.3	1	16.7

N-number of respondents, urn- urban, pun-peri-urban Gove-governmental frq-frequency

In the current study, about 34 respondents from both study sites stated that the distance of the market from their dairy farm was nearly 2 km. Additionally, 62 respondents mentioned that the mode of transport was by foot (Table 3).

Table 3. Mode of transport and market distance

Variable	Category	Total	Dairy production system UR (N-60) PU(N-50)							
			Marsa		Baro		Adigudom		Hiwane	
			Frq.	%	Frq.	%	Frq.	%	Frq.	%
Market distance	<1km	32	7	21.9	17	53.1	0	0	8	25
	1.4-2km	34	6	13.8	8	18.2	11	25	19	43.2
	>2km	34	17	50	0	0	14	41.2	3	8.8
Mode of transport	By foot	62	16	25.8	16	25.8	15	22.6	16	25.8
	Bicycle	36	13	36.1	9	25	8	22.2	6	16.7
	Own ve.	5	0	0	0	0	2	40	3	60
	Hired ve.	7	1	14.3	0	0	1	14.3	5	71.4

N-Number of respondent's %-percentage km-kilometer yr-year ve-vehicles

As stated by majority of the respondents in the study areas the existing land was used primarily for crop production followed by pasture production (Table 4).

Table 4. Land holding (ha) and land use pattern per household in the study areas

Variable	Category	Total	Land use pattern in the study UR(60) PU (50)							
			Marsa		Baro		Adigudom		Hiwane	
			Frq	%	Frq	%	Frq	%	Frq	%
Land size	0.5-1 ha	32	11	34.4	6	18.8	8	25	7	21.9
	1.5-2 ha	18	8	44.4	3	16.7	4	22.2	3	16.7
	2.5-3 ha	34	8	23.5	8	23.5	7	20.6	11	32.4
	3.5-4ha	16	3	18.8	1	6.2	6	37.5	6	37.5
	>4 ha	10	0	0	7	70	0	0	3	30
Land type	Pasture	31	11	35.5	6	19.4	6	19.4	8	25.8
	Crop	68	15	22.1	18	26.5	16	23.	19	27.9
	Forest land	8	2	25	1	12.5	3	37.5	2	25
	Fallow land	3	2	66.7	0	0	0	0	1	33.3

Ha-hectare

4.2. Husbandry Practices in Study Areas

4.2.1. Purpose of keeping dairy cattle breed

In both dairy production systems 46 respondents mentioned that keeping of animals was for asset. While 43 for them stated that the purpose of rearing animals was for food security. Furthermore, majority of the respondents stated that the reason to start dairy farming was for household food (Table 5).

Table 5. Primary purposes for keeping dairy cattle in the study areas

Variable	Category	Total	%purpose of keeping dairy cattle UR(60) PU (50)							
			Marsa		Baro		Adigudom		Hiwane	
			N	%	N	%	N	%	N	%
Purpose of animal keeping	dairy product sale	13	10	76.9	0	0	0	0	3	23.1
	draught power	8	5	62.5	0	0	0	0	3	37.5
	For asset	46	7	15.2	15	32.6	8	17.4	16	34.8
The reason why start dairy farm	Food security	43	8	18.6	10	23.3	17	39.5	8	18.8
	Increase income	21	6	28.6	5	23.8	4	19	6	28.6
	Household food	47	14	29.8	11	23.4	10	21.3	12	25.5
	Main sources of income	42	10	23.8	8	19	10	23.3	12	25.5

In the study areas, majority of the respondents stated that they had knowledge about dairy farming and the type of dairy production system was urban dairy production system (Table 6).

Table 6. Respondents' knowledge about dairy farming in the study areas

Variable	Category	Total	Dairy farm knowledge UR(60) PU(50)							
			Marsa		Baro		Adigudom		Hiwane	
			N	%	N	%	N	%	N	%
Knowledge about dairy farming	Yes	102	29	28.4	23	22.5	21	20.6	29	28.4
	No	8	1	12.5	2	25.	4	50	1	12.5
Types of dairy production system	urban	81	19	23.5	20	24.7	19	23.5	23	28.4.
	Peri-urban	29	11	37.9	6	20.7	5	17.2	7	24.1

In the present study, the most of respondents in the study areas stated that the reason to start dairy production were due to the support by government and non-government organizations (NGOs) followed by own parents encouragements (Table 7).

Table 7. Reason to start dairy production and family practice in dairy farms

Variable	Category	Total	Reason to start dairy production UR(60) PU(50)							
			Marsa		Baro		Adigudom		Hiwane	
			N	%	N	%	N	%	N	%
How did you start dairy farming	Encouraged by parent	33	5	15.2	2	6.1	0	0	26	78.8
	Support by Gov.	48	4	8.7	14	30.4	25	54.3	3	6.5
	Self-motivated	20	17	85	2	10	0	0	1	5
	inherited	11	4	36.4	7	63	0	0	0	0
Family practice in dairy farm	Parents(husband/wife)	44	12	27.3	12	27.3	17	15.9	13	29.5
	Brother/sister(husband & wife)	32	10	31.3	7	21.9	7	21.9	8	25
	Friends(husband/wife)	28	6	21.4	5	17.9	9	32.1	8	28.6
	others	6	2	33.3	1	16.7	2	33.3	1	16.7

As indicated in Table 8, majority of the respondents in the study areas stated that the milking frequency was 2 times per day. All the respondents mentioned that cleaning hands before milking and using clean milk utensils were considered as a means of milk hygiene control.

Table 8. Milking frequency and milk hygiene controls in the study areas

Variable	Category	Total	Milk hygiene in the study area UR(60) PU(50)							
			Marsa		Baro		Adigudom		Hiwane	
			N	%	N	%	N	%	N	%
Milking frequency/d	Once	14	4	28.6	3	21.4	4	28.6	3	21.4
	2-times	70	21	30	14	20	15	21.4	20	28.6
	3-times	26	5	19.2	8	30.8	7	26.9	6	23.1
Hands clean before milking	Yes	110	30	27.3	25	22.7	25	22.7	30	27.3
	No	0	0	0	0	0	0	0	0	0
Clean milk utensils	Yes	110	30	27.3	25	22.7	30	27.3	25	22.7
	No	0	0	0	0	0	0	0	0	0

The majority of the respondents responded that manual churning was the main churning system in their dairy farm and the usual material used for churning was clay pot (Table 9).

Table 9. Milk churning and storage material used in the study areas

Variable	Category	Total	Milk churning in the study areas UR(60) PU(50)							
			Marsa		Baro		Adigudom		Hiwane	
			N	%	N	%	N	%	N	%
Churning system	Manual	74	17	23	21	28.4	13	17.6	23	31.1
	Modern	20	8	40	2	10	7	35	3	15
churning material used	both	16	5	31.2	2	12.5	5	31.2	4	25
	Gourd	23	13	56.5	9	39.1	1	4.3	0	0
used	Clay pot	38	6	15.8	11	28.9	16	15.8	15	39.5
	Plastic	19	6	31.6	1	5.3	5	26.3	7	36.8
	Aluminum	14	2	14.3	3	21.4	4	28.6	5	35.7
	Other types	16	3	18.8	6	37.5	4	25	3	18.8

In the study areas, the main product produced from the dairy cows was raw milk. The majority of the respondents mentioned that cottage cheese was produced from whole milk. Additionally, milk was frequently processed in dry season (Table 10).

Table 10. Dairy product processing in the study areas

Variable	Category	Total	Dairy product processing UR(60) PU(50)							
			Marsa		Baro		Adigudom		Hiwane	
			N	%	N	%	N	%	N	%
Dairy product produced	Raw-milk	66	15	22.7	24	36.4	6	9.1	21	31.8
	Butter	3	2	66.7	0	0	1	33.3	0	0
	ghee	19	10	52.6	0	0	8	42.1	1	5.3
	Cheese	22	3	13.6	1	4.5	10	45.5	8	36.4
Cottage cheese	Whole milk	104	27	26	24	23.1	25	24	28	26.9
	Butter milk	2	1	50	0	0	0	0	1	50
	both	4	2	33.3	0	0	0	0	1	100
Milk processing frequently	Dry season	74	17	23	21	28.4	13	17.6	23	31.1
	Rain season	36	13	51.2	4	32.5	12	66.2	7	40

4.3. Labor use and dairy farm practice in the study areas

The divisions of labor among family members with respect to cattle husbandry in urban and, peri-urban study areas are shown in Table 11. Majority of the respondents in the study area stated that milking was mainly performed by workers followed by house wife (Table 11).

Table 11. Labour division of households in dairy production system

Activities	People involved	Total	Labour division in dairy activity UR(60) PU(50)							
			Marsa		Baro		Adigudom		Hiwane	
			frq	%	frq	%	frq	%	frq	%
Milking	Farm manager	21	7	33.3	5	22.8	3	14.3	6	28.6
	Husband	15	6	40	4	28.7	2	13.3	3	20
	Wife	33	12	36	4	12.1	8	24.2	9	27.3
	Worker	40	5	12.5	12	30	11	27.5	12	30
Cleaning	Farm manager	8	3	33.3	2	22.2	2	22.2	2	22.2
	Husband	9	3	33.3	2	22.2	1	11.1	3	33.3
	Wife	69	22	21.9	13	18.8	15	21.7	19	27.5
	Worker	18	2	10.5	7	36.8	5	26.3	5	26.3
	Son	3	0	0	1	33.3	1	33.3	1	33.3
Dipping	Farm manager	8	3	37.2	2	25	1	12	2	25
	husband	11	4	38.4	2	18.2	2	18.4	3	27.1
	wife	61	19	31.1	13	21.3	16	26.2	13	21.3
	worker	29	4	13.8	8	27.6	9	31	8	27.6

4.4. Feeding and feed resources

As indicated in Table 12, in the study areas the main feed resource used for dairy cows was hay followed by crop residues.

Table 12. Main feed resources used for dairy cattle in the study area

Feeds Types	Total	Study areas							
		Marsa		Baro		Adigudom		Hiwane	
		N	%	N	%	N	%	N	%
Natural grazing land	2	1	50	0	0	0	0	1	50
Crop residues	21	7	33.3	5	23.8	3	14.3	6	28.6
Hay	52	17	32.7	10	19.2	11	21.2	14	26.9
Improved forage	6	2	33.3	1	16.7	2	33.3	1	16.7
Agro-industrial byproducts	14	2	14.3	3	21.4	5	35.7	4	28.6
Non-conventional feeds (hatella)	13	1	7.7	6	46.2	2	15.4	4	30.8

4.4.1. Water sources for dairy cows

In the present study area, water from rain catchment was the main water source in the study areas (Table 13).

Table 13. Sources of water for the dairy production in the study area

variable	Category	Total	Study areas UR(60) PU(50)							
			Marsa		Baro		Adigudom		Hiwane	
			frq	%	Frq	%	Frq	%	Frq	%
	On-farm well/tape	16	0	0	0	0	13	81.2	3	18.8
Water sources	Pipe public water	19	10	52.6	0	0	0	0	9	47.4
	Rain catchment	56	20	35.7	25	44.6	6	10.7	5	8.9
	River/stream water	19	0	0	0	0	6	31.6	13	68.4

4.5. Milk and Milk Products Marketing

In the study areas, dairy products' marketing was practiced by majority of the respondents. The majority of the respondents stated that the experience of marketing dairy products was 12 to 14 years (Table 14).

Table 14. Milk product marketing in the study area

Variables	Category	Total	Milk product Trader in the Study area UR(60) PU(50)							
			Mehoni		Baro		Adigudom		Hiwane	
			N	%	N	%	N	%	N	%
Dairy products marketing	Yes	81	19	23.5	19	23.5	20	24.7	23	28.4
	No	29	11	37.9	6	20.7	5	17.2	7	24.1
How many years in dairy products marketing?	2-5 year	12	3	25	3	25	3	25	3	25
	6-11 year	10	3	30	3	20	2	20	3	30
	12-14year	67	23	34.3	12	17.9	14	20.9	18	26.9
	>14year	20	1	5	8	40	5	25	6	30
Types of dairy product prepared at home	Butter	23	13	56.5	9	39.1	1	4.3	0	0
	Butter milk	38	6	15.8	6	15.8	11	28.9	15	39.5
	Ghee	19	6	31.6	1	5.3	5	26.3	7	36.8
	whey	14	2	14.3	3	21.4	4	28.6	5	35.7
	yoghurt	16	3	18.8	6	37.5	4	25	3	18.8
Dairy product marketing during f and nf.	yes	81	19	23.5	19	23.5	20	24.7	23	28.4
	no	29	11	37.9	6	20.7	5	17.2	7	24.1

F*fasting NF*non-fasting period

In the current study, majority of the respondents stated that Das were the main source of information for dairy products marketing (Table 15).

Table 15. Source of milk product marketing information in the study area

Variables	Category	Total	Milk marketing information UR(60) PU(50)							
			Mehoni		Baro		Adigudom		Hiweane	
			N	%	N	%	N	%	N	%
Dairy marketing information	Other trader	38	12	31.6	12	31.6	9	23.7	5	13.2
	DAs	59	13	22	10	16.9	14	23.7	22	37.3
	Producers	13	5	38.5	3	23.1	2	15.4	3	23.1
Main business of dairy products	Wholesaling	32	7	21.9	17	53.1	0	0	8	25
	Retailing	44	6	13.6	8	18.2	11	25	19	43.2
	processing	34	17	50	0	0	4	41.2	3	8.8
Dairy products price set by	Our self	38	9	23.7	10	26.3	7	18.4	12	31.6
	Other buyer	24	10	41.7	5	20.8	6	25	3	12.5
	Set by negotiations	18	2	11.1	1	11.1	6	33.3	8	44.4
	Set by supplier	15	1	6.7	4	26.7	5	33.3	5	33.3
	Other medias	15	8	53.3	4	26.7	1	6.7	2	13.2

4.5.1. Consumption of dairy products

In the current survey study about 38 of the respondents stated that raw milk was the main dairy product consumed at household level. From those respondents about 95.2% of the respondents in Mehoni stated that Yoghurt was the main dairy product consumed in their area and 84.2% of them stated the high raw milk consumption in the area (Table 19).

Table 16. Dairy products consumption in the study area

Variables	Category	Total	Production system in the study area UR(60) PU(50)							
			Mehoni		Baro		Adigudom		Hiwane	
			N	%	N	%	N	%	N	%
Type of dairy product highly consumed in the study area	Raw milk	38	32	84.2	5	13.2	1	2.6	0	0
	Yoghurt	21	20	95.2	1	4.8	0	0	0	0
	butter	17	0	0	10	58.8	0	0	7	41.2
	Butter milk	34	22	64.7	10	29.4	2	5.9	0	0

4.6. Constraints and Opportunities of Dairy Production System

4.6.1. Opportunities

In the present study, majority of the respondents stated that having rich livestock/dairy potential was the primary opportunity for dairy production followed by available labor force (Table 17).

Table 17. Major opportunities for dairy productions in the study area

Variable	Category	Total	Dairy productions opportunities in the study area UR(60) PU(50)							
			Marsa		Baro		Adigudom		Hiwane	
			frq	%	frq	%	frq	%	frq	%
Opportunities	Livestock/dairy potential	56	46	82.1	10	17.9	0	0	0	0
	Land	22	6	27.3	5	22.7	9	40.9	8	36.4
	Labor force	32	10	31.2	7	21.9	7	21.9	8	25

4.6.2. Major constraints of milk production

In the present study, milk production constraints include animal diseases, lack of credit services, lack and high feed costs and poor genetic make-up were stated as the main constraints to milk production, processing, and marketing in the study areas. From those constraints majority of the respondents stated that lack of credit as the primary constraint in their dairy production. Most of the respondents (61) stated that milk processing was influenced by low milk yield followed by cultural taboo (Table 18).

Table 18. Major constraints of milk productions in the study areas

Variable	Category	Total	Constraints of milk production in the study areas							
			Marsa		Baro		Adigudom		Hiwane	
			frq	%	frq	%	frq	%	frq	%
Major constraints	Animal diseases	30	21	70	7	23.3	2	6.7	0	0
	Poor genetic potential	56	46	82.1	10	17.9	0	0	0	0
	Lack of credit	69	4	66.7	1	16.7	1	16.7	0	0
	Feed cost/ lack	18	3	16.7	8	44.4	0	9	7	38.9
Major Diseases causes of dairy cow	Mastitis	11	3	27.3	3	27.3	2	18.2	3	27.3
	Ketosis	64	22	34.4	12	18.8	13	20.3	17	26.6
	Brucellosis	11	3	27.3	2	18.2	3	27.3	3	27.3
	Milk fever	20	2	10	7	35	5	25	6	30
	Parasite	3	0	0	1	33.3	1	33.3	1	33.3
Milk processing constraints	Low milk yield	61	55	90.2	5	8.2	1	1.6	0	0
	Cultural taboo	32	14	43.8	16	50	2	6.2	0	0
	Milk spoilage	7	1	14.3	1	14.3	0	0	5	71.4
	Marketing Price	10	4	40	4	40	0	0	2	20

CHAPTER 5: DISCUSSION

The proportions of dairy producers were 67 male and 43 female headed households in urban and peri-urban areas. The present findings indicated that the participation of female household heads is lower than the male household head in both dairy production systems. This result is in line, with Woldemicheal (2008), who reported that 82% the household headed was male in the case of Shashemane, Hawassa, and Dale district's milk shed in Southern Ethiopia. This can partly be explained by the relatively better access to male heads to dairy knowledge and skill sources and other inputs required for dairy production. The age of respondents were also varied between a minimum 18 to maximum >65 years. In both study areas, the majority of household heads are in young couple age category 51% that is more likely to be powerful in handling the dairy production operations.

The survey result indicates that in (Table 1) the percentage family size of sampled household in the study area were single, small, medium and large size in urban and peri-urban dairy producers respectively with overall 32% medium and 53% small persons per families. The average household size observed in this study 53% was larger than that reported by Bekele *et al.* (2015) who reported the overall percentage household size of 35% in the area of Dangila Town, Western Amhara region, Ethiopia. In this study, the overall age of household is in working age. This indicates that family members in the productive age group are higher in both the urban and peri-urban dairy producers. Dairy farming is labour intensive tasks which need a labour force for the daily routine activities such as feeding, herding, fetching water, Cleaning & Dipping, milking and processing. Thus the availability of more family members has substantial importance in labour sharing of the dairy farming operations in a manageable way.

Generally, the educational level attained by the majority of the sampled household heads was low which fall between non-educated and primary school. However, in an urban dairy production, the higher proportion of education level of the household was secondary school and vocational. This is in line with Asaminew and Eyassu (2009) in Bahir Dar Zuria and Mecha Woredas, Northwestern Ethiopia, who stated that low level of education of household, can have negative effects on the development of the dairy sector. This evidenced by the low level of use/adoption of improved dairy husbandry practices such as cultivation of improved

forage, feeding animals based on physiological status and lack of well-organized system in the study area.

Comparing the education status of household heads in the urban and peri-urban dairy producers proportionately there were more non-educated in the peri-urban and writing and reading than in the urban because of households in peri-urban are highly involved in the farming activity than proceeding learning. Households who attended primary school was higher in the peri-urban (26%) than urban. but the proportion of household's secondary were 29% and 45.5% diploma and degree were higher in the urban dairy production (Table 1). This study is similar to Bekele *et al.* (2015) who reported that secondary school and above educational level were higher in urban as compared to peri-urban in Dangila Town, western Amhara Region. This indicates that level of education have an influential role in adopting of improved dairy technology/husbandry practices, to perform different dairying activities and to improve the productivity of the dairy farm by following scientific procedures.

Distance to market influences dairy value chain due to perishability nature of the product. The closer to the market the lesser would be the transportation cost and time spent goes to milk collection center and cooperative. The present finding indicated that distance of market place from home between urban and peri-urban dairy farming households were 1.4km-2.2km. far 34% in both study area. Therefore, the urban dairy farming households have a better advantage for marketing of minimizes milk spoilage. The highest sources of income in the urban households in peri-urban were obtained from the dairy product milk and butter. This is in line with, Berihanu (2012) reported that 10km and 23.3% of the household far from dairy cooperatives' in Wolayta zone, southern region, Ethiopia.

Dairy product transportation mode has also one of the most important things to minimizes milk spoilage then 62% % of stallholders dairy product producers were traveled by their foot, 36% by bicycle, the others used own vehicle, dairy producers are traveling with their milk From the production sites to the collection and dairy cooperative center to 1>2 kilometer. This observation was in agreement with the previous reported of 62% milk transport mode footed in Bahir Dar and Mecha district (AsaminewTassew, 2007) 54% milk was transported by Bicycle in Gambella region (Getawech Tang, 2012) Southern Ethiopia (Abebe Bereda *et al.*, 2013).

Dairy Value Chain Mapping enables to visualize the flow of the product from the conception of product design to end consumer through various actors (Schmitz and McCormick, 2002), The value chain map depicts the flow of dairy products in the market, activities carried out at each stage of the value chain, the structure of actors and the support involved in the value adding process. The direct actors play a crucial role in the dairy value chain and their major activities were identified as follow.

Dairy product consumers were individuals who use dairy products in their final stages and then type of dairy product highly consumed in the study area were (66% and 19%), raw milk and ghee, chees 22%. According to the survey result butter is used for various proposes in the study area such as baking, makeup used female household members, particularly those who living in urban study This finding is in line with the finding of Asaminew Tasew (2007) in Mecha and Bahir Dar area district.

Smallholder dairy producers as well as milk processors were operating. The flow of dairy goods and services among the main players is depicted in this value chain map in (Figure5) which starts with input supply and production and ends with consumption. Along the dairy value chain, the direct actors are essential, and their main functions have been identified. These results are in line with previous studies Amanda and Berihanu (2009). The focus of value chain framework is in developing an effective way of coordinating the hierarchical stages in the value chain to meet consumer demand in an efficient manner. Effective vertical coordination of value chain stages requires partnership, actor interactions, information flow along the chain and coordination of the activities of chain actors. Hence, the competitiveness of a value chain is greatly influenced by the partnership and collaboration for innovation that can be realized by chain actors. Moreover, the development and operation of enabling and supportive business development services like market information, transport, and credit play critical role in how well the value chain responds to consumer demands.

The available data in the study area indicates that neither of the study sites' urban or peri-urban dairy production systems had a formal, well-structured system for supplying enhanced feeds, improved dairy cows. The present finding was in agreement with the report of Geleti *et al.* (2014) which was conducted in peri-urban sites in Western Oromia, Ethiopia Overall, the feed supply for dairy cows in the study sites was not adequate enough and. The provision of artificial insemination and veterinary services in the urban production system was well

practiced whereas, in a peri-urban production system, the AI service was found discouraging. The study showed that shortage of land in urban dairy producers was a priority-challenge than peri-urban dairy producers. The larger proportions of urban dairy farmers keep the animals in their residential compound. Besides, the majority of the urban dairy farmers did not have sufficient land for forage cultivation. The credit services provision system was not satisfactory in both dairy production systems.

Value chain constraints in the present study area revealed that in both dairy production systems various dairy value chain constraints were identified which factors affecting to the value chain. The major constraints associated with input supply for dairy production are a shortage of improved feed and the high cost of feed. According to the respondents, there are different challenges in dairy production and marketing in both production systems. The identified constraints include a shortage of improved feeds, the high cost of feeds, poor market access and absence of dairy-led-cooperatives. This finding is in line with Nardos (2010) who reported that, shortage of feed, high costs of feeds, animal genetics, AI service delivery, accesses of veterinary drug, seasonal milk demand, lack of formal marketing systems, knowledge gap regarding improved dairying and access for credit for expansion were identified as constraints which could reduce the perception of dairy producers. Dairy production constraints offers animal diseases, lack of feed and incompetent management were found to be the main constraints to milk production are the most offended. The survey finding indicants that Animal diseases were highly dominated the constraints; animal genetics, infertility and poor management were among the issues raised by respondents. Smallholder dairy producers from every dairy production systems expressed additional concerns about the dearth of veterinary and artificial insemination services/fee).high demand market price for crossbred cows, but the supply does not keep up with the demand of dairy producers. This is in line with Nardos (2010) reported that, shortage of fee, milk demand seasonality, lack of formal marketing systems, limitations of land for sustainable dairy development, shortage of animal drug and high price, knowledge gap regarding improved dairying and access for credit for expansion., which leads them to reduce the dairy cow milk productivity.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

The study was aimed to assess dairy value chains and dairy production systems in urban and peri-urban dairy producers. Majority of the dairy producers in the study areas within the age of 31-45 years and male was the dominant gender in the production system. Majority of the respondents have a secondary education level. Dairy farming was the primary occupation in the study areas. In the study areas, the available land was mainly used for crop production. The primary reason to start dairy farming in the study areas was primarily to be used as an asset followed for food security. The main churning system in the study areas was manual using clay plot. Raw milk was the main product used in the study areas and cottage cheese was processed from whole milk. Hay and crop residue were the main feed resources in the study areas. Dairy products market information was obtained from development agents (Das) in the study areas. Raw milk was the major dairy product consumed in the study areas. Urban stallholder dairy producers were more focused on the market and have a more reliable source of income from dairy production. The major opportunities which can catalyze the development of dairy production in the study area such as livestock/dairy population, land access and labor force. The major constraints which influence the dairy value chains and dairy production are lack of marketing accesses during fasting period and shortage of improved feed, cost of feeds, low genetic potential and limited veterinary and artificial insemination services.

6.2. Recommendations

Based on the current study the following recommendations are for warded.

- ✓ It is recommended that dairy producers should receive progressive training related to quality control methods in dairy processing.
- ✓ Dairy production in the study area was challenged by animal disease, poor genetic potential, lack of credit and low availability and high cost of feeds. Therefore, farmers need to be supported with access to extension services to support feed production as well as training skills for feed conservations methods.

- ✓ The government should encourage private investors, individuals, and cooperatives to be involved in dairy production and processing by providing land for dairy farms, and access to credit with appropriate control.
- ✓ There was a few number of females' participants in the current dairy value chain and dairy production systems. Therefore, it should be needed/ for their intervention on improving female's involvement in dairy farming.

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