



**COMPARATIVE STUDY OF DAIRY PRODUCTION, MARKETING
SYSTEMS, CONSTRAINTS AND OPPORTUNITIES IN WONDO
GENET AND HAWASSA, SOUTHERN ETHIOPIA**

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Table of Contents

ACKNOWLEDGEMENT	ii
Table of Contents	iii
STATEMENT OF THE AUTHOR.....	vi
List of Abbreviations.....	vii
LIST OF TABLES	ix
ABSTRACT.....	x
1. INTRODUCTION.....	1
1.1. General Objectives.....	5
1.2. Specific Objectives	5
2. LITERATURE REVIEW	6
2.1. Cattle production systems in sub-Saharan Africa.....	6
2.1.1. Traditional production systems	6
2.1.2. Improved production systems	8
2.2. Overview of dairy Sector in Ethiopia	8
2.3. Dairy production systems in Ethiopia.....	10
2.3.1. Pastoralist.....	11
2.3.2. Urban and Peri-urban Dairy Farming.....	11
2.3.3. Highland Smallholder Dairy Farming	13
2.3.4. Intensive Dairy Farming	13
2.4. Dairy Cattle husbandry practices.....	14
2.4.1. Feeds and feeding systems.....	14
2.4.2. Water sources and frequency of watering.....	14
2.4.3. Housing system	15
2.4.4. Animal health	16
2.4.5. Breeds of dairy cows and Breeding practice.....	16
2.5. Milk and Dairy Products Consumption in Ethiopia.....	17
2.6. Dairy marketing systems in Ethiopia	18
2.7. Constraints of Dairy Production and Marketing in Ethiopia.....	20
2.8. Opportunities for the dairy farm production	21
3. MATERIALS AND METHODS	22
3.1. Description of the Study Areas.....	22

3.2. Methods of Data Collection.....	23
3.2.1. Sampling procedure and sampling size.....	23
3.3. Statistical Analysis.....	24
4. RESULTS	25
4.1. Socio-economic characteristics of the respondents	25
4.2. Labor division and production system	27
4.3 Livestock herd characteristics	29
4.4. Purpose of rearing cattle.....	30
4.5. Dairy Cattle husbandry practices.....	30
4.5.1. Feeds and feeding system	30
4.5.2. Water resources and watering practices.....	32
4.5.3. Housing system	33
4.5.4. Breeding practice and source of herd.	33
4.5.5. Milking practices	34
4.5.6. Animal health problem	34
4.6. Preference Cattle.....	35
4.7. Milk production and utilization	37
4.7.1. Production Performances.....	37
4.7.2. Utilization of milk	37
4.8. Dairy marketing systems	38
4.9. Constraints of dairy production	39
4.10. SWOT analysis	40
5. DISCUSSIONS	44
5.1. Socio-economic characteristics of the respondents	44
5.2. Socio demography of the respondents	44
5.3. Labor division and production system	45
5.4. Dairy Cattle herd characteristics.....	47
5.5. Purpose of Dairy cattle production	48
5.6. Dairy Cattle husbandry practices.....	48
5.6.1. Feeds and feeding systems.....	48
5.6.2. Water resources and watering practices.....	49
5.6.3. Housing system	50
5.6.4 Breeding practice and source of herd.	51

5.6.5. Milking and calf rearing practices.....	51
5.6.7. Animal health problem	52
5.6.8. Performance parameters of Dairy cattle	53
5.7. Milk production, utilization and marketing.....	53
5.8. Constraints of dairy production and marketing system.....	55
5.9. SWOT analysis	55
6. SUMMARY AND CONCLUSION	58
7. RECOMENDATIONS	59
8. REFERENCE.....	60
APPENDICES 1.....	76
BIOGRAPHY	85

STATEMENT OF THE AUTHOR

First of all, I declare that this thesis is my bonafide work and that all sources of materials used for this thesis have been duly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for an advanced (M.Sc.) degree at the Hawassa University and is deposited at the University Library to be made available to borrowers under rules of the Library.

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List of Abbreviations

AACCSA	Addis Ababa Chamber of Commerce & Sectoral Associations
AGP	Agricultural Growth Program
ASF	Animal Source Food
AWARDO	Awassa Woreda Agriculture and Rural Development Office
BOFED	Bureau of Finance and Economic Development
BOLF	Bureau of Livestock and Fisheries
CSA	Central Statistics Authority
DRDP	Dairy rehabilitation and development project
ESAP	Ethiopian Society of Animal Production
FAO	Food and Agricultural Organization
GDP	Gross Domestic Product
HF	Holstein Frisian
IPMS	Improving Productivity and Market Success
KG	Kilogram
LDMPS	Livestock Development Master Plan Study
LMD	Livestock Market Development
MASL	Meters Above Sea Level.
MOA	Ministry of Agriculture
NGO	Non Governmental Organization
RMA	Rapid Market Appraisal
SDDP	Smallholder Dairy Development Project
SAS	Statistical Analysis System
SPSS	Statistical Procedures for Social Sciences
SNNPRS	Southern Nations Nationalities and Peoples Regional State
SWOT	Strength weakness opportunity threats

UNIDO	United Nations Industrial Development Organization
USD	United State Dollar
WGARC	Wondo Genet Agricultural Research Center

LIST OF TABLES	pages
Table .1 Socio-demography of the Respondent households in the study areas.....	25
Table. 2 Family size and Age of the respondents in the study areas.....	26
Table. 3 Educational level of the respondents.....	27
Table. 4 Distribution of labor (%) among the respondents in the study areas.....	28
Table. 5 Prevailing production system (%) in the study areas.....	28
Table. 6 Characteristics of (Mean \pm SD) of the cattle reared in the study areas.....	29
Table. 7 Primary reasons for rearing cattle in the study areas.....	30
Table. 8 Feeding system in the study areas.....	31
Table. 9 Water source in the study areas.....	32
Table.10 Water Frequency (Mean \pm SD) to the cattle in the study areas (daily).....	33
Table.11 Herd replacements as indicated by the respondents in the study areas.....	34
Table.12 Disease prevalence in the study areas.....	35
Table.13 Preference cattle (%).....	36
Table.14 Performance parameters (Mean \pm SD) of the cattle reared in the study areas.	37
Table.15 Utilization of milk (liters) among the respondents in the study areas.....	38
Table.16 Actors in the marketing of milk in the study areas.....	38
Table.17 Marketing of milk as indicated by the respondents in the study areas.....	39
Table.18 The main constraint of dairy production system in the study areas.....	40

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ABSTRACT

A comparative study of dairy production and marketing systems, constraints and opportunities was carried out in Wondo Genet and Hawassa Area of Southern Ethiopia. The objective of the study was to identify and prioritize the strength, weakness, opportunities and threats pertaining to dairy production and marketing system in the study areas. Purposive samplings followed by random sampling process were employed to select representative kebeles and 120 households from Wondo Genet and Hawassa area. Rapid market appraisals (RMA) were employed in order to collect relevant data from the respective key informants at different stages. The data were analysed using descriptive statistics of SPSS. Three types of livestock production systems were identified in the district, namely irrigated agroforestry based production system, crop-livestock mixed farming and urban and per-urban production system. Average family size of dairy producers in study area was 6.11 ± 1.61 persons per household. Majority of the cattle owned by the sampled households were crossbreed. The average crossbreed milking cattle reared in the study area was 1.54 ± 62 . Major feed resources used by the households were sugar cane leaves, enset leaves; grass hay, crop residues (from teff, maize, barley and wheat), concentrates, industrial by-products. Some farmers also used non-conventional feed like atela, bole and salt. Vast numbers of the households in the study areas (93.7%) obtained the water from tap. Most of the households (76.2%) used AI for breeding practice and only few households used local bull (23.8%). The major disease of cattle identified in the current studied areas was mastitis (70%), Black leg (10.8%), lumpy skin (7.5%) and diarrhoea (5%). The average daily milk yields for local cow in the surveyed areas were 1.73 liters and for crossbreed 10.88 liters. The average amount of milk consumed at home, sold and processed in the study area was 2.68, 19.21 and 3.23 liters respectively. The dairy marketing system identified was entirely informal. Overall, price of dairy commodities were influenced by chat market, fasting days, distance from the market. This were reported to be a major factor that prohibited farmers from selling whole fresh milk to urban consumers and quality of dairy products. Dairy productions were constrained mostly by feed shortage, disease, lack of extension support and poor knowledge in animal management. Large human population and very high rate of urbanization, improved income in some segments of the society, the existence of various nongovernmental organization involved in dairy research and development across the different parts of the country is an opportunity to come up with a solution for challenges that constrain dairy production and for low uptake of dairy technologies in the country.

Key words: Dairy production, marketing, constraint, utilization, opportunity

1. INTRODUCTION

Ethiopia possesses one of the largest livestock populations in Africa. Estimates for livestock holding in the country as indicated by CSA (2015) are 56.71 million cattle, 29.33 million sheep, 29.11 million goats, 1.16 million camel and 56.87 million poultry. These estimates do not include livestock populations in the non-sedentary (nomadic) areas of the Afar and Somali regional states. The agricultural sector employs about 85% of the total population of Ethiopia. Livestock production is an integral part of Ethiopian agricultural system; the country remains heavily dependent upon agriculture, which currently contributes to 48.6% of GDP. The livestock sector contributes 19% of agricultural production by value (Dharani *et al.*, 2015).

Livestock are reared under different production systems viz. pastoralists, agro- pastoralists, and crop-livestock mixed farming system. Dairy production is one of the important (cornerstone) for the livestock economy in the country. Livestock contribute significantly to the livelihood of the agrarian community at large. In spite of large numbers of livestock, their contribution to the national economy is quite low (Girma, 2010). The small contribution of the livestock may be attributed to their genetic potential besides small animal husbandry skills and techniques, animal feed shortage and disease contribute to low productivity of the livestock (Dereje *et al.*, 2014).

In Ethiopia dairy production are synonymous to the cattle and followed by a minuscule amount of production coming from the camels and goats (CSA, 2015b). Dairy production is a biologically efficient system that converts large quantities of otherwise useless roughages to milk, which is one of the most nutritious foods for the mankind (Azage *et al.*, 2013). The dairy industry also occupies an important position among the livestock sectors due to four interrelated features: nutrition of the liquid milk, socio-economic condition of

majority of the farmers involved is small-scale producers, processing and marketing of the dairy products, and the cost of processing of the dairy products (Perera, 1999).

In spite of the large livestock population the dairy industry in the country is still in its infancy even when compared to those of the neighboring countries (Ayele and Peacock, 2003). The milk production of Ethiopia was 3.07 billion liters of cow milk and 233.85 million liters of camel milk in 2014/2015 fiscal year (CSA, 2015b). This translates to the average daily milk production and lactation length for a local cow is 1.35 liters and six months (CSA, 2015a). Consumption of dairy about 19 kg per capita per year. This is one of the lowest levels in Sub-Saharan Africa, due to economic and cultural factors. WHO recommends 175 kg (FAOSTAT, 2013). One of the conditions which are needed for the development of dairy sector in the country is the establishment of a proper milk collection, processing and marketing channel. Milk is an important source of minerals supporting growth and the high lactose content also seems to support growth due to a prebiotic effect and improved absorption of minerals. There is consensus that children with under nutrition should be treated with products with high milk content (Dror and Allen, 2011). The surplus milk is mainly processed using traditional technologies and the processed dairy products such as butter, ghee, ayib and sour milk are usually marketed through the informal channels (Tadese and Mengiste, 2016).

Although several efforts were made towards dairy development in the country, these along with various research projects are yet to make their mark and attain the desired goals (Sintayehu *et al.*, 2008). Most research and dairy intervention projects in the past were conducted within and/or around central parts of the country; besides some other urban and peri urban areas (Belay *et al.*, 2015). However, over the years there has been rapid population expansion in the country especially in areas adjoining regional towns and cities

likes Hawassa. Urbanization is also leading to increase in demand for milk and dairy products (Sintayehu *et al.*, 2008). Thus, the gap between demand and supply of the dairy products needs to be bridged based on socio-economic, institutional and agro-ecological related strategies (Azage *et al.*, 2013).

Though different classifications have been used to characterize the dairy production system in the country; based on their locations, Ahimed *et al.*, (2003) classified into three broad categories, namely, urban, per-urban and rural dairy production. One of the necessary conditions for increase in milk production is the provision of assured marketing outlets that are sufficiently remunerative to the producers. Experience of countries like India, Uganda and Kenya reveals. That private sector, including a large number of independent local traders, has taken an increasing role in local milk collection and trade in milk production to smallholders (Makoni *et al.*, 2014). Even in the long run, surplus milk can be processed into different dairy products for which can then earn foreign revenues. The efficacy of the overall milk production chain ends with the product being delivered hygienically to the end user, through an efficient milk marketing channel. To do so, policy makers, development organizations and private investors need to be appraised about the different aspects of the production system of the specific milk shed and the potentials and constraints of production and marketing conditions/systems existing in the country (Sintayehu *et al.*, 2008).

Different dairy development projects have also been launched over the years at different parts of the country. However, none of the projects were implemented in the milk shed areas of Wondo Genet district and peri urban areas of Hawassa (Dato kebele). These locations have large cattle population and most of the milk and dairy products from these areas are generally supplied to the consumers in Hawassa city.

Dairy development sector in Ethiopia are affected by several factors, including poor genetics that result in low production and low reproductive performance, poor quality and varying seasonal availability of feed, high disease incidence and parasite challenges, low accessibility of services and inputs, and lack of a well-organized marketing system, which is dominated by informal marketing. Unavailability and prohibitive prices of improved breeds, and Limiting institutional factors include poor linkages between technology sources such as research centres and end users, and limited extension and financial services (MOA, 2015).

South Nations Nationalities and Peoples Region is the third highest potential region of the country in livestock production having 11.04 million cattle population next to Oromia and Amhara which owns about 22.50 million and 14.22 million cattle population respectively (CSA, 2014). With average productivity of 1.65 liter per day per cow, the total annual milk yield in SNNPRS is 667, 562 tons (CSA, 2010), from which 88.6% is consumed at home, 2.29% is sold, 0.36 is paid in kind for wage and 8.73% is processed into other dairy derivatives (CSA, 2010). According to SNNPRS's BoA (2014), the total number of dairy cow is 4, 943, 854, from which 933, 225 tons of milk is produced per annum. Even if the area has immense potential for milk production and is the milk shed for the nearby cities like Hawassa, very little is known about the prevailing dairy production and marketing conditions. Strength, weakness, opportunities and threats of the dairy industry was assessed for the areas studied.

Therefore, in order to understand the SWOT analysis regarding the dairy development in the areas, it is imperative to understand the prevalent dairy production and marketing system prevailing in the study areas. Therefore, the study was conducted with the following objectives.

1.1. General Objectives

The general objective of the current study was to study dairy production and marketing systems, constraints and opportunities, in Wondo Genet and peri urban areas of Hawassa.

1.2. Specific Objectives

- To study the dairy production system in the two study areas
- To study the marketing system in the two study areas
- To prioritize the strength, weakness, opportunities and threats pertaining to dairy production and marketing system in the study areas.

2. LITERATURE REVIEW

2.1. Cattle production systems in sub-Saharan Africa

Cattle production systems have been intensified in many parts of developed and developing world. Average herd sizes have increased by process of combination of small units and an increase in purchased feed use. Livestock in Sub-Saharan Africa and in Ethiopia are often undervalued in terms of their potential for supporting overall economic development, poverty alleviation and the general well-being of an immense proportion of the population. In spite of the relatively low notice they are afforded, livestock are estimated to contribute directly supporting the livelihoods of 600 million smallholding farmers in the developing countries (Thornton, 2010).

Ethiopia is one of the Sub-Saharan Africa's countries with a large potential in livestock being 1st among African countries and 10th in the world. This livestock sector has been contributing considerable portion to the economy of the country and still promising to rally round Ethiopia economic development (CSA, 2015). Livestock also offers a certain degree of security in times of crop failure, as they are a "near-cash" capital stock. Furthermore, livestock provides farmyard manure that is commonly applied to improve soil fertility and also used as a source of energy (CSA, 2015). In sub Sahara Africa the livestock production systems can be divided into two broad types: traditional and improved production system (Thornton, 2010).

2.1.1. Traditional production systems

These systems include the pastoral, agro-pastoral and subsistence mixed crop-livestock production systems. In the pastoral system, relatively large herds of cattle are grazed on communal and public land. Because of seasonal scarcity of feed and water, cattle trek over long distances. In this system, cattle owners acquire minimal land holdings at the home

base. Pastoralists are unable to settle and take advantage of available production technology. The herd is dominating with unimproved Zebu animals and milk production is of subsistent type. It is mainly operating in the range lands where the peoples involved follow animal based life styles, which requires of them to move from place to place seasonally, based on feed and water availability. Livestock doesn't provide inputs for crop production but they are the very back bone of their owners providing all of the consumable and saleable outputs and regard as insurance against adversity, milk production is dependent on season due to the rainfall pattern that influenced feed availability. It is estimated that up to 60-70% of Africa's cattle population is within this system (Steinfeld *et al.*, 2010).

Agro-pastoralists own sizable pieces of land and practice integrated cop-livestock production. In this system, crop residues are utilized when feed is scarce but nutritional inadequacies remain. There is less than 10 percent of the total land area covered by crops (Steinfeld *et al.*, 2010). Transfer of technology is not easy. In spite of this, in a few countries farmers in this system are adapted to improved technologies. For example, addition of urea to crop residues was adapted in West Africa. Productivity, nevertheless, is below potential because animals are fed below the optimum level. Agro-pastoralists and pastoralists' production systems produce about 70% of the milk and meat in sub-Saharan Africa. As compared to the above system, this system has better consideration for milk market and its access for additional inputs such as animal health services and supplementary feed from industrial by products and development of forage to calves and milking cows near to the newly started farm land to some extent (Zegeye, 2003).

2.1.2. Improved production systems

This category is characterized by high inputs. These are market-oriented production systems in which farmers adopted improved technology to optimize productivity. These systems are increasingly popular in eastern and southern Africa. Producers usually own less than 10 cows and about 2-4 hectares of land with intensive crop-livestock production (Ibrahim and Olaloku, 2000). There are also large-scale commercial livestock keeping in peri-urban areas targeted to respond to the demand of urban consumers and depends on high level of purchased feeds, including by-products from agro processing industries. In contrast, small- scale livestock keeping by poorer urban dwellers offers supplementary source of income, as well as source of animal protein, which the families could otherwise not afford to buy. Peri-urban and urban livestock-keeping systems have a potentially important role to play in disposing of organic waste, which otherwise could endanger human health, and converting it into useful products (Ibrahim and Olaloku, 2000). Due to high population densities and animal stocking rates, as well as easy access to markets it posses, the system become attractive to invest in market-oriented dairy production technologies in peri-urban areas (Tangka *et al.*, 2002).

2.2. Overview of dairy Sector in Ethiopia

Livestock population of the country that reaches more than 80 million heads is the largest in Africa and the 10th in the world (Temesgen *et al.*, 2014). Next to crop production, the livestock sector has a great potential to assist the socio-economic development and transformation of the country (Tadesse, 2014). Livestock production systems are considered as a subset of the farming systems, including cases in which livestock contribute (31%) of the total gross value of livestock output is represented by the value of animal draught power as an input into crop cultivation or where intermediate contributions

the value of the animal draught power input into arable production is about a quarter (26.4%) of the value of annual crop production (Roy, 2013).

About 60-70% of the population's livelihoods dependent on livestock in one way or another, the majority of Ethiopians are stakeholders in the success of the livestock sector, and in the environmental systems that support livestock production. Of the total population, 35- 40 % of all livestock are located in the pastoral areas (Behnke, 2010). Female cattle constitute about 55.38% of the national herd. Of the total 57.83 million of the cattle population, there are 6.74 million dairy cows and 11.34 million of milking cows in Ethiopia (CSA, 2016). Eighty-three percent of all milk produced in Ethiopia comes from cattle with the remainder coming from goats and camels. Sheep's milk is consumed only in certain parts of the country (MOA, 2015).

In 2014/2015 fiscal year, 3.07 billion liters of cow milk and 233.85 million liters of camel milk were produced (CSA, 2015b). Based on recent surveys the total milk production has increased significantly (3%) from what it has been reported by CSA for the year 2000. CSA, (2012) indicated that total annual national milk production in Ethiopia comes from about 10 million milking cows and is estimated to be 3.2 billion liters that is, 1.54 L/cow on average. Whereas agricultural Sample survey result of 2007 (CSA, 2010) had result of 2.76 billion litres. However, according to the forecast of FAO, the annual milk production is far below the survey made by CSA. The recommended per capita milk consumption according to FAO/WHO is 200 liters per capita per annum. The average per capita consumption of milk in Sub-Saharan African is 25kg, where as our neighbor Kenya is consuming about 90 kg and global average is 175 kg. Comparatively Ethiopia's per capita milk consumption is estimated to be about 19 kg. There is increasing population with improved disposable income at some sectors of the society, especially in the growing urban

areas, to absorb the produce. Despite the different technological advances and increasing efforts of the government, the private sector as well as bilateral, international and development oriented NGO's involvement, the change expected could not be realized and is frustrating (SNV, 2009).

2.3. Dairy production systems in Ethiopia

Dairy production system is the most biologically efficient system that converts large quantities of roughage, the most abundant feed in the tropics, to milk, the most nutritious food known to man (Belete, 2006). Dairy production is a critical issue in Ethiopia, a livestock-based society where livestock, its products are more important sources of food and income, yet dairying has not been fully exploited and promoted. The greatest potential for few technologies in dairying is expected in the highlands of Ethiopia and other Sub-Saharan Africa and Asian countries, due to low disease pressure and good agro-climatic conditions for the cultivation of feeds (Tangka *et al.*, 2002).

Dairying is practiced almost all over Ethiopia involving a vast number of small, medium and large-sized; and subsistence market-oriented farms. Based on climate, land holdings and integration with crop production as criterion, dairy production systems are recognized in Ethiopia; namely the rural dairy system which is part of the subsistence farming system includes pastoralists, agro-pastoralists, and mixed crop-livestock producers; the peri-urban and urban dairy systems (Dereje *et al.*, 2005). The first system (pastoralism, agropastoralism and highland mixed smallholder production system) contributes to 98%, while the peri-urban and urban dairy farms produce only 2% of the total milk production of the country (AACCSA, 2015).

2.3.1. Pastoralist

Livestock and milk production in pastoral systems is primarily dependent on natural pasture located on non-arable rain fed lands (Hussen *et al.*, 2008). Even though information on both absolute numbers and distribution vary, it is estimated that about 30% of the livestock populations are found in the pastoral areas (Belete, 2006). Households are estimated to collect 5 liters per cow (wet season) and 2.5 liters per cow (dry season) of cattle milk and 13 liters per day (wet season) and 8 liters per day (dry season) under this production system. The herd is dominating with unimproved Zebu animals and milk production is of subsistent type (Hussen *et al.*, 2008).

2.3.2. Urban and Peri-urban Dairy Farming

Urban dairy farming is a system involving highly specialized farms, which are mainly concentrated in or around major cities of the country. They have no access to grazing land. Currently, a number of smallholder commercial dairy farms are emerging mainly in the urban and peri-urban areas of the capital including most regional towns districts (Nigussie, 2006). Smallholder rural dairy farms are also increasing in number in areas where there is market access. According to Reddy and Nagala (2016), the urban milk system in Addis Ababa consists of 5167 small, medium and large dairy farms producing 35 million liters of milk annually. Of the total urban milk production, 73% is sold, 10% is left for household consumption, 9.4% goes to calves and 7.6% is processed into butter and *ayib* (cottage). In terms of marketing, 71% of the producers sell milk directly to consumers (SNV, 2009).

Peri-urban milk production is developed in areas where the population density is high and agricultural land is shrinking due to urbanization around big cities like Addis Ababa. It possesses animal types ranging from 50% crosses to high grade Friesian in small to medium-sized farms. The peri-urban milk system includes smallholder and commercial dairy farmers in the proximity of Addis Ababa and other regional towns. This sector owns

most of the country's improved dairy stock (Tsehay, 2001). The primary objective of peri-urban milk production is to generate income from milk sale and main source of feed is both home produced or purchased hay. Peri-urban milk production have an access to grazing land, which produces part of the remaining feed in the form of crop. This production system is now expanding in the highlands among mixed crop–livestock farmers, such as those found in Selale and Holetta, and serves as the major milk supplier to the urban market (Azage, *et al.*, 2013).

2.3.2.1. Commercial small scale

The main distinguishing feature of these units is a substantial family labor input in addition to the hired labor. Popular system of management is by confinement in the backyard, particularly for households with in city centers. The units located within or close to major cities, have herd sizes of few cows, kept under an intensive zero-grazing or semi-intensive regime (Azage *et al.*, 2013). In urban and peri-urban area of secondary towns, dairy herd are grazed on owned or rented land and public open fields. Financial inputs go towards the purchase of improved crossbred animals, production of farm-grown fodder where land is available, purchase of supplementary feeds, payment for veterinary services and hired labor (Nyapendi *et al.*, 2004). Milk is marketed through formal and organized co-operatives, as well as through informal channels to local traders and individual consumers (Tegegne *et al.*, 2013).

2.3.2.2. Commercial large scale

This type of farming system is completely commercial with little or no family input except at management level. Parastatals in many countries practice this system. The farm units are usually situated at the outskirts of towns and cities, where land is available for growing fodder, which constitutes the main feed source, supplemented with purchased concentrates (Azage *et al.*, 2009). The system is labor and inputs intensive as compared to the other

systems. Most of the feed sources are based on purchase and some part of the feed requirement being fulfilled from own source (LDMPS, 2006). The potential for significantly increasing dairy production in Ethiopia lies with the commercial market oriented production systems in the central highlands in which crossbred and pure exotic dairy breeds can be used (UNIDO, 2009).

2.3.3. Highland Smallholder Dairy Farming

The Ethiopian highlands possess a huge potential for dairy development. These areas occupy the central part of Ethiopia and cover about 40% of the country's land area (approximately 490,000 km²) (Belete *et al.*, 2010). The smallholder milk production system is dominated by subsistence farming (Asaminew, 2007). Approximately 75% of the livestock population is held by smallholders in the Highlands. Cattle are used for milk production and animal traction. It becomes important source of house hold income in Ethiopia. The average milk production can range from 400 to 600 lt for a two hundred day lactation period (2 - 3 lt/day/head). However, the sector is agonized by several problems like poor quality and quantity of feed resource, lack of appropriate feeding system, poor production and reproduction traits, low productive and reproductive performance, economic and technical problems (Yoseph, 1999). About 93% of the total milk production in Ethiopia is produced by the smallholder dairy farmers living in the villages and exercising, in most instances, traditional dairying. This sector also produces 90% of the overall agriculture output in the country (CSA, 2015).

2.3.4. Intensive Dairy Farming

The most specialized and high-tech system is intensive milk production system. It is practiced by, state sector and very few individuals on commercial basis (Welearegay *et al.*, 2012; Tegegne *et al.*, 2013). Farmers use part or all of their land to grow fodder crops for their dairy cattle. The dairy animals do not provide draft, but their manure is used as

fertilizer on crops, milk is the main source of farm income. It is mainly undertaken by small farmers using family labor, but commercial farmers using hired labor also practices this system on a large scale. In the intensive management system, exotic breeds or crossbred animals are mainly kept for their high performance (Tegegne *et al.*, 2013).

2.4. Dairy Cattle husbandry practices

2.4.1. Feeds and feeding systems

Feeding of livestock in different places differs depending on forage availability, climatic variability of a given location or region to mitigate feed shortage problems during worse conditions, season of the year and type of animal the owner prioritize to feed (Beyene *et al.*, 2011). In Ethiopia Livestock feed resources are mainly natural grazing lands and browses, crop residues, pasture, forage crop and agro-industrial by products. Feeding systems include communal or private natural grazing and browsing, cut and carry feeding, hay and crop residues. At present, livestock are fed almost entirely on natural pasture and crop-residues. Use of improved forages and agro-industrial by products is minimal and most of agro industrial by-products are concentrated in urban and peri-urban areas (Tesfaye, 2008). Under urban livestock production system the land is at premium and hence communal grazing land is usually unavailable (Zena, 2011). Thus, dairy producers are mostly dependent on cut and carry system to feed their cattle (Hailemikael *et al.*, 2016). Crop residues and agro industrial byproducts usually are poor in quality and need to be enriched with good quality feed (Azage *et al.*, 2013). Therefore, the ration provided to the cattle is usually not balanced and hence the optimum productivity of the cattle may not be realized (Mekuria, 2016).

2.4.2. Water sources and frequency of watering

According to Zena (2011) the main water source for the cattle are tap water in Harar. Regarding the accessibility of the water, almost all of the interviewed dairy producers in

the study area responded that they had access to water throughout the year. Also Endale (2015) reported that about 99% of the respondents around Ginchi area indicated that there was no shortage of water for both domestic and livestock watering and during the dry and small rainy seasons. Milk is composed of nearly 87% water. An adequate supply of quality water for dairy cattle is extremely important. Farmers typically provide cows with free access to fresh water at all times. The water requirements of lactating cows are closely related to milk production, moisture content in the feed and environmental factors such as air temperature and humidity. The cow's peak water intake generally occurs during the hours of greatest feed intake (MOA, 2007). However, watering frequency to dairy animals is varies from one production system to another, due to the factors such as season of the year, accessibility of the water sources, feeds and feeding system applied (Gatwech 2012). The crossbred cattle are provided water at a higher frequency when compared with their local counterparts which is in close accordance with the observations of (Tsadkan, 2012). It has also been reported that the crossbred cattle are unable to withstand the vagaries of nature when compared to the local cattle and hence need to be provided with water more frequently when compared to the local cattle (Zinash, 2015).

2.4.3. Housing system

Housing or confinement of livestock has many important effects on production, and in the tropics various types of housing could be seen. Many of the management aspects such as feeding, breeding, disease control and labor inputs is invariably influenced by the type of housing. Findings of a study by (Tsegay *et al.*, 2015) indicate that proper housing is important for protection of the livestock against vagaries of nature. Proper housing also helps the cattle to protect the owners against zoonotic diseases especially tuberculosis (Tsegay *et al.*, 2015). Whether cows are housed in cubicles, straw yards or cow sheds in order to maximise performance of the cows and to ensure satisfactory standards of welfare

the accommodation must provide for the cows most basic needs. As an absolute minimum, the housing must provide a comfortable, clean, well drained and dry lying area together with shelter from adverse weather. It must also allow the animal to move freely around without risk of injury (Bowell *et al.*, 2003).

2.4.4. Animal health

Diseases in dairy animals affect reproduction, milk production, milk quality and cause mortality and morbidity (Tegegne *et al.*, 2013). Keeping the sanitation of animals and their house is one of the herd health management techniques (Tsadikan, 2012). Mastites, Blackleg, Bloat and Parasites are the major Diseases affecting livestock production and productivity in the area of Chench and Kucha (Minale and Yilkal, 2015). They indicated that the effect is more severe during summer and spring seasons because in those periods, the environment is conducive for different parasites and microbes reproduction (Tsegay, 2015). Control of diseases, which are transmissible from cattle to humans, spread through vectors or wild animals, or epizootic diseases is normally the responsibility of governments and international agencies. The control of other diseases and parasites is the responsibility of herd owners. Vaccination programs against endemic diseases are usually required by national laws which should be strictly followed by dairy farmers, co-operative and dairy organizations (Tsegay, 2015). The cattle producers therefore should be trained by the livestock extension personnel for the identification of different economically important diseases. There can be a provision of establishment of para veterinarians amongst the community members who can at least administer the preliminary veterinary care to the animals (Rushton, 2009).

2.4.5. Breeds of dairy cows and Breeding practice

In Ethiopia indigenous animals are the dominant source of milk across all the production systems with the exception of urban and peri-urban dairy system where improved

crossbreeds have significant contribution (Tegegne *et al.*, 2013). Most of the smallholder dairy farmers in Hawassa and Debre Birhan cities had Holstein Friesian cross breed with local Ethiopian zebu, but there were few pure local breeds too (Mekuria, 2016). Pure exotic breed is not common in dairy farm practice, except few large scale dairy farms of government institutions and private dairy plants (Mekuria, 2016). The findings indicate that most of the respondents (across the study areas) prefer artificial insemination (AI) for their cattle in Harar (Zena, 2011). In urban and peri-urban dairying production is to flourish, access to improved genetic material through improved AI or breeding service is critical.

2.5. Milk and Dairy Products Consumption in Ethiopia

In the Ethiopian context when dealing with consumption of milk and safety of milk and dairy products the type of milk and dairy products that needs to be considered are whole milk consumption (liquid milk, Ergo, buttermilk etc) and use of dairy products from fermented processing (butter, ghee, Ayib, etc.), (Ayenew *et al.*, 2009; LMD, 2013b). Consumption pattern of milk and milk products produced at home varies depending upon the amount of milk produced per household, dairy production system and market access, season of the year, and fasting period (particularly for the followers of Orthodox Christianity) (Tegegne *et al.*, 2013).

According to the Annual Agricultural Sample Survey for 2014/2015 of livestock product utilization, 46.36% of the total annual milk production is consumed in the household; 47.33% is processed to butter (35.49% of which is sold) local cheeses (15.22% of which is sold) and other products; and only 5.98% is sold as fluid milk (CSA, 2015a).

The growth in milk production in Ethiopia has been slow. The total volume of milk produced in Ethiopia increased over the last 15 years from less than 1 billion litres to 3.06

billion litres in 2015/16 (CSA, 2016). During this time, the growth rate in national milk production has been less than the growth rate in human population. The decreased consumption is attributed to the higher growth rate of the human population compared to the increase in milk production. The annual average per capita consumption of milk in Ethiopia is the lowest in the world i.e., 17 kg AGP-LMD, (2013b).

Survey results conducted by LMD project show the average per capita consumption for four towns (Addis, Bahir Dar, Hawassa and Dire Dawa) to be 28.86 litres per annum. The consumption in Addis Ababa is very high (51.85 litres) as compared to the national and other towns (AACCSA, 2016). The rural population is estimated to be 85% of the total population and its milk consumption largely depends on livestock holding. In the mixed highland region, it is estimated that 50% of households own cattle of which 56% are dairy cattle. Consequently, most households have access to milk. Similarly, 80% of the households in the lowlands own cattle, significant numbers of small ruminants and camels. In this area, it is likely that all households consume milk.

2.6. Dairy marketing systems in Ethiopia

In the African context, markets for agricultural products would normally refer to marketplaces (open spaces where commodities are traded). Conceptually, however, a market can be visualized as a process in which ownership of goods is transferred from sellers to buyers who may be final consumers or intermediaries. In Ethiopia, dairy products (fresh milk, butter, buttermilk and cottage types of cheese) are distributed through the informal and formal marketing systems. In the dominant informal marketing system, producers sell to consumers directly or to unlicensed traders or retailers (Yilma *et al.*, 2011). Price is usually set through negotiation between the producer (seller) and the buyer; this system is predominant in the rural dairy production system (Tegegne *et al.*, 2013). In

both rural and urban parts of the country, milk is distributed from producers through the informal (traditional) means.

In the formal marketing system there are cooperatives and private milk collecting and processing plants that receive milk from producers and channel to consumers, caterers, supermarkets and retailers (Tegegne *et al.*, 2013). Studies have indicated that milk marketing groups and dairy cooperatives play a key role for milk marketing outlets, which as a result encourages farmers to rear more cows and thereby leads to increase in milk yield (Zegeye, 2003). The only organized and formal milk marketing and distribution system comes from the several big and small milk-processing plants which are located in Addis Ababa, and even in regional cities like, Hawassa and Dire Dawa.

According to Tsehay (2002), a milk-marketing group can be defined as a group of smallholder farmers who rear cows and can have at least one liter of saleable milk and are willing to form groups with the objective of collectively processing and marketing milk. Studies by Berhane and Workneh (2003) indicated the very useful involvement of the government of India at every step of the development for expansion of dairy cooperatives in the country for the successes of dairying and suggested that the Anand pattern of dairy development. The milk marketing sheds can be established at least around some of the major milk sheds in Ethiopia, viz. Nazareth, Dire Dawa, Harar, Bahir Dar, Jimma and Assela. Dairy cooperatives can help to trigger a series of positive developments in the subsector; hence strengthening the existing group marketing activities and formation of new cooperatives in different parts of the country (Berhane and Workneh, 2003). Cooperatives play a significant role in ensuring sustainable supply of raw milk to the dairy industry by coordinating the flow of milk from their members and assisting them by supplying the required dairy farm inputs (Misganaw *et al.*, 2017). It is known that

establishment of cooperatives can minimize the transaction cost of the dairy produce besides facilitating the small holder farmers to enter the market. Findings of a study by Zegeye (2003) indicate that the farmers group and the cooperatives can, play important roles towards establishment of milk marketing outlets, which on the other hand encourages farmers to produce more.

2.7. Constraints of Dairy Production and Marketing in Ethiopia

The livestock sub sector in general and the dairy sub sector in particular do not make a required level of contribution to the national income considering its size. The structure and performance of livestock and its products marketing both for domestic consumption and for export is generally perceived low in Ethiopia. Underdevelopment and lack of market-oriented production, inadequate permanent trade routes and other facilities like feeds, water, holding grounds, lack or non-provision of transport, ineffectiveness and inadequate infrastructural and institutional set-ups, prevalence of diseases, illegal trade and inadequate market information (internal and external) are generally mentioned as some of the major reasons for the poor performance of this sector (Ayele *et al.*, 2003). The reasons for this sub optimum performance are numerous and including Technical, institutional and policy-related constraints (Azage *et al.*, 2013).

In general, dairy production in Sub Saharan Africa is characterized by low milk yields. In comparison to production levels in other regions, milk yields in Africa have been reported to be 2.5 times lower than in Latin America and Asia, 10 times lower than in Europe, and 15 times lower than in North America (Smith and Olaloku, 1998). Technical constraints responsible for such low productivity revolve around three factors: 1) Feed availability and quality: seasonal quantitative and qualitative feed shortages, 2) Poor livestock health: poor

veterinary health care and management, 3) Low genetic potential for milk production and unavailability of supply of improved genotype.

2.8. Opportunities for the dairy farm production

The government of the Ethiopia has now giving a number of opportunities for dairy production in the country. For instance, commercial feed and fodder production i.e. high price for fodder and fertile soil create opportunities for specialized farms that grow a fodder crops such as Alfalfa and Maize in both highlands and lowland areas; Supplying the concentrate, introduce new fodder crops and grass varieties, combined with improved cultivation, harvesting and conservation techniques. And also the other opportunities that help for improvement of production and productivity for dairy farms of the country such as; supplying young stock, AI services and upgrading the genetics, controlling and monitoring animal health, cattle housing-design and farm equipment for milking are some of the opportunities that are given in the country now a day (Zijlstra, j. *et al.*, 2015). High demand of milk and dairy products, increasing population growth and urbanization, improving income of the society in relation to increasing economic growth of the country, establishment of new livestock and Fishery ministry could be opportunities for dairy production.

3. MATERIALS AND METHODS

3.1. Description of the Study Areas

The study was conducted in Wondo Genet woreda of Sidama zone, Southern Nations Nationalities and Peoples Regional State (SNNPRS) of Ethiopia and Dato Kebele Hawella Tulla Sub City of Hawassa. Wondo Genet is located 264 km south of Addis Ababa and 14 km southeast of Shashemene. It is situated between $7^{\circ}5.9' - 7^{\circ}6'$ N latitudes and $38^{\circ}37' - 38^{\circ}37.8'$ E longitudes. The altitude ranges between 1,760 m and 1,920 m above sea level (ASL). The average annual temperature of the district is 19°C . The minimum and maximum temperature is 11.5°C and 26.2°C respectively. The average annual rainfall is 1,372mm whereas 709 and 2,062.1mm is the minimum and maximum annual rainfall recorded in the district respectively (WGARC, 2009). The total human population of the district was estimated to be 152,392 heads (CSA, 2011), which is unevenly distributed in rural and urban areas.

Wondo Genet has a bimodal rainfall distribution with two rainy seasons. Short rains occur during March-May and the long rains in July-October. The dry season extends from November to February. Agriculture is both rain fed and seasonally irrigated. The main land use of the area is dominated by rain fed agriculture and irrigation based agro-forestry practices like coffee, enset, avocado, banana, sugarcane and chat plantations. Income sources of most residents in the area are mostly chat farming. However, it is known that some kebeles viz. Wosha Soyama, Wotara Kachama, Chuko 01, Aruma and Yuwo kebeles have potential for dairy production. The types of livestock reared are cattle, small ruminants and equines.

Hawassa is the capital city of Southern Nations Nationalities and People's Regional State (SNNPRS). It is situated at 275 km away from Addis Ababa and 1125 km North of Nairobi (Adise Anito, 2014). It is situated at an altitude of 1750 masl and is located at $6^{\circ}83'$ to

7°17' N and 38°24' to 38°72' E (AWARDO, 2006). Hawassa area has a mean annual precipitation of about 1062mm. The mean minimum precipitation is 21 mm in December during the dry season and the mean maximum precipitation is 128mm in July, during the rainy season. Temperatures vary between 19°C in July and 22°C in April. The livestock resource of the city administration in (2011) was 61,123 cattle, 14,764 sheep, 17735 goats, 5,544 equines and 56,961 poultry.

3.2. Methods of Data Collection

3.2.1. Sampling procedure and sampling size

The study had two parts, where the first part focused on assessing the production system prevailing in the two locations. In order to assess the same, step wise purposive sampling followed by random sampling process were involved. The kebeles within the two locations where the population of the cows are highest were selected with the help of the authorities from the Bureau of Agriculture. From the selected kebeles participants who own at least two cows and involved in the dairy farming for the last five years were identified. This procedure was replicated in both the studied locations thereby making 120 farmers in all.

Marketing of the possible marketable dairy commodities like whole milk, cheese and sour buttermilk (arera) was studied as the second activity. Rapid market appraisal (RMA) (Miles, 2000) was employed in order to collect data from the respective key informants at different stages (milk producers, dairy traders and consumers). Separate semi-structured informal interview following the guideline (checklists) were used for each group of key observers. Prior to conducting the RMA on the different marketing agents was conducted to count the number of permanent milk and milk product sellers at each of the selected kebeles. The information for the same too was obtained from the authorities of the Bureau of Agriculture.

The SWOT analysis was conducted in both the places with 20 households per location (Wondo Genet and Hawassa). The households were selected randomly from the earlier identified households. The SWOT analysis for each individual household was conducted according to the procedure suggested by (kime, 2017). The people involved in the SWOT analysis at the household levels include all members of the family (who are associated with dairy husbandry and marketing of milk) so as to get a clear picture at the household level. Two groups of household heads comprising of 5 farmers each were participated in the SWOT analysis at Kebele level. Checklist was prepared so that the discussions do not deviate much from the intended questions.

3.3. Statistical Analysis

Data collected for the characterization of dairy production and marketing systems were analysed using appropriate statistical software such as Statistical Procedures for Social Sciences (SPSS) and Statistical Analysis System (SAS). Survey results were reported using descriptive and inferential statistics. Statistical analysis such as correlations and mean comparisons were made for some variables of interest. Mean comparisons were made using Duncan's multiple range tests. Levels of significance were considered at $P < 0.05$. Data related with pricing, collected for the characterization of dairy marketing system, were analysed using descriptive statistics of SPSS and the data collected with RMA were reported with flow charts and summarized discussions

$$\text{Model: } Y_{ij} = a_i + b_j + c_{ij} + e_{ij}$$

Where a_i = effect of location on milk production 1= Hawassa; 2= Wondo Genet

b_j = different constraints associated with milk marketing

c_{ij} = location specific constraint on milk production and marketing constraints

e_{ij} = random error associated with milk yield and production

4. RESULTS

4.1. Socio-economic characteristics of the respondents

The results show that most of the respondents were males and also the households were male headed across both the studied locations. The findings also indicated that at Wondo Genet most of the respondents were farmers contrary to the same majority of the respondents residing at Hawassa were traders.

Table 1: Socio-demography of the Respondent households in the study areas

Variable	Wondo Genet	Hawassa	Total	p-value
Sex	%	%	%	
Female	20	20	20	
Male	80	80	80	
Total	100	100	100	0.601
Headed by				
Female	20	17.5	19.2	
Male	80	82.5	80.8	
Total	100	100	100	0.474
Major occupation				
Farmer	61.2	22.5	48.3	
Daily labor	1.2	5	2.5	
Trader	33.8	65	44.2	
Public servant	3.8	7.5	5	
Total	100	100	100	0.001

The findings as presented in Table 2 show that the most of the respondents belonged to age group which was between 11-25 with very few of them who belonged to higher age categories.

Table 2: Family size and Age of the respondents in the study areas

Variables	Wondo Genet		Hawassa		Total	
	N	Mean ±SD	N	Mean ±SD	N	Mean ±SD
Age >10 yrs	77	2.36±0.98	39	2.49±1.02	116	2.40±0.99
Age (11-25 yrs)	74	2.15±1.22	37	2.08±1.19	111	2.13±1.21
Age (26-40 yrs)	76	1.22±0.70	39	1.10±0.30	115	1.18±0.60
Age >40 yrs	54	1.02±0.14	26	1.00±0.00	80	1.01±0.11
Total numbers of households	80	6.12±1.65	40	6.10±1.56	120	6.11±1.61

As indicated in Table 3, differences among the respondents when it came to their educational qualifications. The study further indicates that most of the respondents in both areas were high school graduates while illiterate respondents were also recorded at Wondo Genet. The majority of urban dairy producer household heads were literate and beyond high school. While some household heads did not attend any level of schooling. The results in general indicate that dairy cattle owners in the study areas were mainly literate suggesting that with good extension and training program they can improve their dairy production and marketing.

Table 3: Educational level of the respondents

	Wondo Genet	Hawassa
Parameter	%	%
Illiterate	13.8	-
Primary school	23.8	-
Junior school	21.2	30
High school	33.8	50
Graduate	3.8	7.5
Read and write	2.5	-
TVET/ATVET	1.2	12.5
Total	100	100

4.2. Labor division and production system

The results from Table 4 pertain to the distribution of labor among the respondents when it comes to the day to day husbandry practices when it comes to the study areas. The procurement of cattle sale, breeding and nursing of sick cattle were basically the domain of the males (>15 years of age) while the grazing of the cattle were generally carried out by the males/ boys Wondo Genet while the same was carried out by females (>15 years of age) at Hawassa. The farm activities that were solely in the domain of the females (>15 years of age) were, collection of feed, milking, processing and selling of the dairy products.

prevailed at Hawassa, it was irrigated agro forestry based production system at Wondo Genet followed by crop livestock production system.

Table 6. Characteristics (Mean \pm SD) of the cattle reared in the study areas

	Wondo Genet		Hawassa		Total	
Types of cattle (TLU)	N		N		N	
Local cattle (TLU)						
Milking cow	18	0.82 \pm 0.36	9	0.78 \pm 0.23	27	0.80 \pm 0.32
Dry cow	8	0.70 \pm 0.00	3	0.70 \pm 0.00	11	0.70 \pm 0.00
Bulls	4	1.00 \pm 0.00	1	1.00 \pm 0.00	5	1.00 \pm 0.00
Heifer	6	0.67 \pm 0.26	3	0.66 \pm 0.28	9	0.67 \pm 0.25
Bull calves	7	0.20 \pm 0.00	3	0.20 \pm 0.00	10	0.20 \pm 0.00
Cow calves	12	0.22 \pm 0.05	5	0.20 \pm 0.00	17	0.21 \pm 0.04
Crossbred cattle(TLU)						
Milking cow	79	1.56 \pm 0.62	40	1.50 \pm 0.62	119	1.54 \pm 0.62
Dry cow	41	0.84 \pm 0.42	18	0.82 \pm 0.27	59	0.83 \pm 0.38
Bulls	9	1.00 \pm 0.00	6	1.00 \pm 0.00	15	1.00 \pm 0.00
Heifer	38	0.60 \pm 0.19	21	0.58 \pm 0.20	59	0.59 \pm 0.20
Bull calves	47	0.22 \pm 0.05	19	0.20 \pm 0.00	66	0.21 \pm 0.05
Cow calves	70	0.35 \pm 0.13	34	0.39 \pm 0.14	104	0.36 \pm 0.13

1TLU =1 Bull, 0.7 Cow, 0.5 Heifer, 0.2 Calves

4.3 Livestock herd characteristics

The results as presented in Table 6 indicate the herd characteristics prevailing in the two locations. The findings show that in the herd of indigenes cattle reared in both the locations the numbers of Bulles were higher followed by those of the milking cows. The findings

pertaining to crossbred cattle indicate that the highest numbers of cattle were milking cows followed by those of Bulles which were similar across both the areas studied.

4.4. Purpose of rearing cattle

The results pertaining to the reason for which the cattle are reared are consistent across both the locations i.e for income generation followed by milk production. The findings also show that a cattle rearing is a relatively new profession with most of the respondents rearing cattle for less than 10 years followed by those who are doing so for less than 15 years.

Table 7. Primary reasons for rearing cattle in the study areas (%)

Reason of rearing cattle	Wondo Genet	Hawassa	Total
Income generation	82.5	95	86.7
Milk production for consume	17.5	5	13.3
Over all	100	100	100
Experience of cattle rearing			
< 10 years	53.8	55	54.2
<15 years	40	40	40
>15 years	6.2	5	5.8
Over all	100	100	100

4.5. Dairy Cattle husbandry practices

4.5.1. Feeds and feeding system

The major feed resources available for cattle in the study area include agricultural byproducts viz. sugar cane leaves, enset (false banana) leaves, stem and roots of false banana, crop residues (from teff, maize, barley and wheat). Some farmers also use non-conventional feed like Attela (local brewery byproduct), bole (mineral soil) and salt. In Wondo Genet 40% of the farmers' plant improved forage. The study further indicates that most of the respondents do not have access to improved forages especially at Hawassa

where land is at premium. The study further shows that at Wondo Genet most of the respondents preferred to provide their cattle on grazing, hay and concentrate while at Hawassa it was grazing followed by crop residues and concentrates. The study also indicated that most of the respondents also provided vitamin and mineral supplements to their cattle. The results also showed that most of the respondents at Wondo Genet used temporary manger made of use truck tyres followed by those providing feed in cemented troughs while the reverse was true for Hawassa. In the study area, supplementary feed was mainly given to lactating cows and pregnant cows.

Table 8. Feeding system in the study areas (%)

Variable	Wondo Genet	Hawassa	Total
Plant improved forages	40	-	26.7
Non plant improved forages	60	100	73.3
Over all	100	100	100
Types of feeding practices			
Based on grazing and concentrate +hay	73.8	42.5	63.3
Based on grazing and crop residue + agro industrial products	26.2	57.5	36.7
Over all	100	100	100
Vitamins and mineral supplementation			
yes	86.2	77.5	83.3
no	13.8	22.5	16.7
Over all	100	100	100
Feeding equipments			
Cemented trough	33.8	42.5	36.7
Trough made with old tyre	43.8	35	40.8
Wooden trough	18.8	20	19.2
On the ground	3.8	2.5	3.3
Over all	100	100	100

4.5.2. Water resources and watering practices

The results pertaining to the source of water and the maker of the watering trough are presented in Table 9. The findings show that at both the locations the respondents preferred to provide water from the municipal sources i.e tap water for their livestock. The respondents also indicated that most of them provided water in plastic followed by those providing the same cemented troughs. The study further indicates that the respondents preferred to just clean the watering trough.

Table 9. Water source in the study areas (%)

Water source (%)	Wondo Genet	Hawassa	Total
River	6.3	0	4.2
Tap Water	93.7	92.5	93.3
Well bore/holes	0	5	1.7
Conserved water	0	2.5	0.8
Providing water to the cattle (%)			
Plastic trough	75	75	75
Cemented trough	22.5	25	23.3
Non trough at all	2.5	0	1.7
Over all	100	100	100
Cleaning the water trough (%)			
With water	82.3	82.5	82.4
With water and detergent	17.7	17.5	17.6
Over all	100	100	100

The average water frequency of local and crossbred cattle is also variable as shown in the table. The results pertaining to the frequency of providing water to different types and classes of cattle are presented in Table 10. The study shows that across both the locations, the local cattle are on average provided water twice a day during the dry and once a day

during the wet season. The crossbred cattle are provided with water almost thrice a day during the dry and twice a day during the wet season.

Table 10. Frequency of providing water (Mean \pm SD) to the cattle in the study areas (daily)

Season	Wondo Genet	Hawassa	Total	Sig
Native cattle				
Dry season	1.94 \pm 0.54	1.87 \pm 0.64	1.92 \pm 0.56	0.777
Wet season	1.11 \pm 0.32	1.12 \pm 0.35	1.11 \pm 0.32	0.922
Crossbred cattle				
Dry season	2.78 \pm 0.44	2.92 \pm 0.26	2.83 \pm 0.39	0.069
Wet season	1.55 \pm 0.52	1.67 \pm 0.47	1.59 \pm 0.50	0.234

4.5.3. Housing system

Systems of housing as well as types of houses used for cattle differed significantly between the two locations. Most of the respondents (88.8%) in the study area kept their cattle separately in barn/s. Keeping cattle and other livestock within the family dwelling were uncommon and were practiced by few households. Majority of urban households (90%) use open barn as a night shelter for their cattle. Sheltering cattle, not only protects animals from extreme environmental hazards, but also ease some other husbandry practices.

4.5.4. Breeding practice and source of herd.

Most of the respondents depended on artificial insemination (AI) service which is provided by the Ministry of Livestock and Fisheries (MOLF) to breed their cows. In the irrigation based mixed crop–livestock production system. 76.2% of the households used AI for breeding and 23.8% households' used natural mating. The proportion of household using AI in the urban system is higher than that of the irrigating and mixed farming. The results

pertaining to the source of herd replacement indicated that most of the respondents residing at both the locations procured the replacement cattle from the nearby livestock market followed by purchasing them from the neighbors.

Table 11. Herd replacements as indicated by the respondents in the study areas.

	Wondo Genet	Hawassa	Over all	p-value
Source of herd	%	%	%	
Inherited	15	12.5	14.2	
Purchased from neighbors	37.5	40	38.3	
Purchased from state farms	1.2	7.5	3.3	
Purchased from market	45	40	43.3	
donated from Bureau of Agriculture	1.2	-	0.8	
Total	100	100	100	0.414

4.5.5. Milking practices

The study indicates that the respondents in the study area hand milk their cows twice a day, milking is carried out by the females of the household after allowing the calves to suckle the dams. Colostrums feeding are practiced by all the respondents in the study areas. Milking is carried out at 12 hours interval. Some respondents maintain informal records on the amount of milk produced however their numbers are very few.

4.5.6. Animal health problem

The results pertaining to the major diseases of cattle in the study area indicate that mastitis followed by blackleg were the major diseases in the study area. While the former can be controlled by management of the animals the latter is vaccine preventable. Out of all interviewed households, 95.8% of them seek intervention of the modern veterinary clinic,

while 4.2% still prefer to visit the traditional livestock healers. As the livestock are reared for commercial purposes 90.8% of the respondents prefer to get their cattle vaccinated, the veterinary care is provided by the government facilities. About 48.8% and 55% of the household in Wondo Genet and Hawassa, respectively are aware of zoonotic diseases. Majority of the farmers say farm hygiene is important to prevent zoonotic disease.

Table 12. Disease prevalence in the study areas (%)

Major disease prevalence (%)	Wondo Genet	Hawassa	Total	p-value
Mastitis (Gadansa)	68.8	72.5	70	
Blackleg (Abbagorba)	10	12.5	10.8	
Lumpy skin (Girubrub)	8.8	5	7.5	
Diarrhoea (Deeo)	5	5	5	
Reproductive failure (Sirote qara)	2.5	0	1.7	
Calcium deficiency	1.2	0	0.8	
Ticks (Deere)	1.2	2.5	1.7	
Over all	100	100	100	0.930

4.6. Preference Cattle

The findings pertaining to the attributes of the local and the crossbred cattle are presented in Table 13. The respondents in both the studied areas opined that local cows have high heat and disease tolerance besides they are also able to tolerate feed shortage better than those of the crossbreds. The study further indicates that the milk yields of the local cows are quite poor while the growth traits and ability to provide milk inspite of poor feed availability are fair. Contrary to the same the crossbred cattle have a fairly good heat and disease tolerance, while their milk yield and growth were very good. However, these cattle are unable to tolerate feed shortages and hence this influences the milk yield.

Table 13. Performance parameters of cattle (%)

	Wondo Genet					Hawassa				
Local cow	E	V.G	G	F	P	E	V.G	G	F	P
Heat tolerance	5.3	73.7	21.0				77.8	22.2		
High milk yield			10.5	36.8	52.7			11.1	33.3	55.6
Disease tolerance		78.9	21.1				55.6	44.4		
Growth rate		5.3	10.5	84.2				11.1	77.8	11.1
Less feed but high milk yield			5.3	63.1	31.6			11.1	55.6	33.3
Tolerance to feed shortage		73.7	26.3				44.4	55.6		
Crossbreed										
Heat tolerance				78.5	21.5				85	15
High milk yield	1.3	92	6.4			2.6	92.3	5.1		
Disease tolerance			1.3	62.0	36.7				60	40
Growth rate		88.6	11.4				87.5	12.5		
Less feed but high milk yield			1.3	36.7	62				50	50
Tolerance to feed shortage			1.3	34.2	64.5				47.5	52.5
	E=Excellent	V.G= very good		G=good		F=fair		P=poor		

4.7. Milk production and utilization

4.7.1. Production Performances

The results as presented in Table 14 show that there were no differences in the lactation length, while milk yield between the crossbred cattle reared in the two studied locations.

Table 14. Performance parameters (Mean \pm SD) of the crossbred cattle reared in the study areas.

	Wondo Genet		Hawassa		Total	Sig
	Local					
Average daily milk yield (in liters)	18	1.72 \pm 0.30	8	1.75 \pm 0.26	26	1.73 \pm 0.29 0.827
Average lactation length (in months)	18	7.17 \pm 0.38	8	7.00 \pm 0.00	26	7.11 \pm 0.32 0.236
	Crossbreed					
Average lactation length (in months)	79	7.06 \pm 0.24	40	7.07 \pm 0.26	19	7.06 \pm 0.25 0.821
Average daily milk yield (in liters)	79	10.65 \pm 2.54	40	11.32 \pm 1.96	19	10.88 \pm 2.37 0.149

The average daily milk yield for local cow in the study areas was 1.73 \pm 0.29 liters and the lactation yield was 369 liters over an average lactation period of about 7.11 \pm 0.32 months (Table 15).

4.7.2. Utilization of milk

The findings as presented in Table 15 indicate that the amount of milk consumed, sold or processed are almost similar across the two studied locations.

Table 15. Utilization of milk (liters/day) among the respondents in the study areas

	Wondo Genet		Hawassa		Total		Sig
	N	Mean ±SD	N	Mean ±SD	N	Mean ±SD	
Consumed	80	2.72±1.02	40	2.60±0.95	120	2.68±0.99	0.519
Sold	80	19.11±11.62	40	19.42±8.57	120	19.21±10.67	0.881
Processed(butter)(Kg)	26	3.38±1.06	9	3.00±1.00	35	3.28±1.04	0.349

4.8. Dairy marketing systems

The results as presented in Table 16 indicate that marketing of milk is carried out informally by the individuals themselves. This is followed by the marketing of milk through hotels and restaurants. While, the traders predominate at Hawassa, marketing is carried out by local cooperatives at Wondo Genet.

Table 16. Actors in the marketing of milk in the study areas

	Wondo Genet	Hawassa	Total	p-value
	%	%	%	
Individuals	57.5	60	58.3	
Traders	10	15	11.7	
Cooperatives	15	7.5	12.5	
To other(hotels and cafeteria)	17.5	17.5	17.5	
Over all	100	100	100	0.615

The results as indicated in Table 17 show that the milk is mostly sold fresh at both the studied locations. The criteria for selecting the markets for selling the milk is the price offered and the distance.

Table 17. Marketing of milk as indicated by the respondents in the study areas

	Wondo Genet	Hawassa	Total	p-value
	%	%	%	
Whole milk	90	92.5	90.8	
Fermented milk	10	7.5	9.2	
Over all	100	100	100	0.655
Criteria for selecting the markets for selling dairy products				
Price	90	87.5	89.2	
Distance	7.5	10	8.3	
Reliability of the customer	2.5	2.5	2.5	
Over all	100	100	100	0.896

4.9. Constraints of dairy production

The findings (Table 18) pertaining to the constraints of dairy production system prevailing in the study locations indicate that feed shortages and diseases. These constraints are the major hindrances which limit the dairy development in the studied locations. The feed shortages are primarily due to anthropogenic and agronomic causes. The erstwhile grazing lands are being converted to human habitats and the agricultural growth too is responsible for the other half. In general, feed shortage, disease and parasite, lack of extension support, poor knowledge in animal management, limitations of land for sustainable dairy development, lack of awareness on cattle housing systems, problems related to waste

disposal (for urban producers), and lack of capital are some of the important constraints reported by the producers in the study areas (Table 18). The importance of the constraints between the two study sites however was different. Feed shortage is the number one problem in Hawassa followed by disease while in Wondo Genet the reverse is true.

Table 18. The main constraints (%) of dairy production system in the study areas.

	Wondo Genet	Hawassa	Total	P-value
Feed shortage	41.8	75	52.9	
Disease	44.3	15	34.5	
Water shortage	7.6	10	8.4	
Hot or Cold stress	6.3	-	4.2	
Over all	100	100	100	0.002

4.10. SWOT analysis

The SWOT analysis was conducted in both the study locations. This was conducted to address the specific objectives, identifying the opportunities and constraints of dairy farming sector in the study area thereby to assess the current dairying practice.

Results of SWOT analysis of Dairy production and marketing in Wondo Genet

Strengths

- Availability of family labor.
- Availability of ample water the year round.
- Growing demand for milk in the district and surrounding areas.
- Government supports the sector by providing veterinary care and vaccination.
- Different nongovernmental organizations support the sector by training farmers.

Weaknesses

- Majority of the respondents in the study area do not practice record keeping.
- Lack of proper livestock extension services.
- Lack of agro industries hence seasonal shortages of feed observed.
- There is insufficient or/ lack of private sector inputs, such as artificial insemination technicians.
- Lack of land to plant improved forages.
- Less hygiene during milking, feeding and watering.
- No formal market system is installed as a result the dairy products transaction is traditional and informal.
- The housing system is not well organized.
- Seasonality in price variations of chat market
- Low milk production during the dry season.
- Lack of milk collection centre.

Opportunities

- The regional research institutions are nearby area to improve the sector by innovating different modern technology.
- The prices of dairy products are escalating indicating a gap between demand and supply.
- The dairy sector is prioritized by the government
- Wastes from dairy farms can be used as a source of energy (Biogas) and input for agricultural purposes.
- The moderate climate, of the region is suitable for the dairy sector

Threats

- The price variation of khat market in Wondo Genet area.

- Reports of afltoxins in milk and livestock feeds, can deter many consumers to drink milk
- Emerging livestock and zoonotic disease is a major threat for the farmer.
- Due to urbanization and expansion of chat farms there is a threat of shrinkage of grazing lands.

SWOT analysis in Hawassa

Strength

- Weather favors dairy cattle rearing in the area.
- The district has been identified as milk shed areas for dairy development. Accessible to all water road and power supply.
- Access to veterinary clinics, pharmacies and also veterinarians and livestock professionals.
- Different nongovernmental organizations support the sector by training farmers.
- Establishment of industrial park is attracting many expatriates and local citizens.
- Well established milk collection centers and demand for specialized dairy products are on a rise.

Weaknesses

- Majority of the respondents do not maintain proper records.
- Land is at a premium and hence grazing lands are almost nonexistent.
- Lack of well-established milk market especially the year round.
- There is insufficient artificial insemination technicians.

Opportunities

- The regional research institutions are at the vicinity and hence there can be easy lab to land transfer of technologies.

- Hawassa University, one of the first generation universities in the country, is one of the stakeholders in the sector and hence can play a pivotal role in the process of livestock and dairy development in the area.
- The study area is well organized in terms of infrastructures and service sectors.
- The large population and very high rate of urbanization, improved income among some segments of the society.
- Dairy sector can reduce urban unemployment caused by several factors hence can contribute to poverty alleviation.
- In the study area they have dairy processing plant.

Threats

- The town has a large population of Orthodox Christians who abstain from consuming livestock products during the fasting period which is around 200 days a year.
- The waste disposal method is not well organized and friendly with the environment, which is contributing for the environmental pollution.
- Due to urbanization and establishment of industry zone the large grazing land is shrunked.
- Livestock are dependent on procured forages, crop residues and agro industrial byproducts; hence cost of milk production is high.
- There are only a few established dairy processing units and hence the qualities of the dairy products are compromised.
- There are influxes of dairy products from other parts of the country and also from other well established global players.

5. DISCUSSIONS

5.1. Socio-economic characteristics of the respondents

The socio economic characteristics of the respondents as presented in Table 1 indicate that most of the respondents were males, which may be correlated by the fact that most of the households are male headed and under that condition it is imperative that most of the respondents were males. These observations are in close accordance with the observations of (Belay *et al.*, 2015) from Wolega. The findings from the table 1 further indicate that at Wondo Genet most of the respondents were farmers which is in close accordance with the findings (Ketema, 2014) who reported that at shewa zone majority of them took farming as a major occupation and all of the respondents rear other livestock asides, like sheep, goat, donkey and poultry. Contrary to Wondo Genet most of the respondents in Hawassa were traders as they preferred to take dairying as a business venture and as an investment, these findings are in close accordance with those of (Zena, 2011) most of the dairy farming practice in the Harar city are currently as an alternative source of income for the practitioners.

This is in one way good as they can hire professionals and also procure feed and medicaments needed for proper upkeep of the crossbred cattle. Moreover, these ventures can create job opportunities for the youth either directly or indirectly.

5.2. Socio demography of the respondents

The average family size per household is in both the locations similar to the observations of (Bereda *et al.*, 2014, and Belay *et al.*, 2012). The numbers of family members are however higher than those reported by Woldemichael (2008) for Hawassa (3.29) but only slightly higher than the average family size reported by Hailemikael *et al.*, (2016) residing at Burie town (5.7 person/ household). The large family size is an opportunity for improving dairy production with respect to labor provision in cattle herding, husbandry,

rearing of calves and dairy product processing and marketing (Belay *et al.*, 2015). However, on the other hand large family size leads to resource allocation among many members and therefore less per unit availability of resources, hence leads to poverty. Therefore, in order to optimize the resources it is imperative to advise the respondents to limit their family size. The findings also show that most of the respondents were of middle age and hence are physically able to practice dairy husbandry in an optimum way (Sintayehu *et al.*, 2008).

The results pertaining to the educational status of the respondents indicate that majority of them were literate. The findings are in close accordance with those of Misganaw *et al.*, (2017) from Axsum. The levels of illiteracy was higher in Wondo Genet which has a higher number of farmers, studies by Gatwech, (2012) which indicated literacy of the agrarian community in Gambela is usually low. The literacy of the traders is usually higher than those of the farming communities and the findings are in close accordance with of Zena, (2011) from Harar. The results also indicated that the educated respondents will be able to understand the virtues of modern cattle husbandry processes including recording of husbandry activities Zena, (2011). Hence, the authorities of the Bureau of Livestock and Fisheries have to revamp their livestock extension activities so as to cater to the need of extension activities pertaining to the different classes of livestock owners.

5.3. Labor division and production system

The findings as presented in Table 4 indicate that there are activities which are sex specific viz. purchase and selling of cattle were carried out by the males of the households. The observations are in close accordance with the findings of Sintayew *et al.*, (2008) from Shashemene, Dila, Hawassa and Yirgalem parts of Ethiopia. The results also indicate that feeding and grazing of cattle are carried out by the young males at Wondo Genet and

young females at Hawassa. These findings too are in close accordance with the observations of (Gatwech, 2012). However findings of a study by (Zena, 2011) indicate that at Harar most of the grazing activities are conducted by hired people. Using family members in different husbandry activities can lower down the cost of production and also improve the husbandry activities but should not be at the cost of education of the younger generation (Birhan, 2013). The use of even hired child labors in these cases should also be avoided. The study further shows that nursing of the sick cattle were carried out by the adult male members, which is also in close accordance with the findings of (Yosef *et al.*, 2013). This may be ascribed to the fact that the sick cattle are to be taken to the veterinary clinics which may require traveling long distances from the dwellings and adult family members were usually housewives (Azage *et al.*, 2013).

The results pertaining to the milking, handling, processing and selling of the dairy products are carried out by the females of the households which are in close accordance with the findings of (Gatwech, 2012). However, the findings of (Sintayew *et al.*, 2008) indicate that while processing of dairy products are carried out by the female members the selling is usually still carried out by the adult females. Therefore, it becomes imperative to conduct regular trainings of the dairy processors so that the products obtained are of good quality. It is also necessary to form cooperatives which can be professionally managed and develop a good marketing channel for the dairy products (Yilma *et al.*, 2011).

The results (Table 5) show that the production system prevailing in the two locations are different and earlier studies by (Arega, 2009) have indicated that at Wondo Genet the prevailing production system are irrigated agro forestry based production system along with the mixed crop livestock production system. Furthermore, studies by (Welearegay *et*

al., 2012) indicate that at Hawassa like those of Debre Ziet the prevailing dairy production system are urban livestock production systems.

5.4. Dairy Cattle herd characteristics

The results as presented in Table 6 among the crossbreed cattle reared at both the locations were heifers which are in close accordance with the findings of (Mekuria, 2016). This may be ascribed to the preferences of the farmer for female calves/heifers for future dairy animals (Azage *et al.*, 2013) or may be because the bull calves/ steers are sold off early for fattening purposes or for agrarian activities. Followed by the numbers of heifers were the numbers of dairy cattle which were reared as a source of income from dairy produce followed by meeting immediate family needs (Belay *et al.*, 2015). However, the numbers of heifers and dairy cattle as observed in the present study are lower than those reported by (Tesfaye, 2007) from Metema location of North Western Ethiopia. This might be ascribed to the land holdings of the respondents and also the availability of pastures which over the years is shrinking (Asaminew and Eyasu, 2009).

The results pertaining to the numbers of crossbred cattle indicate that the numbers of cows are followed by the cow calves which are in close accordance with the findings of (Bereda *et al.*, 2014). The results also show that the numbers of bull calves and bulls are more or less similar across the two studied locations. While can be of use for agrarian activities at Wondo Genet, at Hawassa they can be used for fattening purposes. There is an ever increase in demand for beef in the area besides there are several agro industrial factories in the vicinity and also the plan to establish an agro industrial park at Yirgalem in the near future.

5.5. Purpose of Dairy cattle production

The findings as presented in Table 7 show that the cattle are predominantly raised for income generation which is similar across both locations. These findings are in close accordance with those of (Welearegay *et al.*, 2012). However, the findings of a study by (Belay *et al.*, 2015) indicated that at Horro Guduru, wolega most of the respondents rear cattle for milk production. However, the findings of a study (Lemma *et al.*, 2017) indicate that most of the respondents started rearing cattle for less than 10 years, while some of them also reared cattle for more than 10 years but less than 15 years. Experience of rearing cattle makes the venture quite profitable, as it can minimize the risk associated with cattle husbandry and marketing of the produce (Tegegne *et al.*, 2013).

5.6. Dairy Cattle husbandry practices

5.6.1 Feeds and feeding systems

The major feeds resources of cattle in the study area were sugar cane (leaves), enset (*Ensete ventricosum*) (leaves stem and roots), crop residues (from teff, maize, barley and wheat) and some farmers also used non- conventional feed like *attelaa*. Most of the respondents also provided their cattle with minerals in form of bole and table salt. These findings are in close accordance with the findings of (Sintayew *et al.*, 2008). Studies by (Ketema, 2014) have however indicated that most of the farmers at Kersa Malima, South West Shewa usually do not provide any minerals to their cattle. In the urban dwellings of Hawassa grass or hay are purchased by the respondents which is also in close accordance with the findings of (Mekuria, 2016). This may be ascribed to the fact that under urban livestock production system the land is at premium and hence communal grazing land is usually unavailable (Zena, 2011). Thus, they are mostly dependent on cut and carry system to feed their cattle (Hailemikael *et al.*, 2016). Crop residues and agro industrial byproducts usually are poor in quality and need to be enriched with good quality feed (Azage *et al.*,

2013). Therefore, it can be deduced from the findings that the ration provided to the cattle is usually not balanced and hence the optimum productivity of the cattle may not be realized (Mekuria, 2016). The respondents need to be appraised by the livestock extension agents, livestock experts regarding ration formulation for different classes of cattle using locally available feed materials (Tsadkan, 2012).

The findings also indicate that the cattle are provided with feed in cemented manger, which is in close accordance with the findings of (Zena, 2011). The results further indicate that many of the respondents provide feed to their cattle in feeding troughs made of used truck tyres, which is also in close accordance with the results from a study by (Tegegne *et al.*, 2013). While, cemented troughs are appraisable, the use of used truck tyres may lead to heavy metal toxicity, which can have adverse consequences in the long term. Some respondents also indicated that they just put the feed on the ground; this can result in hardware disease among the cattle and therefore can even result in its mortality (Andnet *et al.*, 2014).

5.6.2. Water resources and watering practices

The findings pertaining to the water resources and watering practices in the study area are presented in Table 9. Most of the respondents provide tap water for their cattle which is in close accordance with those of (Zena, 2011). This is contrary to the findings of (Zinash, 2015) who reported that most of the cattle are either provided water from bore well or from river. The tap water is expected to be of good quality and hence beneficial for the cattle (Sintayewu *et al.*, 2008).

The findings also indicate that the cattle are provided water in plastic trough or cemented trough these reports are in close accordance with the findings of (Zena, 2011). The results further indicate that the watering troughs are usually cleaned with water. However, it is

appreciable if the watering trough is cleaned with soap as this would ensure that the watering trough is fairly well cleaned and free from any infectious agents/parasites.

Watering frequency of the cattle varied across the production systems (Gatwech, 2012). Thus can be ascribed to differences across the year, accessibility of the water sources, feeds and feeding system (Sintayewu *et al.*, 2008). Water is among the most neglected of all the nutrients. It is important for all the physiological processes (Tsadikan, 2012). The crossbred cattle are provided water at a higher frequency when compared with their local counterparts which is in close accordance with the observations of (Tsadikan, 2012). It has also been reported that the crossbred cattle are unable to withstand the vagaries of nature when compared to the local cattle and hence need to be provided with water more frequently when compared to the local cattle (Zinash, 2015). Water shortage would lead to lowering of milk yield and also reproduction ability of the cattle (Asrat *et al.*, 2013). Therefore, it has to be ensured that the cattle are provided with good quality water the year round (Sintayewu *et al.*, 2008).

5.6.3. Housing system

The findings of study indicate that most of the respondents house their cattle in separate houses within the dwellings of their owners; these observations are in close accordance with the findings of (Dessalegn, 2015). Findings of a study by (Tsegay *et al.*, 2015) indicate that proper housing is important for protection of the livestock against vagaries of nature. However, studies by (Dereje *et al.*, 2014) have indicated that in most of the cases the cattle are housed within the houses of their owners. It was also reported in a study by (Zinash, 2015) that different species of livestock are housed together; also different classes of cattle too are housed together. Proper housing also helps the cattle to protect the owners against zoonotic diseases especially tuberculosis (Tsegay *et al.*, 2015). The livestock

extension agents should also provide the respondents with the intricacies of proper housing in cattle especially constructed with locally available materials. In the housing of the cattle, proper ventilation, slope, disposal of wastes and also space required per animal should be given proper consideration (Gatwech, 2012).

5.6.4 Breeding practice and source of herd.

The findings indicate that 76.2% of the respondents (across the study areas) prefer artificial insemination (AI) for their cattle which is in close accordance with the observations of (Zena, 2011). However, in many of the cases 23.8% the respondents prefer natural mating over AI, these observations are in close accordance with those of (Belay *et al.*, 2015) from Horroguduru Wolega Zone. The findings also suggest that 95% of the respondents rear the cattle for income generation and therefore crossbreds are preferred over local cattle (Mekuria, 2016). The results from Table 11 further indicate that most of the cattle are procured from the markets and/or neighbors, these findings are in close accordance with those of (Zinash, 2015).

In absence of any proper records most of the cattle are procured based on their phenotype. However as the milk related traits are moderately heritable procurement of cattle for dairy related traits needs to be carefully selected (Gatwech, 2012). The findings indicate that at many times the respondents purchase cattle sold by the neighbors, which maybe because to a certain extent the milk yield of the dams can serve as a possible milk yield of the heifers/cows (Tegegn *et al.*, 2013).

5.6.5. Milking and calf rearing practices

The results pertaining to the milking practices are in close accordance with the observations of (Sintayehu *et al.*, 2008). Hand milking is practiced by all the respondents which is in accordance with the findings of (Tsegay *et al.*, 2014) from Aroressa Sidama

Zone. The respondents too need to be taught about the techniques of teat dipping as it can minimize the incidents of mastitis among the cattle (Fentaye *et al.*, 2014). The respondents need to be trained on different hand milking techniques which can minimize the rate of mastitis and also maintain the muscular tone of the udder (Rice and Bodiman 2004). This is because mastitis can lead to serious economic loss in dairy cattle (DeGrave and Fetrow, 1993).

5.6.7. Animal health problem

The findings as presented in Table 12 indicate the prevalence of the diseases among the cattle in the locations. The findings also show that mastitis is the most prevalent disease in the area; these observations are in close accordance with those of (Minale and Yilkal, 2015) from Chench and kucha district, Gamo Gofa zone of Ethiopia. Findings from a study by (Kedija, 2007) indicate that mastitis is prevalent among the crossbred cattle and can result in serious economic losses. Findings of (Rupp and Boichard, 2007) also indicate that incidences of mastitis can be minimized through teat dipping and also by maintaining proper hygiene in dairy cattle. This is followed by incidences of black leg among the cattle in the area; blackleg is a vaccination preventable disease causing serious economic loss (Jiregna *et al.*, 2013). Hence, regular vaccinations should be administered to the cattle so that these incidences can be minimized (Rainard and Riollot 2006).

The respondents therefore should be trained by the livestock extension personnel for the identification of different economically important diseases. There can be a provision of establishment of para veterinarians amongst the community members who can at least administer the preliminary veterinary care to the animals (Rushton, 2009).

5.6.8. Performance parameters of Dairy cattle

The results pertaining to the performance parameters of the indigenous and crossbred cattle are presented in Table 13. The study shows that while the indigenous cattle are better adapted to the locations, their productivity and growth are relatively lower than those of their exotic counterparts. These observations are in close accordance with the findings of (Demissu, 2014).

The within breed selection of the indigenous cattle should be conducted with the consultation of all the stakeholders and in a participatory manner (Gatwech, 2012). Meanwhile, the appropriate blood level of the crossbred cattle should be based on the husbandry practices that can be provided by the respondents (Zena, 2011). Higher blood levels should be advocated only when husbandry practices are appropriate (Tegegne *et al.*, 2013). While, the crossbreds have a better growth and milk yield but also opined that they were susceptible to new nature and problems associated with feed shortages, which too are in consonance with the observations of (Demissu, 2014). Therefore, husbandry associated with rearing of crossbred cattle need to be imparted to the respondents prior to introduction of crossbreds in a particular locality (Tegegne *et al.*, 2013).

5.7. Milk production, utilization and marketing

The finding from Table 14 is indicative of the lactal yield of the crossbreds and their local counterparts. The findings show that the milk yields of the crossbreds are several times higher than those of the local genotypes which are in close accordance with those of (Ulfina *et al.*, 2013). However, the productivity of the crossbred cattle is higher than those reported by (Demissu, 2014) from Horro guduru, Wolega Zone. The productivity however can be further improved through proper feeding, management and disease prevention mechanism.

The findings as presented in Table 15 indicate that most of the milk produced per household are sold with little quantity left for processing and home consumption, these observations are in close accordance with the reports of (Sosina, 2016) from Meta, Eastern Ethiopia. This is indicative of a fairly good marketing channel in the localities concerned. Studies by (Welearegay *et al.*, 2012) have indicated that marketing of milk is fairly well developed in the urban and peri urban locations. However the respondents can be further benefitted if some sort of processing units can be established in the study areas. Milk collection centres should also be established by the cooperatives or private milk processing plants where the milk can be procured using scientific principles of payment based on fat: solids not fat ratio (Misganawu *et al.*, 2017).

The study also shows that marketing of milk is basically informal where the milk is sold based on mutual agreement of the seller and the buyer. The reports are in close accordance with those of (Sosina, 2016). This is not beneficial for either of the player, as the quality of the milk is not an issue under such cases. Therefore, it is important that selling and buying of milk or other dairy products is formalized through cooperatives of similar such organizations (Lemma *et al.*, 2017). The selling of milk through hotels and cafeterias involve the presence of middlemen who extract their profit from either of the parties and also make the dairy products prone to contamination (if improperly handled) and adulterations (Welearegay *et al.*, 2012). Therefore, it is important that there are establishments of small and medium scale dairy processing units which can handle the raw milk on day to day basis and also maintain the quality of the final produce (Asfaw, 2009). Cooperatives can also play a pivoted role in providing inputs in form of feed, fodder seeds, veterinary care and trainings to the dairy producer and also involve in product innovation, processing and marketing (Misganaw *et al.*, 2017).

5.8. Constraints of dairy production and marketing system

The results pertaining to the constraints associated with dairy production and marketing system is presented in Table 18. The findings show that seasonal feed shortage besides diseases are the major constraints of dairy sector. These findings are in line with the findings of (Minale and Yilkal, 2015) from Chenchu and Kucha, Gamo Gofa. Improvement of dairy sector is impossible without proper feeding and medicament for the cattle as nutritional demand of the crossbreds are high and that they are susceptible to tropical diseases. Thus, quality trainings at a regular basis and establishment of feed factories which can utilize the crop residues and agro industrial byproducts need to be prioritized (Sosina, 2016). The farmers also need to be appraised by the livestock extension agents about the different feeding techniques for different classes of cattle too need to be established (Tegegne *et al.*, 2013). The scientists and researchers of the Universities and Research institutes need to be involved with the extension agents so that the lab to land and land to lab projects can be established. The diseases are also a major hindrance for the development of the sector; cattle which are suffering from vaccine preventable diseases need to be vaccinated on a regular basis (Mekuria, 2016). The veterinary care has to be further strengthened with para veterinarians providing first aid to the cattle at the door step of the farmers.

5.9. SWOT analysis

The results from the SWOT analysis for Wondo Genet indicate that ecologically the climate is favorable for dairy production, besides the favor of the government and also that there is a year round demand for milk and dairy produce in the study area which is the strength of the location as a whole. Studies by (Zena, 2011) have indicated that rearing of crossbred cattle is possible in cooler climates. The demand for all season milk too makes dairy farming an attractive venture for the educated but employed youth besides also

provide an opportunity for direct or indirect employment of the University and ATVET graduates.

The weaknesses are the lack of inputs in form of artificial insemination units, feed processing units and also lack of involvement of the financial institutes are some of the major hindrances. Involvement of the formal banking sector is imperative for the development of agriculture sector and livestock sector in particular (Zena, 2011). Involvement of the banks help the resource challenged farmers to avoid taking loans from money lenders at a high rate of interest besides the money can be used for procurement of farm inputs. Lack of proper trainings for the respondents and milk marketing infrastructure too leads to poor quality of final produce which also leads to poor price received by the producers (Betela, 2015).

The presence of Regional Research Stations, Wondo Genet College of Forestry and Natural Sciences (Hawassa University) can be an opportunity for strengthening the livestock extension services and lab to land and land to lab programs. However, the community development services of both the institutes are quite weak and needs to be strengthened further. The presence of Hawassa town with a large population indicates that only a fraction of the total demand for dairy products has been presently met.

Threats include that most of the farmers are chat farmers and hence more and more of the farming land and activities are being aimed at cultivation of chat. The presence of mycotoxin in milk and livestock feed has been publicized over the media and many people are desisting from consuming milk and dairy products produced locally. This is providing an opportunity for the entry of foreign actors which will adversely affect the local dairy producers in the long run.

The strength of Hawassa town lies to the fact that the production center is situated at the vicinity of one of the fastest growing cities of the country with all the modern amenities associated with the cities. Veterinary care is available at hand with a Veterinary Medicine School and clinic of the Hawassa University. Besides to the same there are many veterinary pharmacies in the town (Tegegne *et al.*, 2013). There are several agro processing industries which can supply wheat barn, teff byproducts, brewery byproducts for livestock feeding (Sintayehu *et al.*, 2008).

Land is at a premium and hence most of the livestock owners have to procure even grasses and hay (Yilma *et al.*, 2011). The respondents do not employ professionals and hence there are lacks of proper records (Mekuria, 2016). There is only one milk processing unit and hence most of the milk and dairy products are sold informally compromising the quality (Welearegay *et al.*, 2012).

Hawassa University, Southern Agriculture Research Institute, Hawassa Research Institute and Bureau of Livestock and Fisheries, have their head office in the city and hence there can be a very strong extension linkage, lab to land and land to lab linkage which can cater to the needs of the respondents.

6. SUMMARY AND CONCLUSION

The dairy production system practiced in Wondo Genet and Hawassa is composed of irrigation based agro forestry, crop livestock production system, peri urban and urban production system. Dairy cattle in Hawassa and Wondo Genet are mainly kept for market oriented milk production. Dairy production in the study area is at its infant stage while on contrary there is a high demand for dairy and dairy products. The production is depended entirely on family labor. The study area has high potential for dairy production, suitable environment and access to veterinary service with high opportunities for economic development. Dairy marketing system is entirely informal, in which the producers sell dairy products directly to consumers and/or traders with no fixed price. However, cooperatives/producer groups were trying to fix price for milk collection in Wondo Genet and Hawassa towns based on organoleptic qualities of milk.

Different constraint related to dairy production and marketing system were disease, feed shortage, poor management of dairy animal (feeding, housing, record keeping) which were the most important constraints hindering dairy development. Seasonality in price variations of chat market in Wondo Genet area and small amount of milk produced in dry season are another challenges. Fresh milk could not be kept for long hours before consumed or processed. Distance from the market was a major factor that prohibited farmers from selling whole fresh milk to urban consumers. Access to veterinary services and availability of water throughout the year, various institutions, nongovernmental organization involved in dairy research and attention given by the government to dairy sector are an opportunity in the study area.

7. RECOMENDATIONS

- ✓ Training for the farmers is needed on feed improvement by urea treatment, about zoonotic disease, and awareness creation to practice vaccination
- ✓ Awareness should be created about breed improvement, record keeping and health management.
- ✓ Create awareness about housing and milking management.
- ✓ Provision of training to the farmer about supplementation especially for the milking, pregnant cows and calves.
- ✓ Organize the farmer in cooperatives and establish milk collection centre for better market opportunities.
- ✓ The farmers need to be trained by the livestock extension experts regarding phenotypic selection of dairy cattle.

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APPENDICES 1

Main Questioner-data collection from dairy producers

Name of the Enumerator

Date of recording.....

Code.....

Study area

Region.....zone.....woreda.....

Kebele/pA.....

Agro ecology.....

General information (socio-economic demography of the household to be interviewed

1. Socio-economic conditions

1.1. Address.

1.1.1. Name of the respondent.....Woreda _____

1.1.2. Kebele

1.2. Sex of respondent 1. Male 2. Female

1.3. Position in the household..... 1. Head 2. Family member

1.4. Age of respondent...

a. 20-30 b. 30-40 c. 40-50 d. 50-60 e. >60

1.5. Is the household headed by male or female? 1. Male 2. Female

1.6. Would you tell your family size as per their age group?

Number of the house hold groups	Age groups (in years)					
	<10	11-25	26-40	41-60	>60	Total

1.7. Education level of the respondent?

Education level						
a. Illiterate	b. Primay	c. Middle	d. High School	e. Graduate	f. Church Edu	g. TVET/ATVET

1.8. Would you tell us about the occupation/job of your family members?

Occupation type						
a. Farmer	b. Daily labour	c. Trader	d. Student	e. Government servant	f. Retired	g. Other(specify)

1.9. Information on labour utilization in rearing dairy cattle. (tick with this mark x if agreed)

	Male >15years	Females > 15years	Males < 15 years	Females < 15 years
Purchase of cattle				
Sale of cattle				
Grazing the cattle				
Breeding of cattle				
Caring/nursing for sick animals				
Feed collection/feeding				
Milking				
Processing of milk				
Selling of dairy products				
Cleaning the cattle shed				
Watering the cattle				

1.10. Type of farming system

- | | |
|-------------------------------------|--|
| 1. Mixed crop-livestock | 2. Urban and per urban production system |
| 3. Irrigation based agroforestry | 4. Extensive production system |
| 5. Semi intensive production system | 6. Intensive production system |

1.11. Do you practice record keepings? 1. Yes 2. No

If yes, what type of record keepings?

1. Mating date
2. Date of estrus
3. Date of parturition
4. Milk production/cow/day
5. Lactation length
6. Peak yield
7. Health records
8. Feeding records
9. Others

2. Cattle breeds (types) and the relative importance and problems

2.1. Livestock owned at house hold level

Livestock species	Buck	Doe	Ram	Ewe	donkey	horse	poultry
Total number							
Total TLU							

1 TLU= 250 Kg

2.2. Total number of cattle owned by the farm (enter numbers)

	Native	F1 cross		Native X Boran	Higher grade		Total	TLU
		HF cross	Jersey cross		Holstein	Jersey		
Milking cows								
Dry cows								
Bulls								
Steers								
Heifers								
Calves (male)								
Calves (female)								

2.2. Why do you rear cattle? (Choose one)

- a. Primarily for agricultural purposes
- b. primarily for milk production
- c Primarily for income generation
- d. To produce calves for sale (after growing)
- e. for Meat and milk production
- f. for ploughing, meat and milk production
- g. for manure
- h. Source of investment

2.3. Tell the origin/source of the cattle which helped you established your farm.(tick only One best response).

- a. Inherited
- b. Neighbor (purchased)
- c. State farm (purchased)

- d. Market (purchased) e. NGO/Project (credit) f. Microcredit
 g. From Bureau of Agriculture h. On sharing basis I. Others

2.4. When did you start keeping dairy cattle in your farm (in year)?

- a). < 10yrs, b) > 10yrs c)<15 yrs d)> 15yrs

2.5. How do you see the quality of your dairy animals as per the traits indicated below?
 (Perception indication)

Type	Native	HF Cross	Jersey cross	Boran X Native	Higher grade HF	Higher grade Jersey
Heat tolerance						
High Milk yield						
Disease tolerance						
Growth rate						
Less feed but high milk yield						
Tolerance to feed shortage						

**** Excellent *** Very Good ** Good * Fair ^P Poor

2.6. Describe your dairy cattle as per production characteristics indicated below.

Trait	Native	HF Cross	Jersey cross	Boran X Native	Higher grade HF	Higher grade Jersey
Lactation length-(in months)						
Milk yield/animal per day(in Lt.)						

Convert months to days (1 month = 30.416 days)

3. General management practices

3.1 What is the frequency of milking (code 1).....

- 1=once 2=twice 3=three times

If thrice, reason.....

3.2. Time of milking

- 1=morning..... 2=afternoon (if any)..... 3=evening..... 4=morning and evening

3.3. Do you plant improved forage? 1. Yes 2. No

If yes, what are they?

If yes, how do you utilize your improved pasture/forage?

- i. Grazing ii. Cut and carry system iii. Both

If you do not plant improved pasture, why?

3.4. What type of feeding do you practice for dairy cattle?

- a) Based on only grazing
- b) Based on grazing and stall feeding (concentrate + hay)
- c) Based on grazing and stall feeding (crop residue+ agro-industrial by product)

3.5. Do you provide vitamins and mineral for your animal? a. Yeas b. No

3.6. If you supplement additional feed for your animals, which category and genotype of cattle.

- 1. Milking cow 2. Pregnant cow 3. Calves 4. Milking and pregnant 5. milking and calves

3.7. How do you provide feed to your cows?

- 1. Plastic trough 2.Cemented trough
- 3. Trough made with old tyre 4.Wooden trough5.Just put it on the ground

3.8. How frequently do you clean the mangers?

- a) Daily b) once in two days c) once a week d) never

3.9. How do you clean the mangers?

- a. With water b. With detergent and water
- c. Just clean it with broom d. With ash and water

3.10. What type of water sources you use for dairy animal watering, specify the type of water Source, season and frequency of watering?

Water source		Native	HF Cross	Jersey cross	Boran X Native	Higher grade HF	Higher grade Jersey
River	Season						
	Frequency						
Supplied tank, Tap	Season						
	Frequency						
Pond and holes	Season						
	Frequency						
Conserved water	Season						
	Frequency						

D=Dry, W=Wet

3.11. How do you provide water to your cows?

1. Plastic trough
2. Cemented trough
3. Trough made with old tyre
4. Wooden trough
5. No trough at all the animals drinks from natural pool

3.12. How frequently do you clean the water troughs?

- a. Daily
- b. Once in two days
- c. Once a week
- d. Never

3.13. How do you clean the water trough?

- a. With water
- B. With detergent and water
- c. With ash and water

3.14. How do you house your dairy cattle?

- a) Separately in corral
- b) Mixed with small ruminants in corral
- c) Mixed with other livestock species in barn
- d) separately in barn
- e) In the farmer's house mixed with people

3.15. Do you keep the performance and service records of your dairy cattle? a) Yes b) No.

If yes, what are the records you are keeping?

- a. Breeding records
- b. Reproduction records
- c. Performance records
- d. Disease records
- e. Growth records

3.16. Do you select your own bulls? a) Yes b) No

3.17. Which are the selection criteria you use to select bulls?

- a. Breed of the bull
- b. Age of the bull
- c. Size of the bull (large size)
- d. Pedigree of the bull (based on dams records)
- e. Pedigree of the bull (based on sisters records)
- f. Records of the progeny (of the bulls)
- g. Colour of the bulls (mention the color)

3.18. Do you feed new born calves with colostrums? a. Yes b. No

If yes, for how long after birth?

- a) Immediately after birth
- b) Within 6 hours of birth
- c) After 6 but within 12 hours of birth
- d) After 12 within 24 hours of birth
- e) After 24 hours of birth

If the answer is No then Why?

- A. Development agent B. Woreda office C. Private Veterinarian

3.24. Do you have knowledge about zoonotic diseases? a. Yes b. No

If yes, mention some diseases:.....

3.25. How do you prevent the spread of the zoonotic diseases?

- a. Maintain the hygiene at the farm b. Wash hand regularly
 C. Keep the animals away from the children d. Maintain Hygiene during milking
 e. Do not allow the animals to be near to the human habitat

4. Milk production and utilization

4.1. Do you estimate the yield of milk performance by your dairy cattle a day? If yes please fill the table below

Native		Native cows	HF Cross	Jersey cross	Boran X Native	Higher grade HF	Higher grade Jersey
Daily milk yield/head/day (liter)	D						
	W						
Daily milk production/hh/day (liter)	D						
	W						
Total	D						
	W						
Lactation length of the cows*							

D= Dry , W=Wet , * Days

4.2. How do you use the amount of milk produced (in liter)?

- a) Consumed at home____, b) selling____, c) processing____,
 d) Others (specified)

4.3. What are the main constraints out of the following constraints for your dairy production?

Native	Native	HF Cross	Jersey cross	Boran X Native	Higher grade HF	Higher grade Jersey
Diseases						
Environmental stress						
Stress due to water shortages						
Stress due to feed shortages						

5. Dairy products marketing

5.1. For whom do you sell your dairy products?

- a) To individuals b) To traders c) Cooperatives d) Others

5.2. What type of product you sell?

- a) Whole Milk b) Fermented Milk c) Butter d) Butter Milk e) Ergo

5.3. What criterion do you mostly use in selecting your marketing outlet?

- a). Price b). Distance c). Reliability d) others (specified)

5.4. What are major constraints related to dairy product marketing? Mention some

Appendix 2: Checklist for key informants' interview

- What is the reason for the uneven distribution of dairy farmers in the study area?
- What are the problems on the dairy farming sector in wondo Genet and Hawassa?
- What are your suggestions to alleviate the above mentioned constraints?
- What are opportunities dairy farmers can incur from this activity?
- What are the main uses of dairy farming?
- What are the most common supports readily available by the governmental and nongovernmental organizations for dairy farmers?
- Are there any policy supports for dairy farmers?

BIOGRAPHY

The author was born in Sidama, Wondo Genet town on September 30, 1992. He attended elementary school in Wondo Genet Hibret Primery School and Secondary School at Dehub Ethiopia Academy and Preparatory School at Hawassa Tabor Secondary and Preparatory School. Then he joined Arba Minch University college of Agriculture, and was awarded Bsc in Animal and Range science in 2013. After one year of service in office of Agricultural bureau in wondo Genet, He joined the School of Graduate Studies of Hawassa University to advance his study in Animal production. The author is Unmarried.