ASSESSMENT OF THE CURRENT STATUS OF DAIRY PRODUCTION AND MANAGEMENT PRACTICES IN DUGDA DISTRICT OF EAST SHOA ZONE OF OROMIA,ETHIOPIA

MSc THESIS

FIKREMARIAM NEGASA HORDOFA

HAWASSA UNIVERSITY

COLLEGE OF AGRICULTURE, HAWASSA, ETHIOPIA

JUNE, 2016

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FIKREMARIAM NEGASA HORDOFA

MAJOR ADVIOR: AJEBU NURFETA (PhD, Associate professor)

A THESIS SUBMITTED TO THE SCHOOL OF ANIMAL AND RANGE SCIENCES, HAWASSA COLLEGE OF AGRICULTURE, SCHOOL OF GRADUATE STUDIES

HAWASSA UNIVERSITY HAWASSA, ETHIOPIA

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN ANIMAL AND RANGE SCIENCES (SPECIALIZATION: ANIMAL PRODUCTION)

HAWASSA UNIVERSITY

COLLEGE OF AGRICULTURE, HAWASSA, ETHIOPIA

JUNE, 2016

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This is to certify that the thesis entitled "***Assessment of the current status of dairy cattle production and management practices in Dugda district of East Shoa Zone of Oromia, Ethiopia."*** submitted in partial fulfillment of the requirements for the degree of Master's with specialization in Animal production, the Graduate Program of the Department/School of Range and Animal Sciences, and has been carried out by Fikremariam Negasa Id. No ARSC 017/06, under my/our supervision. Therefore I/we recommend that the student has fulfilled the requirements and hence hereby can submit the thesis to the department.

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DEDICATION

I dedicate this thesis manuscript to my mother Alemitu Makuria who educate and nursing me with affection and love through many life challenges.

STATEMENT OF THE AUTHOR

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Place: Hawassa University, Hawassa

Date of Submission: June, 2016

ACKNOWLEDGEMENT

For all, I praise the Almighty God for giving me the courage and strength in my life. My first great indebtedness goes to my research thesis advisor, Dr. Ajebu Nurfeta for spending his precious time to give genuine and regular advice, and to correct this manuscript from the very beginning to end. I would like to extend my thanks to ILRI-LIVES (Livestock and Irrigation Value Chain for Ethiopian Small holder) Project for financing my study through the LIVES Project in Dugda woreda Site without which this work would not have been possible. My thanks to LIVES project coordinator Dr.Nigatu Alemayehu who facilitate and timely adjusting my financial. I also thank all the staff members of the Dugda woreda Livestock resources and fisheries development and all staff of agricultural sectors in a day-to-day encouragement during my study.

I especially thank the enumerators and data collectors and famers who involved in responding my interview questionnaires. I am thankful to Ato Gemechu Korji Dugda Woreda livestock resource development and fishery head office for all his kindly cooperation starting from beginning to end. My deepest gratitude goes to my entire elder and all my colleagues who offered me comprehensive moral support. Also give who treatment that enabled me succeeds though out my academic life. Generally, I would like to pass my great appreciation to those individuals and institutions that were involved directly or indirectly in this work so that my study came to success

LISTS OF ABBREVATIONS

AFC	Age at first calving
AI	Artificial insemination
CSA	Central Statistics Authority
DM	Dry matter
DWOA	Dugda Woreda Office of Agriculture
DWOL	Dugda Woreda Office of Livestock Development and Health
ESAP	Ethiopian Society of Animal Production
GLM	General Linear Model
IGAD	Inter Governmental Authority on Development
FAO	Food and Agriculture Organization of the United Nations
ILRI	International Livestock Research Institute
IPMS	Improving Productivity and Market Success
Kg	Kilogram
L	liter
LIVES	Livestock and Irrigation Value chain for Ethiopian Smallholder
LOL	Land O' Lakes
LSD	Least Significant Difference
MDG	Millennium Development Goal
MOA	Ministry of Agriculture
NSPC	Number of Service per Conceptions
NDDB	National Dairy Development Board
SAS	Statistical Analysis for Social Science
SE	Standard error
SPSS	Software Package for Social Science
TLU	Tropical Livestock Unit
UNIDO	United Nations Industrial Development Organization

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ASSESSMENT OF THE CURRENT STATUS OF DAIRY PRODUCTION AND MANAGEMENT PRACTICES IN DUGDA DISTRICT OF EAST SHOA ZONE OF OROMIA,ETHIOPIA

By: Fikremariam Negasa

Advisor: Ajebu Nurfata (PhD)

ABSTRACT

The research was conducted to assess the current status of dairy cattle production and management practices in Dugda district of East Shoa Zone of Oromia, Ethiopia. Eight sample Kebeles were purposively selected based on the potentiality of milk production and stratified as urban, peri urban and rural dairy production systems. Semi-structured questionnaire, secondary data sources and personal observation were employed to generate data. A total of 144 farmers which included 36 from urban, 54 from peri urban and 54 dairy producers from rural dairy production systems were randomly selected for the study. In urban dairy production system daily milk yield for cross breed cow (10.11±0.96 lit) was higher (P<0.05) than peri urban and rural dairy production systems. Mean lactation length was lower (P<0.05) in urban for local breeds as compared to peri urban and rural production systems. Lactation length for crossbreed dairy cow was higher (P<0.05) in urban than rural and peri-urban production system. Mean ages at first calving in peri-urban for both local (39± 0.47months) and cross breeds (27.84±0.46 months) were shorter (P<0.05) as compared to peri urban and rural dairy production systems. The calving interval for crossbreed dairy cow was longer (P<0.05) in the rural (19 months) than that of urban (16.96 months) and peri urban (17.40 months) production systems. About 94.4% of the households in urban dairy production system practiced teat wash before and after milking. About 97.2%, 57.4%, and 20.4% of the urban, peri-urban and rural households clean their milking utensils before and after milking, respectively. In the urban system, the major dairy product produced were butter (for 25% of the households), fermented whole milk (30.6%) and cottage cheese (19.5%).Butter was the primary product in peri-urban (88.9%) and rural (92.6%) production system. Dairy producers prioritized the major constraints of dairy farming in the following order: feed shortage, diseases problems, high price of feeds, problems related to market availability, breed related problem, capital shortage and high price of medicaments. The most important sources of animal feeds were crop residues followed by natural pasture. Annual feed balance estimation revealed that the total estimated available feed supply in urban dairy, peri-urban rural systems met 57.34%, 84.34% and 90.46% of the maintenance DM requirement of livestock, respectively. Milk handling practices are also sub-optimal under semi-urban and rural production system. Therefore, improving the nutritive value of crop residues and enhancing fodder conservation and utilization is critical to dairy production. Training needs to be provided with regard to milk and milk products handling. Improvement in marketing of milk and milk products should get due attention so that farmers optimize the opportunity from the sector.

***Key words**:* Dairy production systems, management practices, feed resources availability

1. INTRODUCTION

Agriculture is the backbone of Ethiopian economy, shares the largest portion of national gross domestic product. According to World Bank (2014) agricultural sector is the leading sector in Ethiopian economy by contributing 42.3% for total national gross domestic product (GDP). Out of the total agricultural GDP, livestock sectors contributes about 40% to agricultural gross domestic product and solely the livestock subsector contributes about 26.4% to the national Gross Domestic Product (ILRI, 2016). According to LOL (2010) livestock also performs multiple functions in the Ethiopian household economy by providing food, input for crop production and soil fertility management, cash income as well as in promoting savings, fuel, social functions, and employments. With these multiple functions, livestock can serve as a vehicle for improving food security and better livelihood of the rural population.

In terms of the number, Ethiopia owns the largest livestock population in Africa, comprising about 55.03 million heads of cattle of which 98.71 percent cattle in the country are local breeds (CSA, 2014). Out of this total cattle population, the female cattle constitute about 55.38 percent and the remaining 44.62 percent are male cattle (CSA, 2014).Inspite of the huge numbers of livestock resource and great potential for increased livestock production, the benefits obtained from the sector does not match with the high livestock population due to a number of dynamic economic, technical, policy and institutional challenges. Livestock producers encounter various livestock management problems, prevalence of major diseases, poor feeding, highly based on indigenous breed and high stocking rate on grazing lands. Thus, the contribution of this sector in the agricultural economy of the country remains lower.

Among livestock production, dairy sector is a major contributor to economic development, especially among the developing countries. As an engine of growth, it provides increased income, employment food and foreign exchange earnings as well as better development, the share of animal products in total food budget increases faster than that of cereals. The development of the dairy sector in Ethiopia can contribute significantly to poverty alleviation and nutrition in the country. Furthermore, as it is produced daily and is an important cash source for smallholder farmers, dairying offers a pathway out of poverty to a large number of smallholder households keeping dairy cattle which is also a means of diversifying livelihood strategies. Dairy production is therefore, a critical issue in Ethiopian household economy and its products are important source of food and income. However, dairying has not been fully exploited and promoted in the country (Sintayehu *et al*., 2008) as compared with other neighbour countries like Kenya, Uganda and Tanzania. Despite its potential for dairy development, productivity of indigenous livestock genetic resources in general is low, and the direct contribution it makes to the national economy is limited. According to CSA (2014) national average milk production per cow was estimated at only 1.37 litres/day, and the per capita milk consumption was only about 19.2kg/year (MOA, 2012), which is much lower than African and world per capita averages of 27 kg/year and 100 kg/year, respectively (FAO, 2009). Also milk production, milk collection, processing and marketing in the country is not well developed.

Zewdie (2010) reported that annual milk production per cow in Ethiopia is generally low due to low efficiency of reproductive and productive performance of dairy cows. Another major problem to such low milk production is shortage of livestock feed both in quantity and quality, especially during the dry season. In general, the development potential of livestock production is negatively influenced by the chronic shortage of fodder in most of the livestock producing

areas. Many years ago, a lot of efforts have been made towards dairy development to improve t milk production through providing extension service by government and non-governmental institutions. However, the result obtained from such efforts is not satisfactory to all smallholder dairy farmers in the country as well as in the study area.

Recently, NGOs (LIVES) promoted dairy development through capacity building to increase milk production and to improve incomes of crop livestock mixed farmers in the study area. Therefore, Dugda woreda is one of the livestock and irrigation value chain for Ethiopian smallholder (LIVES) project interventions which was chosen due to its potential for dairy production (DWOL, 2010). However, the potential of dairy cattle, productive and reproductive performance of dairy cattle, marketing systems, milk handling method were not yet studied and the information of dairy activities were not documented. Therefore, it is very important to explore the current situation of dairy production and marketing systems; and to assess the present dairy management practices in the district. Hence this study was initiated to assess dairy potentials, dairy cattle performance, identify constraints related to dairy activities with the general objective of assessing dairy production, management practices and marketing system in the area.

Specific Objectives

- To characterize dairy cattle production and marketing system in the district.
- To assess the productive and reproductive performance of dairy cattle
- To assess feed resources availability in the study area
- To identify the main constraints of dairy production systems

2. LITERATURE REVIEW

2.1. Dairy Production Systems in Ethiopia

There are different criteria for the classification of dairy production systems in Ethiopia. Based on location or scale of market orientation and production intensity as criteria, three major dairy production systems are reported in Ethiopia (Dereje *et al*., 2005; Sintayehu *et al*., 2008). These are traditional smallholders, peri-urban and urban dairy production systems.

2.1.1. Urban dairy production system

Urban dairy farming is a system involves highly specialized, state or businessmen owned farms as well as smallholder urban dairy keeping households which are mainly concentrated in major cities of the country. For a decade a number of smallholder and commercial dairy farms are emerging mainly in the urban and peri-urban areas of the capital and most regional towns and districts and have no access to grazing land(Nigussie,2005;Yitay *et al*.' 2007). Smallholder rural dairy farms are also increasing in number in areas where there is market access.

2.1.2. Peri urban dairy production system

Per urban production system is developed around the cities where agricultural land is shrinking due to the expansion of urbanization. In this system crossbred animals are kept in small to medium-sized farms. Urban and peri-urban production systems include commercial to smallholder dairy farms. Such farms are reported to be found in and around major cities including Addis Ababa and other regional towns. The main source of feed is both own farm produced and purchased hay and the primary objective is to get additional cash income from milk sale (Yitay, 2008).

2.1.3. Rural Dairy production

The rural dairy production system is part of the subsistence farming system which is the predominant production system that includes pastoralists, agro-pastoralists, and crop-livestock producers. Largely, the system is based on low producing indigenous breeds of zebu cattle. The livestock are kept under traditional management conditions and generally obtain most of their feed from native vegetation, aftermath grazing and crop residues (Tsehay, 2002).

2.1.3.1. Pastoral production system

Pastoralist is the major system of milk production in lowlands. However, because of the low rainfall, shortage of feed and water availability, milk production is low and highly influenced by season (Tsehay, 2002). The system is not market oriented and most of the milk produced in it is retained for home consumption (Ahmed *et al*., 2003) or household processing. Processing is usually done using traditional technology in to products such as butter, ghee, ayib and sour milk. Milk and milk products are usually marketed through the informal market after the households satisfy their needs (Tsehay, 2002).

2.1.3.2. Agro-pastoralists

Agro-pastoralists are part of the pastoral society who promotes opportunistic crop farming to improve food security. Traditionally its one way of maintaining ownership rights over the use of land. It enables the production of crops to be used by both humans and livestock (Beruk and Tafesse, 2001).Cultivation is wider practices in pastoral area depending on rainfall.

2.1.3.3. Crop and livestock integrated production system

According to the crop and livestock production integrated farming systems can be categorized as crop-livestock and livestock-crop systems. In the crop-livestock system, cropping is primary and the more important farming activity, while livestock is secondary. In the livestock/crop system, the livestock is the primary activity and cropping takes secondary position in terms of farming importance (Janke, 1982).The crop-livestock production system is available in most of the Central Rift of Ethiopia.

2.2. Milk production

Dairy cow is the main source of milk production in Ethiopia and dairy production depends mainly on indigenous livestock genetic resources; more specifically on cattle, goats, camels and sheep. Cattle contributed 81.2% of the total national annual milk output, followed by 7.9% of goats, 6.3% of camels and 4.6% of sheep (CSA 2009). Even though Ethiopia has potential for dairy development, productivity is low due to highly dependence on indigenous livestock genetic resources which account more than 98 % total cattle in the country and the direct contribution it makes to the national economy is limited (CSA,2014). Accordingly, the current average lactation period per cow at country level is estimated to be about six months, and average milk yield per cow per day is about 1.37 litres.

2.3. Milk consumption

The majority of dairy households in Ethiopia directly consume most of their animals' milk production. An increase in household income through the adoption of improved dairy technology has been found to lead to improving the household's nutrient intake which contributes to better health and nutrition (CSA, 2010). However, level of milk consumption was influenced by households' income, amount of milk production, religious and price of milk. Kassahun and Fikadu(2009) indicated that the consumption level of milk was significantly correlated with household income, consumer unit (family size) education level of the food budget manager, ownership of dairy cattle, monthly expenditure on dairy products, average daily milk production per household and price of milk products. Kassahun *et al.* (2014) reported that the higher proportion of Orthodox Christianity (87.5 and 91.2%) household in East Shoa Zone (Ada'a and Lume) districts respectively, may not have impact on the adoption of dairy technologies however; it has impact on the utilization of milk and milk products

especially during the fasting periods. The amount of milk consumption also varies according to the location as well as production systems. The recent finding by Azage *et al.* (2013) in the rural highland dairy production system of Fogera woreda indicated that about 20.6% of daily milk produced was consumed by the households, while 65.5% is processed into milk products and used for home consumption and sale. Bilatu *et al.* (2013) reported that about 94% of the milk produced in East Shoa Zone (Ada'a and Lume districts) was sold while only 6% was retained for home consumption. Kassahun (2008) also indicated that the highest amount of milk was allocated for the sale in the same study area. Similarly, the studies conducted at Mekele area of Northern region by Nigussie (2006) revealed that 79% of the milk produced by urban dairy farmers was allocated for marketing.

2.4. Reproductive and productive performance of cattle

2.4.1. Age at first calving (AFC)

Usually cows do not produce their first calve at earlier stage of their age. Recent research finding by Tadelle and Nibret (2014) in North Gondar of Amhara regional state had shown that the average age at fist calving for indigenous dairy cows ranged from 39.8 to 45.4 months. Mureda and Mekuraiw (2007); Ibrahim *et al.* (2011) and Lemma and Kebede (2011) had reported age at first calving of 36.2, 34.7, and 33.2 months, for crossbred cows , respectively , in different areas of Ethiopia. But slightly different from the means (32.4, 39.2 and 40.6 months) were also reported by Tadesse *et al*. (2010) and Moges (2012). Kefelegn *et al.* (2014) reported that age at first calving for indigenous, crossbred and higher grade (exotic) cows in Adama district was 51.8, 31.8 and 33.8 months ,respectively. Figure in Ada'a and Lume districts demonstrated that the age at first calving of indigenous ,crossbred and exotic breed dairy cows were 49.1,33.7,35.6 months and 51.0,39.5 and 38.0 months, respectively. These

variations of age at first calving might be due to variation in location, breed and level of management.

2.4.2 Calving interval

Calving interval is a function of calving-to-conception interval or days open, which is considered to be the most important component determining the length of calving interval, and gestation length, which is more or less constant. Calving interval varies slightly due to breed, calf sex, calf size, dam age, year, and month of calving. Longer calving interval reduce number of lactation initiated in total life and the total number of heifers in the herd which consequently reduce the chance of replacement with better animals. Kefelegn *et al.* (2014) reported mean calving interval of about 18.7, 20.4 and 20.7months for indigenous breed cattle in the three districts of East Shoa zone Adama, Lume and Ada'a, respectively. By the same authors, calving interval of crossbred cattle was estimated to be 15.6, 17.4 and 15.8 months in the same area, respectively. Zewudie (2010) also estimated that mean calving interval of crossbred in Highland system is about 15.7 months, whereas calving interval for indigenous breed in Central Rift Valley production systems is estimated to about 22 months. Report by Kedija (2007) from Mieso district of Oromia regional state shown that a minimum and maximum calving interval for local breed cows were 11 and 24 months, respectively. Over all calving interval estimated at 16 months. Abebe *et al.* (2014) in the Southern of the country reported the value recorded was 24 months of for calving interval of local breed cows. Diriba *et al.* (2014) also estimated 16.57 months of overall mean calving interval for pure Jersey cattle at Adea dairy research centre in the highlands of Ethiopia

2.4.3. Milk yield

The estimated average daily milk yield for Zebu X Holstein-Friesian crossbred dairy cows in Jimma town of Oromia region was reported with the valued of 8.52 litres (Belay *et al*., 2012). Yitaye (2008) estimated 7.8 kg/day/cow for borana crossbred cows in urban and peri-urban areas of North Western Highlands. Many authors reported higher values of milk yield in different areas. For instance, research conducted by Kefalegn *et al*. (2014) reported higher average milk yields for cross breed (10.70,11.11 and 11.88L) at different location of East Shoa Zone (Adama,Lume and Ada'a),respectively. However, in central rift valley around Ziway, Zewdie (2010) estimated the lowest overall average daily milk yield who valued as 7.6 L

With regard to daily milk yield obtained from local breed cows, the average milk yield varied between 2 to 3 litres in the three districts of East Shoa Zone (Kefelegn *et al.*, 2014). Also Zewudie (2010) reported about 1.5 litres of overall milk yield in East shoa Zone. Similarly, in the other areas of the country, a mean daily milk yield of 2.2 L/day (Jiregna *et al.*, 2013) in Western part of Oromia ;1.8 L/day (Abebe *et al*., 2014) in southern part of Ethiopia; Lemma *et al.* (2005) reported 1.0 kg/day/cow for Arsi zebu breed, Adugna and Aster (2007)2.2 kg/day/cow for Boran breed in Borana Zone and Kedija (2007) 1.2 kg/day/cow for local zebu breed at Meiso district was reported for local cows. The results reported by different researchers in different locations were almost comparable with the national average milk of 1.37 per cow per day (CSA, 2014). For both breed type; the difference might be associated with feed shortage due to extended period of drought during the study seasons. Moreover, indigenous breeds of cattle are low yielders under poor management conditions (Million and Tadelle, 2003).

3.4.4. Lactation length

The estimated average lactation length for Zebu X Holstein-Friesian crossbred dairy cows in Jimma Town of Oromia region was reported with the valued 9.13manths (Belay *et al*., 2012). Yitaye (2008) also reported 11.2 months for Borana crossbred cows in urban and peri-urban areas of North Western Highlands. Mulugeta and Belayneh (2013) reported the higher values of lactation length for crossbreds in North Shoa (11.1 ± 4.8 months).On the other hand, the estimated lactation length for local Arsi zebu cows was 8.3months (Lemma *et al.,* 2005).Also (Adugna and Aster, 2007) reported 8.3 months for Boran breed in Borana Zone and 7.3 months for local zebu breed at Meiso district (Kedija, 2007).The lowest value of lactation length reported by national livestock survey (2014) was 6 months average.

2.4.5. Days Open

Days open are the number of days between calving and conception period. It influences profitability of the dairy industry. Days open is influenced by breeds of cattle and level of management and environment. Zewde (2010) reported that mean days open for crossbred in highland were about 192 days, whereas, local breed in Central rift valley around Ziway were about 382 days. Research finding reported by Nibret (2012) in Gonder Amhara regional state showed that the average days open for crossbred under Urban and peri urban production system were about 87 and 100 days, respectively. Belay *et al.* (2012) reported about 156 over all mean days open for crossbred in Jima town of Oromia region. On the other hand, Tadele and Nibre (2014) estimated about 87 mean days open for indigenous dairy cow maintained in small dairy units under farmer's management in North Gondar of Amhara regional state. Breed type and environmental factors may increase or decreased days open. As De Vries (2006) concluded that decreased in the length of days open would increase pregnancy rates, profit per cow and

decrease breeding and labour cost. Environmental conditions and breeds are the main factors, which might affect the profitability and lifetime productivity of dairy cows.

2.4.6. Number of service per conception

Number of service per conception depends largely on the breeding system used. It is higher under uncontrolled natural breeding than hand-mating and artificial insemination (Moges, 2012). The overall Least Squares Means for NSPC in North, Gondar Zone was 1.8(Belay *et al*., 2012) and the overall least squares means for NSPC in the indigenous dairy cow is 2.0.. Additionally, 2.33 1.98 and 2.25 number of service per conception for cross breed and 1.56, 1.45 and 1.57 for local cows were reported by Kefelegn (2014) in Adama, Lume and Ada'a, respectively.

2.5. Milk handling and processing

Smallholder milk producers use different traditional storage and processing facilities. Plant materials are used for seasoning and fumigation of milk containers to increase the shelf life of highly perishable dairy products such as milk, butter milk, cottage type cheese and butter. Among which butter is the most shelf stable product (Alganesh and Fekadu, 2012) direct means of milk contamination, unclean hands and milking equipment is the main factor affect milk product. Milking system among the traditional smallholder farmers' production systems in the country was entirely hand milking. Washing of udder before milking was mainly practiced by farmers of peri-urban (Fikrineh *et al*., 2012)

Hygienic milk production is important and should take into account the sanitation of the barn, personnel involved in milking and the utensils used to collect and store milk. Cleaning of the teats before milking contributes to hygienic milk production. However, it is not common practice to sanitize teats before milking in the rural dairy production systems, and the number of farmers sanitizing teats is few in urban dairy production system with the assumption that teats are cleaned when the calf suckles before milking (Azage.T.*et al*, 2013).Similar finding

was also reported by Kedija(2007) from Mieso district of Oromia region which expressed washing of teats is not practiced, and the producers believe that during calf suckling for milk let-down, the teat get washed by the saliva of calf and therefore it is not as such important to wash the teat before milking(Kedija,2007). In East Showa zone of Oromia region majority of the women (85.5%) follows limited sanitary procedure before and after milking, only few women (14.5%) wash the udder of the cow before milking (Lemma, *et al.,* 2005).

2.6. Feed resource availability and feeding systems

Livestock feed resources in Ethiopia are mainly natural grazing lands and browses, crop residues, pasture, forage crop and agro-industrial by products. Using 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 (Alemayehu, 2005).According to Million *et al.* (2014) , the major feed resources for dairy cattle in urban dairy production systems of Ada'a Liban districts were involved agro-industrial by products, commercial concentrates and purchased crop residues. Adebabay (2009), Million *et al.* (2014) and Sintayehu *et al*.(2008) shown that the existence of different types and different feeds sources which includes crop residues, natural grazing ,commercial feeds and non conventional feed(local brewery) were common feed resources based on availability and production systems.

2.6.1. Estimation of feed dry matter production

Many researchers estimated the average dry matter production in different areas of the country based of feed availability. Bogale *et al.* (2008) in Bale highland and Dawit *et al*. (2013) in East Shoa Zone of Adami Tullu Jiddo Kombolcha Woreda and Zewdie (2010) in central rift valley of Ethiopia estimated the average of dry matter production. Based on Karl (1982) recommendation DM requirement, Zewdie (2010) estimated that crop residues contributed about 86.38% of total feed DM production in Central Rift Valley of Ethiopia, respectively.

Also Bogale (2008) and Dawit *et al.* (2013) reported that 7.6 and (9.69 and 7.69 rural, peri urban) of the average utilizable feed DM yield tons per year per household from crop residues using 10% loss, respectively. On the other hand Amare (2006) and Mulu (2009) reported the positive balance for DM requirement in north Gondor and Bure Woreda of Amhara region. The positive value might indicate the small number of livestock population, fertility of the land and average moisture content the area.

2.7. Cattle housing management

In cattle management, construction of animal was the most important. In the Central Rift valley, around Ziway the majority of farmers kept their in corral house (Zewdie, 2010). Whereas, in Boditi and Guraghe all most all households (80%) in rural or mixed crop/livestock system kept their cattle within family house because of the fear of thieves, to protect animals from extreme environmental hazards, while the minority (10%) the farmers used a separate shelter for their animals and open bar nor fences within their own compounds (Asrat *et al.,* 2012 and Asrat *et al*., 2013); Abebe *et al.* 2012).

5.8. Watering management

Water plays a critical role in life. There are different sources of water body which used to cattle watering. According to the report of Gebrekidan and Zeleke (2014) pipe water was the major sources of water in urban area of in Tigray. Similarly, Sintayehu *et al.* (2008) showed comparable usage of water sources in which the majority of the urban dairy producers obtained water from pipe water. However, Asrat *et al*. (2013) in Boditi and Zewdie (2010) in Debre Birhan were reported that river as the main sources of water for watering livestock. Also lake was the main sources of water for watering livestock (Zewdie, 2010). Farmers who are far from

the water source, trek long distances for water searching which causes weight loss of animals. Girma *et al*. (2009) indicated that animals consume less water if they have to travel further to the source.

2.9. Constraints of dairy production

Dairy production is constrained by multifaceted factors, though the nature and magnitude of the problems vary between production systems and agro-ecologies. Some are cross-cutting that can have influence on dairy production regardless of dairy production system and agro-ecologies; others are system specific. Belay *et al*. (2012) and Abebe *et al. (*2014) listed land shortage, feed shortage, inefficient artificial insemination (AI) service and water shortage as the most important dairy production constraints in Jimma and Gurage Zone, respectively.

Diseases such as lump skin diseases, mastitis, blackleg and foot and mouth diseases were the major diseases problems hampered dairy production. Azage *et al.* (2013) reported that pasteurolosis, lump skin disease, anthrax and black leg were major disease in the highland dairy system. Out of the whole diseases, mastitis was the most important diseases affecting milking cows through reduction in milk production especially in urban dairy production Among the listed diseases, anthrax, blackleg and foot and mouth diseases are the common outbreak occurred seasonally and the farmers and farmer used to vaccinate their animals before the outbreak.

Problems related with reproductive performances were the major problems that affected dairy herds. The major problem of reproductive performance faced in dairy production systems were include long calving interval, abortion, late age at first maturity and low rate of conception (Asrat *et al.,* 2013).There were also market related problems which includes distance from the

markets place, shortage of milk and seasonal fluctuation in milk supply have been reported to be the major determinant across all the production systems (Azage *et al*., 2013).

According to Derese (2008) unavailability of feed probably limit the milk production potential of cows with good milk producing ability more than any other single factor and is the most serious constraint to improve dairying in West Shoa Zone. Generally, market for dairy products was the major problems affecting dairy cattle production such as low price of milk during fasting period and higher cost of feed. This idea was similar with the reports of Adebabay (2009); Kassahun (2008); Sintayehu *et al.* (2008) and Million *et al.* (2014) in different parts of Ethiopia

2.10. Dairy product marketing

Dairy marketing in the country can be categorized as informal and formal marketing system. The common marketing system identified in the current study was informal marketing system(Belete *et al.*,2010 ;Dessalegn *et al.,*2013; Azage *et al.,*2013 and Abebe *et al.,*2014) were indicated that informal marketing systems as the dominant dairy marketing practices where they sell their products to neighbours and sale to itinerant traders or individuals in nearby towns or local markets. Also Zelalam *et al.* (2011) indicated that about 95% of the marketed milk at national level is channelled through the informal system. Whole milk, fermented milk, butter and cheese are common marketable product in the urban areas, whereas traditional butter and cheese are the most important dairy products used for marketing in rural dairy production systems. The recent finding by Million *et al.* (2014) showed that raw milk, butter and cheese are the most important dairy products used for marketing in urban dairy production system of Ada'a Liban Woreda. Milk and milk product marketing was affected by different factors. The

main factors are shortage of milk, cultural restrictions (taboo) and lack of the market access are the most common (Sintayehu *et al.*, 2008; Abebe *et al.*, 2014)

3. MATERIALS AND METHODS

3.1. Descriptions of the study area

The study was conducted in Dugda district of East Shoa Zone, Oromia regional state. Dugda is part of the former woreda of Dugda Bora, at present divided into Bora and Dugda Woreda. It is located at 8° 10'N latitude and 38° 50'E longitude at an altitude ranges between 1500 -2300 meters above sea level (CSA, 2008).The capital town, Meki, is found 130 km on east south of Addis Ababa on the main road from Addis Ababa to Hawassa. The agro-ecology of the woreda is categorized as lowland *(*55 %) and dry woynadaga (45%). The minimum and maximum mean annual temperature was 22^0_C-28^0_C, respectively. Soils in the district are of different types, most of which are sandy loam (59%) and clay loam (41%, DWOA, 2014). It receives an average annual rainfall of 750mm. Rainy season is the main season for crop production.

According to the Central Statistical Authority (2008) an estimated total human population of Dugda woreda was 144,910, of which 74,561 were men and 70,349 were women; 36,252 or 25.02% of its population were urban dwellers. The majority of the inhabitants (about 91.32%) are Ethiopian Orthodox Christianity, while 3.88% of the populations are Protestant, 2.13% of the populations are Muslim and 1.36% of the population practice traditional beliefs.

Dugda Woreda has a potential for agriculture farming which include both crop farming and animal husbandry. From the total land area coverage, 63.3% is arable or cultivable, 8.3% pasture, 3.7% forests, 3.1% swampy and the remaining 21.6 is considered water body and others (DWOA, 2014). This shows that the area is dominated by agricultural land where crop farming is the major activity. Major cereals crops such as maize, wheat and teff are grown in the district. Vegetables and fruits such as tomato, onion, cabbages and papaya are the main

sources of cash crops. Annual crops are predominant and rain-fed agriculture is mainly practiced by subsistence farmers. However, according to MDG Plan of Dugda woreda, large area (21.94%) of agricultural land was identified for irrigation purpose. The district holds large number of livestock population of which 190,243 were cattle, 43,978 sheep and 46,126 goats (DWOL, 2010).

3.2. Sampling technique and sample size

From a total of 36 rural kebeles and 3 urban kebele of Dugda District, three rural, three Peri urban and two urban kebeles were selected using purposive sampling technique based on the accessibility and potential for dairy production. A multi stage sampling technique was used for the study. First dairy cattle holding farmers were clustered in to urban, peri urban and rural kebeles. Then, individual households having dairy cows of any breed and size was identified and listed. Finally, a total of 144 individual dairy cow owner households which included 36 from urban, 54 from peri urban and 54 dairy producers from rural dairy production systems were randomly selected from the list.

For the three production systems a semi- structured questionnaire was prepared and pre-tested for its applicability before its commencement. Interview was done by the researcher together with the livestock experts and development agents from the respective livestock offices. These experts were used to assist as translators for the local language '*Oromifa'* and as a local guide to lead to the selected farmers. The interviews were carried out at the farmer's home to enable counterchecking of the farmer's response with respect to the availability of feed resources, livestock population and species and the overall management system of the farm. A group discussion was also organized with purposively selected farmers, who had long experience and

knowledge of livestock husbandry as well as with Kebeles administrative and development agent to identify and generalize livestock production constraints.

The following data sets were collected using questionnaire: the socio-economic characteristics of dairy producers and the pattern of dairy production, consumption and marketing and the opportunities and challenges of dairy production. Data on feed resources availability and management, housing of dairy animals, breeding and watering activities was collected. Productive and reproductive performance of dairy cattle such as age at first calving, calving interval, lactation length, days open and number of service per conception was also collected.

3.3. Estimation of annual feed resource

The quantity of feed dry matter obtainable from natural pastures were determined by multiplying the hectare under each land use category by their respective estimated annual DM yield per hectare tDM/ha (FAO, 1987). Conversion factors of 2.0, 0.5, 3.0, 1.8and 0.7 tDM/ha/year was used for natural pasture, aftermath, private grazing land, fallow land and forest/woody land, respectively.The quantity of available crop residues produced by farmers was estimated by applying grain to straw ratio as suggested by FAO (1987). Accordingly, for a ton of wheat, barley and *teff* straw, a multiplier of 1.5 was used for haricot bean straw a multiplier of 1.2 used ,for maize a and sorghum multiplier of 2.0 and 2.5 was used, respectively. Similarly, quantity of feed dry matter obtained from irrigation practices was estimated by multiplying the irrigated land size by 0.3tDM/ha/seasons (FAO, 1987).

The quantity of potentially available crop residues for animal consumption was estimated by assuming 10% wastage (Adugna and Said, 1994).The quantity of industrial by product feed

resources was estimated by interviewing the farmers with regard to the frequency and quantity purchased per month.

3.4. Estimation of annual feed balance

Livestock populations per household were converted into Tropical Livestock Unit (TLU) as suggested by Gryseels (1988) for indigenous zebu cattle and Shifarew (1991) for crossbreds. The DM requirements for maintenance were calculated based on daily DM requirements of 250 kg dual-purpose tropical cattle (an equivalent of one TLU) according to Kearl(1982).Nutrients supplied by each feed types were estimated from the total DM output and nutrients content of that feed on DM basis.

3.5. Statistical analysis

The data collected by semi-structured questionnaire was entered in to Microsoft excel for the purposes of data management. Descriptive statistics was employed to describe qualitative data using statistical procedures for social sciences (SPSS) version 16.0. Quantitative data such as reproductive and productive parameters were analyzed using the General Linear Model (GLM) procedure of the statistical Analysis System (SAS, 2004). Means with the same category were compared using the Least Significant Difference (LSD) when F test was found to be significant. The following mathematical model was used during data analysis.

$y_{ijk} = \mu + P_i + S_j + B_k + e_{ijk}$
Where,
y_{ijk} = the observed value of a dependent variables
μ = overall mean
P_i = the effect of i^{th} production system
B_k=the effect of k^{th} management practices
e_{ijk} = random error

4. RESULTS

4.1. Socio economic characteristics

4.1.1. Household age structure and family size

The mean age of the household head in the study area are presented in Table 1. The average age of the respondents was 40.95 years. The mean age of household heads across all production systems was more or less similar.

With regard to family size, the average family size per household across the surveyed areas was 6.39±0.23 (Table 1). The family size in the urban dairy production was lower than the peri urban and rural dairy production system. The average number of males and females with in the household was lower for urban dairy production as compared to the peri urban and rural dairy production systems. The average family size composition by age group indicates that the majority of household members were within independent age categories across all dairy production systems. The mean number of family members categorized as dependent group per household headed was slightly lower in the urban production than in the peri urban and rural production system.

Table 1 Average age and family size based on sex and work condition in production system

Variables	Urban dairy (n=36)	Peri urban dairy (n=54)	Rural dairy (n=54)	Overall mean
Age (years)	39.67±1.41	42.07±1.18	41.11±1.67	40.95±1.42
Family size(No)	4.72±0.48	7.07±0.31	6.91±0.49	6.23±0.23
Male	2.28±0.31	3.50±0.26	3.31±0.20	3.03±0.14
Female	2.44±0.17	3.57±0.18	3.59±0.29	3.20±0.14
Dependents	1.29±0.19	2.82±0.20	2.48±0.20	2.14±0.80
Independents	3.43±0.29	4.25±0.26	4.43±0.25	4.04±0.27

Family members less than 15 and above 65 years old as 'dependents' (CSA, 1999), Family members of 15 to 65 years old as independent age' (CSA, 1999).

4.1.2. Household educational background

The educational background of the households was better in urban dairy production system than Peri urban and rural dairy production systems. Thus, about 71 and11.1% of the household in urban production system had attended/joined primary school and higher education institution, respectively. The proportion of respondents who attended primary school in the three dairy productions exceeds the proportion of adult education, junior and high school levels.

Table 2 Educational background of household heads (%) across dairy production system

Parameters (%)	Urban dairy	Peri urban dairy	Rural dairy	Overall mean
Adult education	-	23.3	28.5	25.9
High school	13.9	3.7	18.5	12.0
Junior school	4.0	3.7	9.3	5.7
Primary school	71.0	66.7	47.2	61.3
Higher institution	11.1	0.9	-	3.7
Total	100	100	100	100

4.1.3. Household religions

In peri urban dairy production, the majority of household heads were followers of Ethiopian Orthodox Christians Church than the households in urban and rural dairy production. The majority of household heads (83.1%) in Dugda district were Orthodox Christians Church followers and followed by Protestant (8%), Muslim (3.7%) and others religion (5.4%) followers, respectively (Table 3).

Table 3 Religions of household headed in the dairy production system

Variables	Urban dairy %	Peri urban dairy %	Rural dairy %	Average %
Orthodox	73.3	92.6	83.3	83.1
Protestant	13.9	3.1	7.1	8.0
Other	8.3	3.2	4.0	5.4
Total	100	100	100	100

4.1.4. Livestock holding and compositions

Livestock number varied among the three production systems. In urban dairy production system, total average livestock holding was significantly lower (6.52TLU) than the peri urban (8.86TLU) and rural production (12.58) systems. In terms of breed type, urban production system holds relatively large number of cross breed cattle whereas rural production system dominated by local breeds. Dairy cows are solely sources of milk in the study area. Accordingly, urban dairy production system was characterized by high milk producing cross breed cow in the study area while rural dairy production system holds low milk producing local cow.

Table 4 Average livestock holding per household across the dairy production systems

	Average livestock holding in TLU		
	Urban dairy	Peri urban dairy	Rural dairy
Livestock structure	(Mean ± SE)	(Mean ± SE)	(Mean ± SE)
Total livestock unit	6.52±1.59	8.86±2.07	12.58±2.03
Total cattle	5.38±0.3	7.67±0.2	12.16±0.33
Local breed cattle	1.44±0.21	4.87±0.56	10.95±1.92
Local breed oxen	$0.53.\pm0.07^{c}$	2.75 ± 0.10^{b}	4.66 ± 0.65^{a}
Local breed cows	0.42 ± 0.11^{c}	1.59 ± 0.19^{b}	3.72 ± 0.73^{a}
Local breed heifers	0.39 ± 0.04^{b}	0.42 ± 0.11^{b}	1.88 ± 0.41^{a}
Local breed calves	0.10 ± 0.02^{a}	0.11 ± 0.16^{b}	0.69 ± 0.31^{a}
Cross breed cattle	3.94±0.6	2.80±0.33	1.21±0.31
Cross breed oxen	0.48 ± 0.15^{b}	1.05 ± 0.09^{a}	0.46 ± 0.08^{b}
Cross breed cows	1.80 ± 0.19^{a}	0.9 ± 0.20^{b}	0.45 ± 0.13^{b}
Cross breed heifers	1.22 ± 0.11^{a}	0.67 ± 0.16^{b}	0.18 ± 0.15^{c}
Cross breed calves	0.44 ± 0.25^{a}	0.18 ± 0.16^{b}	0.12 ± 0.39^{b}
Sheep and goat	0.07 ± 0.59^{b}	0.09 ± 0.82^{b}	0.17 ± 0.53^{a}
Horses	0.64 ± 0.00^{a}	0.64 ± 0.00^{a}	0.1 ± 0.09^{b}
Donkeys	0.43 ± 0.22^{a}	0.46 ± 0.16^{a}	0.15 ± 0.16^{b}

Means with the same rows different superscript was significantly different ($P<0.05$)

4.1.5. Purposes of livestock keeping

In peri urban and rural dairy production systems, livestock were mainly raised to satisfy both milk and traction purpose, while the majority of household in urban keep their dairy cattle primarily for milk production (Table 5). About 94.4% and 50% of the respondents in the urban production system held cattle for milk production only and both milk and draught power, respectively. In the rural dairy production, the highest proportions of respondents (77.8%) keep cattle for both traction and milk purposes.

Table 5 Purpose of cattle keeping (%) by farmers in the three production systems

	For milk only		Milk and meat		Milk and traction		For traction only		As fertilizers		For dung as a fuel	
Production systems	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Urban dairy(n=36)	94.4	5.6	5.6	44.4	50	50	-	100	30.6	69.4	100	-
Peri urban (n=54)	27.8	72.2	5.6	94.4	98.1	31.5	-	100	85.1	14.9	100	-
Rural dairy(n=54)	7.4	92.6	-	77.8	100	22.2	7.4	92.6	100	-	100	-

n=number of respondents

4.2. Gender roles in dairy production

In the study area, milking was fully accomplished by females in rural area, while in the urban dairy production system about 70.3 % of the households indicated that milking was done only by female and 29.7 % of the households indicated that milking was shared between both sexes (Table 6).

Cattle herding was common in rural areas of the study. Therefore, about 87 % of interviewed households reported cattle herding activity were undertaken by adult male or children in rural areas.

Barn cleaning was the responsibility of male across all dairy production systems as reported by the majority of the interviewed households. Accordingly, about 45.9%, 48.1 and 77 % of the respondents in urban, peri urban and rural dairy production systems were reported barn cleaning activity as the responsibility of male.

Labour division varied among various dairy production systems and between household sexes for feed collection which depends on the availability of feed. Accordingly, about 79.5 % of respondents in urban and 83.3% of respondents in rural areas showed that feed collection is the

only responsibility of male households. Similarly, about 74.1% in peri urban households indicated that this task can the completed by males.

Milk and milk products marketing in most cases was performed by females (87.5%) in urban dairy, 96.3% in peri urban and it was as a whole job of females(100%) in rural dairy production systems. With regards to live animal marketing, about 77.4, 86.7 and 94% of the households indicated that live animal marketing is the responsibility of men in urban, peri urban and rural dairy, respectively. But, about 22.6 % of the households indicated that both men and women have equal responsibilities to participate in this task.

In overall dairy production systems, the majority of the respondent reported that animal house construction is the responsibility of male in household head members. About 97.3%, 96.3 and 98.1% of interviewed households reported as animal house construction for males in urban, peri urban and rural dairy production systems, respectively.

Table 6 Proportion of labour division (%) among production systems in Dugda woreda

	Urban dairy (n=36)			Peri urban dairy(n=54)			Rural dairy(n=54)		
Types of dairy activities	Female	Male	Both	Female	Male	Both	Female	Male	Both
Milking dairy cows	70.3	24.3	5.4	92.6	-	7.4	100	-	-
Barn cleaning	43.2	45.9	10.9	27.8	48.1	24.1	18.5	77.	3.7
Herd feeding	32.4	64.9	2.7	16.7	70.4	13.0	-	87.	13.0
Milk product marketing	87.5	5.4	7.1	96.3	-	3.7	100.	-	-
Feed collection	10.9	79.5	6.6	1.9	74.1	24.1	-	83.	16.7
Dairy cattle housing	-	97.3	2.7		96.3	3.7	-	98.	1.9
Live animal marketing	-	77.4	22.6	-	86.7	13.3	-	94.	5.2

n=number of respondents

4.3. Milk utilizations

Out of the interviewed dairy producers in the rural dairy production system, the majority of the households (44.4%) used whole milk primarily for home consumptions and about 43.9 % for traditional processing (Table 7).In peri urban dairy production, about 42.2 and 42.1% of the respondents utilized milk for home consumption and home processing, respectively. On the other hand, the result in the urban system showed that the majority (43.3%) of the households produced milk primarily for sale. The majorities of the respondents reported that the highest proportions (74.3%) of milk was given for children and followed by vulnerable groups (14.6%) of the family members.

Table 7 Milk utilization among the production systems

	Milk utilization (%)			
Milk utilized (%)	Urban dairy(n=36)	Peri urban dairy (n=54)	Rural dairy(n=54)	Overall
For calves consumption	12.1	10.9	8.6	10.53
For home consumption	29.6	42.2	44.4	38.73
For processing	15.6	42.1	43.9	33.87
For sales	43.3	3.4	-	15.56
For other purpose	0.7	2.0	3.9	2.2
Home consumption(%)				
Children	64.6	77.1	81.3	74.3
Male head	15.1	14.6	14.1	14.6
Vulnerable groups	10.3	3.6	-	6.9
Women	10	4.7	4.6	6.4
Total	100	100	100	100

4.4. Productive and reproductive performance cattle

Productive and reproductive performance of dairy cows in the study area was presented in the Table 8. The estimated milk yield for local breed did not shows significant difference ($P>0.05$) across all dairy production systems. However, there was significant difference between the two breed type which indicate higher value ($P<0.05$) for crossbreed across dairy production system. Variations among production systems might due to management level whereas variation between breed types was due to genetically variations.

The estimated mean lactation length was significantly lower ($P<0.05$) in urban for local breeds as compared to peri urban and rural production systems. This is due to dairy producers in urban dairy production system was not focused on local breed for milk production rather than they used to obtained replacement cross breed heifers. On the other hand, local breed in peri urban and rural dairy production systems were higher due to their exploitation milk up to conception period. In fact, lactation length for cross breed cows in urban production system marked significantly higher ($P<0.05$) than the other production systems. Conversely, lactation length for crossbreed dairy cow was significantly higher ($P<0.05$) in urban than peri urban and rural dairy production systems. However, lower for peri urban and rural dairy production systems due to poor management practices. With regard to breed type average lactation length shows significant variation between breed types among production systems.

The estimated mean ages at first calving for local and cross breeds in urban dairy were 39.00 and 27.84 months, respectively. Mean ages at first calving for both local and cross breeds were significantly shorter ($P<0.05$) as compared to peri urban and rural dairy production systems (Table 8). In rural dairy production system, the estimated mean age at first calving were

significantly (P<0.05) longer as reported by the respondents. However, age at first calving for cross breed in peri urban and rural dairy production systems did not shows significant difference(P>0.05).Generally, age at first calving for cross breed was significantly lower due to genetically variations between the two type breeds.

Estimated mean calving interval, in urban and peri urban production systems did not shows significant (P>0.05) whereas longer calving interval in rural production system for both local and cross breed cows. There was also significant difference (P<0.05) in length of calving interval between breeds types among the production systems. Variations between breed type and among production systems might be aroused from genetic and level of management practices among production systems.

The overall estimated mean days open in the current study were about 290 and 204.2 days for local and cross breeds cows, respectively. Production systems and breeds types had significant effect (P<0.05) on length of days open. For instance, the days open for both local and cross breeds in urban dairy productions were about 290 and 180 days for local and cross breeds which was shorter than the others. In the current study of rural area the highest average days open (309.9 and 226.50) was reported by respondents for both local and cross breed cows, respectively.

The overall mean number of service per conception was 1.52 and 1.80 for local and cross breeds, respectively. Number of service per conception did not shows marked difference (P >0.05) among production systems and between breeds types.

Table 8 Productive and reproductive performance of cattle (Mean ± SE) in three dairy production systems of Dugda district

Parameters	Urban dairy	Peri urban dairy	Rural dairy	Overall
Milk Yield/litre/day				
Local breed cows	1.53±0.40	1.34±0.09	1.48±0.21	1.45±0.23
Cross breed cows	10.11±0.96[a]	6.20±1.35[b]	5.00±1.87[b]	7.10±1.39
Lactation length(months)				
Local breed cows	7.31±1.04[b]	9.31±0.38[a]	9.87±.44[a]	8.80±0.62
Cross breed cows	8.81±0.33[a]	7.09±0.58[b]	7.25±1.03[b]	7.72±0.65
Age at first calving(months)				
Local breed cows	39.00±0.47 [c]	48.00±0.59[b]	48.6±0.77[a]	45.2±0.61
Cross breed cows	27.84±0.46[c]	35.28±0.40 [b]	36.96±0.55[a]	33.36±0.45
Calving interval(months)				
Local breed cows	18.56±0.77[b]	19.32±0.38 [b]	19.84±0.76[a]	19.24±064
Cross breed cows	16.96±0.59 [b]	17.40±0.37[b]	19.00±0.50[a]	17.79±0.5
Number of service per conception				
Local breed cows	1.53±0.11	1.70±0.12	1.32±0.07	1.52±0.10
Cross breed cows	1.67±0.14	1.73±0.17	2.00±0.38	1.8±0.28
Days open(Days)				
Local breed cows	270.00±0.34[c]	290.1±0.35[b]	309.90±0.35a	290.0±0.35
Cross breed cows	180.00±0.33[c]	206.10±0.47[b]	226.50±0.56[a]	204.2±0.45

Means in the same row within the same breed different letter of superscripts are significantly different from each other ($P<0.05$)

4.5. Mating systems

About 63.9 and 11.1% of the respondents in the urban and peri urban production systems, respectively, use artificial insemination service. Natural mating techniques was the main breeding technique in the study area (52.1%), whereas it was about 28.1% and 19.8% of the interviewed household used artificial insemination techniques and combination of the two

techniques, respectively. In natural mating breeding technique, 53.3% farmers use their own bulls and 34.6% of the interviewed household use bulls owned by their neighbour.

Table 9 Breeding techniques used the three production systems

Breeding technique	Urban dairy		Peri urban dairy		Rural dairy		overall
	N	%	N	%	N	%	
Artificial insemination	23	63.9	6	11.1	5	9.3	28.1
Both AI and natural mating	6	16.7	14	25.9	9	16.7	19.8
Natural mating	7	19.4	34	63.0	40	74.0	52.1
Total	36	100	54	100	54	100	100
Natural mating							
Own bulls	7	53.8	29	60.4	30	61.2	53.3
Neighbour bulls	4	30.8	14	29.2	16	32.7	34.6
Private cross bull	2	15.4	5	10.4	3	6.1	12.1
Total	13	100.0	48	100	49	100.0	100

4.6. Milking practices and milk handling

Cleaning of the teats before milking contributes to hygienic milk production. As indicated in Table 14, about 94.4% of the households in urban dairy production system practiced teat washing before and after milking. However, it is not a common practice to wash teat before milking in the peri urban and rural dairy production systems. Accordingly, the proportion of farmers washing teats was few in peri urban (27.8%) and rural dairy production system (5.6%) with the assumption that teats are cleaned when the calf suckles before milking.

With regard to type and milk utensils, the majority (63.9%) of urban dairy households used plastic milk utensils and about 53.7% of the peri urban and 59.2% rural producers used clay pot and plastics. Almost all of the urban producers (97.2%) usually clean their milking utensils

before and after milking. However, more than half (57.4%) of peri urban and 20.4 % of rural producers washed milking utensils before and after milking. Considering personal hygiene all of the interviewed respondents in urban dairy production system washed their hand before milking. About 31.5 and 9.3% of household in peri urban and rural areas washed their hand before milking, respectively. Bargemo adi (Eucalyptus *globulus*) was used for washing utensils and Ejersa *(Olea africana*) was used for smoking to improve the flavor of their products.

Table 10 Milking practices and milk handling methods in three dairy production systems

	Urban dairy		Peri urban dairy		Rural dairy		Overall
Milk handling methods	N	%	N	%	N	%	%
Hand wash before milking	36	100.0	17	31.5	5	9.3	46.9
Udder wash before and after milking	34	94.4	15	27.8	3	5.6	42.6
Washing milking utensils before and after	35	97.2	31	57.4	11	20.4	59.3
Plastic milk utensils	23	63.9	12	22.2	13	24.1	36.7
Clay pots and plastic utensils	9	25.0	29	53.7	32	59.2	46.0
Local made grass utensils	4	11.1	13	24.1	9	16.7	17.3
Smoked by aroma producing plants							
Ejersa(*Olea africana)*for smoking purpose	36	100.0	54	100.0	54	100.0	100.0
Eucalyptus globulus(for utensils washing)	27	75.0	39	72.2	51	94.4	80.5

4.7. Milk processing

Milk processing method across all the dairy production systems is traditional home processing method. In the urban system, the major dairy product was fermented milk (30.6%) followed by butter (25%) and cottage cheese (19.5%) Unlike urban dairy production system, majority of the households in peri urban (88.9 %) processed milk into butter, whereas for 55.6% and 35.2 % of the household cottage cheese and fermented milk were the main products, respectively. Similarly, in the rural dairy production system butter was the primary products for 92.6 % of

the households, fermented milk for 57.4% the households and cottage cheese for the remaining 75.6% of the households.

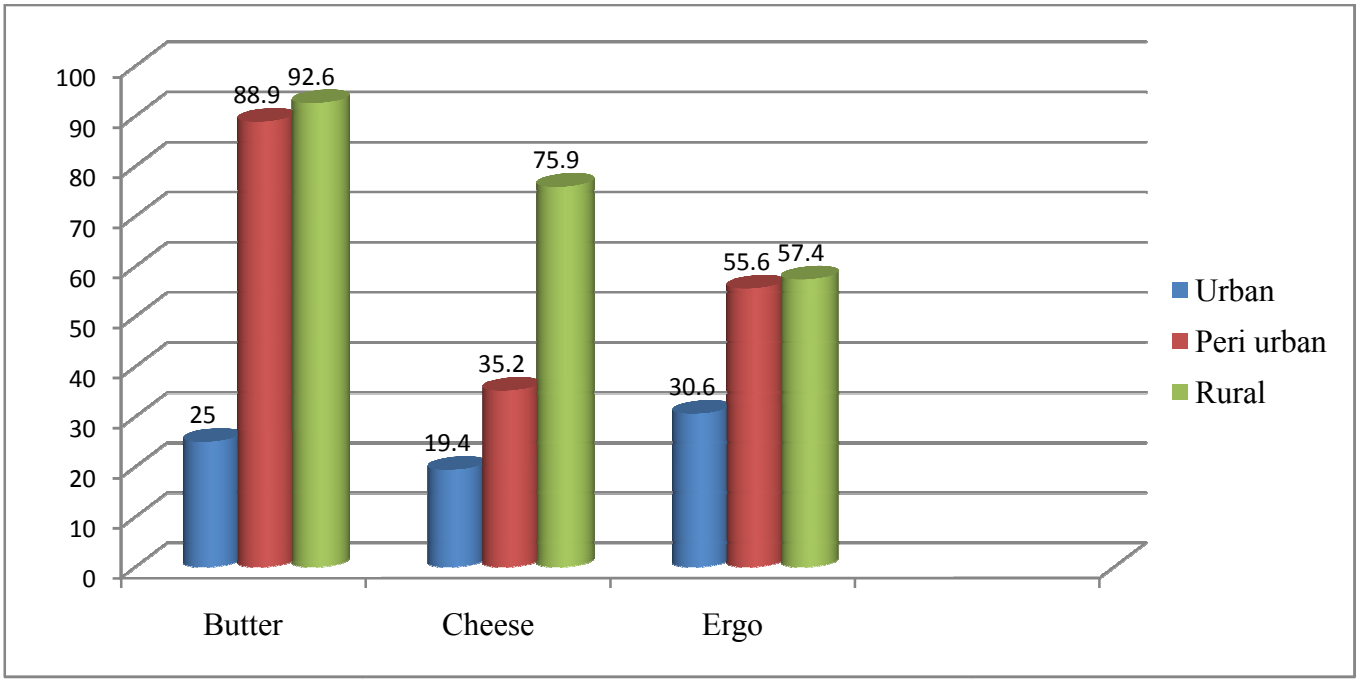

Figure 1Variations of processed milk among dairy production systems in the study area

4.8. Feed resources and feeding systems

The most important sources of animal feeds in the study area were crop residues followed by natural pasture. The most important types of crop residues frequently used in the study area are maize stover, wheat straws and followed by teff straw. Grazing own pasture and communal land are commonly used as feed resources. Crop aftermath grazing was also used by the higher proportion of the respondents in rural area, where as only about 22.2 and 37% of the respondents in the peri urban practiced crop aftermath grazing during rainy and dry seasons.

Table 11 Types of feeds and feeding systems at different seasons

Types feeds and feeding systems	Urban dairy (n=36)		Peri urban dairy (n=54)		Rural Dairy (n=54)		
	Rainy season	Dry season	Rainy season	Dry season	Rainy season	Dry season	Overall
Grazing own Pasture	-	-	83.33	75.93	92.59	87.08	70
Grazing communal land	-	-	77.78	70.37	85.19	81.48	56.64
Feeding own crop residues	-	-	90.74	98.15	96.29	100	75.77
Purchase crop residues	16.67	19.44	3.7	-	-	-	13.27
Crop aftermath grazing	-	-	22.22	37.04	88.89	97.22	61.34
Feeding purchasing feeds	83.33	80.56	38.89	44.44	14.81	24.07	49.99
Weeds from crop farm	-	-	20.37	16.67	74.07	22.22	33.33
Types of crop residues							
Maize stover	5.6	8.3	27.8	36.5	40.7	48.1	27.8
Teff straws	8.3	11.1	21.2	33.3	35.2	38	24.5
Wheat straws	2.8	-	18.5	31.5	33.3	40.7	25.4
Haricot bean straw	-	-	-	5.6	14.8	20.4	13.6
Barley straws	-	-	-	-	-	9.3	9.3

4.9. Estimation of feed dry requirement

The type and amount of DM obtainable from available major feed resource is presented in Tables 12. The average utilizable feed DM yield per household from crop residues was 0.52, 7.88 and 8.67 ton per annum by using 10% loss for urban, peri urban and rural kebele, respectively. The mean annual utilizable dry matter production from different type of feed resources was estimated to be 6, 11.69 and 16.5 tDM for urban, peri urban and rural production systems, respectively. The mean feed dry matter produced per household in rural areas was higher than that of feed DM in urban and peri urban kebeles. This is due to lack of grazing land and crop residues in urban production system.

Table 12 Estimated annual feed dry matter obtained per household farm from different crop residues, land use type and utilizable DM yield in the three production systems

	Urban dairy	Peri urban dairy	Rural dairy
Sources of feeds	Total DM per year	Total DM per year	Total DM per year
Maize	-	3.25	3.02
Wheat	0.1	2.84	3.33
Teff	0.42	1.71	2.2
Barley	-	0.11	0.17
Haricot bean	-	0.31	0.94
Sorghum	-	0.02	0.04
Utilizable crop residues	-	7.88	8.70
Natural pasture	-	2.00	1.5
Private grazing land	-	0.75	1.69
Aftermath	-	0.80	1.63
Forest / woody land	-	0.45	1.13
Fallow land	-	0.24	0.96
Irrigated land	-	0.25	0.87
Wheat bran	2.14	0.05	0.02
Noug seed cake	2.00	-	-
Concentrate mix	1.25	-	-
Other by product	0.09	0.04	-
Total DM available	6.00	11.69	16.5

4.10. Estimated annual feed balance

As reported in the Table 13, the average annual utilizable feed DM supply was estimated to be 5.39, 12.17 and 16.5 tDM per household for urban, peri urban and rural production system, respectively. Based on Kearl (1982) recommendation, the estimated values of annual feed dry

matter requirements for maintenance for urban, peri urban and rural areas was 9.44, 14.43 and 18.24 tDM, respectively. Accordingly, the annual utilizable feed dry matter satisfied about 57.34, 84.34 and 90.46% of the livestock maintenance requirements for urban, peri urban and rural kebeles, respectively. This result indicated that the feed shortage was more severe in urban dairy production systems due to lack of grazing lands.

Table 13 Estimated annual utilizable feed DM supply, DM requirement and feed balance per household in the three production systems

Location(Kebeles)	Estimated DM annual requirement for maintenance(t)	Annual feed DM supply(t)	Balance of supply versus requirement (t)
Urban dairy	9.44	5.39	-4.05(57.34%)
Peri urban dairy	14.43	12.17	-2.26(84.34%)
Rural dairy	18.24	16.5	-1.74(90.46%)
Overall	14.04	11.35	-2.68(75.92)

4.11. Cattle housing practices

The majority (58.9%) of the interviewed respondents kept their cattle in open barns. However, 13.3 and 14.5 % of the respondents kept their cattle in the house that have stone floor with roof and mud floor with roof, respectively. In the rural dairy production systems about 87.0% of respondents used open barn where as about 75.9% of the peri urban and 13.9 % urban respondents use open barn.

Table 14 Type of animal housing among dairy production systems

	Urban dairy		Peri urban dairy		Rural dairy		Overall
Type of cattle house	N	%	N	%	N	%	%
Stone(concrete) floor with roof	19	52.8	5	9.3	4	7.4	14.5
Mud floor with roof	12	19.4	8	14.8	3	5.6	13.3
Open barns	5	13.9	41	75.9	47	87.0	58.9
Total	36	100.0	54	100.0	54	100.0	100.0

4.12. Watering management

The majority of interviewed households in peri urban (46.3%) and rural production (33.3%) systems got water for livestock from Lake Ziway. However, about 61.1% of the respondent in urban dairy production system reported that pipe water was the main sources of water for their dairy cattle. Despite the smaller contribution of other water sources, water shortage is the major constraint during the dry season for kebeles located far away from Lake Ziway and Main River. As indicated in Table 15, in the urban dairy production system dairy farmers did not trek their animals to distant places due to watering at home. With regards to watering frequency about77.8, 81.5 and 92.6% of the households in urban, peri urban and rural areas water their dairy cattle once per day, respectively.

Table 15 Water sources and frequency of watering in the study sites

Sources of water	Urban(n=36)	Peri urban(n=54)	Rural(n=54)
Lake	-	46.3	33.4
Lake and pond	-	11.2	20.4
Pipe water	61.1	7.4	13.0
Pond	25	13	7.4
Rivers	13.9	22.2	18.5
Travel from point source			
At home	94.4	16.7	14.8
1 km	-	7.4	-
< 1 km	5.6		
1-5 km	-	63	22.2
> 5 km	-	12.9	63
Watering frequency			
Once	77.8	81.5	92.6
Twice	22.2	18.5	7.4

4.13. Constraints to dairy production

The nature and magnitude of the constraints were varying among dairy production systems. Dairy producers in the studied areas prioritized the major problems in the following order: feed shortage, diseases problems, high price of feeds, problems related to market availability, inefficient breeding, capital shortage and high price of medicaments.

Table 16 Major Constraints of dairy production systems in the study areas

Component of dairy constraints	Urban dairy		Peri urban dairy		Rural dairy		Overall	Rank
	N	Percent	N	Percent	N	Percent	Percent	
Feed shortage	11	30.5	17	31.5	15	27.7	30.0	1
High feed price	8	22.2	7	13.0	5	9.3	14.8	3
Diseases	6	16.7	9	16.6	8	14.8	16.0	2
Market availability	5	13.9	8	14.8	7	13.0	13.9	4
Breed related constraint	3	8.3	5	9.3	7	13.0	10.2	6
Lack of capital	2	5.6	6	11.1	8	14.8	10.5	5
High mendicants cost	1	2.8	2	3.7	4	7.4	4.6	7
Total	36	100.0	54	100.0	54	100.0	100.0	

According to the respondents feed shortage was the main constraints followed by disease and feed price. Household in peri urban and rural dairy production systems highly stressed seasonal variation in feed availability as the main problem, whereas in urban production system the majority of dairy producers were highly influenced by the high price of feeds

Market availability and lack of market information have been reported to be the fourth major problems in the current study. Thus, in the rural dairy production system milk marketing is a common problem due to cultural restrictions, distance to markets, shortage of milk and seasonal fluctuation in milk supply were the major determinant across all production systems.

Breed and reproductive related constraints such as delayed age at first mating, low calving rate and long calving interval are the most important problems in the current study. Although artificial insemination service is available in most urban production system, it is less available for most peri-urban and almost all in rural dairy production system.

4.14. Consequence of feed shortage

The consequences of feed shortage for livestock in all dairy production system in the study areas was characterized by lower milk yield, weight loss, mortality and absence of heat and abortion (Table 17). Overall, decreased milk yield (41.7%) and weight loss (30.5%) and lack of sign of estruses (21.9%) shares the largest percentage consequences of feed shortage on the performances of animals.

Table 17 Consequence of feed shortage among the three production system

Consequence of feed shortage	Urban dairy		Peri urban dairy		Rural dairy		Overall	
	n	%	N	%	N	%	N	%
Weight loss of animals	8	22.2	17	31.5	19	35.2	44	30.5
Reduced milk yield	11	30.6	23	42.6	26	48.1	60	41.7
Increased mortality	4	11.1	2	3.7	-	-	6	4.2
Abortions	2	5.6	1	1.9.	3	5.6	6	4.2
No sign of estruses	11	30.6	11	20.4	8	14.8	28	21.9
Total	36	100.0	54	100.0	54	100.0	144	100.0

4.15. Mitigation measure to overcome feed shortage

In urban dairy production system the majority (69.4%) of dairy farmers used purchased supplement feeds, while the majority of households in peri urban dairy farmers provided feed for their livestock in small quantity. The majority of households in rural dairy production feed from the stock of the rainy seasons (33.3%) as mitigation measures.

Table 18 Feed shortage mitigation measures of the different the production systems

Mitigation of feed shortage	Urban dairy(n=36)	Peri urban dairy(n=54)	Rural dairy (n=54)
Feed from the stock of the rainy season	5.6	27.8	33.3
Provision of feed in smaller quantity	-	29.6	31.5
Give less feed to certain type of animal	-	24.1	24.1
Purchase crop residues	11.1	3.7	-
Purchase supplement feeds	69.4	7.4	1.9
Selling the animal	-	1.9	3.7
Use nonconventional feeds	13.9	5.5	5.5
Total	100	100	100

4.16. Milk and milk products marketing

As indicated in Table 19, the majority of urban dairy farmers (75%) primarily produced whole milk for sale, whereas11.1, 8.3, and 5.6% of the households produced butter, fermented milk and local cheese, respectively, as primary dairy products for sale. However, the majority of the respondents in peri- urban (90.7%) and rural dairy production (96.3%) system produced butter as the predominant dairy product for sale .A few number of dairy producer in peri urban produced whole milk for sale (3.4) and local cheese (5.6%).

Table 19 Involvement of producers in milk and milk products marketing

Milk and milk products	Urban dairy (n=36)	Peri urban dairy (n=54)	Rural dairy(n=54)
Whole milk	75	3.7	-
Fermented milk	8.3	-	-
Butter	11.1	90.7	96.3
Local cheese	5.6	5.6	3.7
Total	100	100	100

5. DISCUSSIONS

5.1. Socio- economic characteristics

5.1.1. Household age structure and family size

The overall mean age of the household in the current study was higher than the mean value of 39.7years reported by Kedija (2007) in Mieso districts and 36.7 years reported by Teshome (2009) in the North Western of Ethiopia. However, higher mean values of 46.4 and 51.9 years were reported in Hawassa and Shashamane by Sintayehu *et al.* (2008), respectively. Also Belete (2006) and Belete *et al.* (2010) reported the mean values of44.6 and 44 years in Fogora Woreda, respectively.

The overall mean family size of the studied households was comparable with the value of average family size of 6.2 persons per household in Ada'a and Lume districts (Kassahun, 2008), 6 people per household in Gurage Zone of southern Ethiopia (Abebe *et.al*, 2014) and Wolayita Zone (CSA, 2011). Lower average family size (4.66 people household) was reported by Bilatu *et al.* (2013) in East shoa zone of Ada'a and Lume districts areas. However, higher average family size of 8.2 and 7.2 was reported by Asaminew and Eyasu (2009) in northern part of Ethiopia, Bahir Dar zuria and Mecha districts, respectively. Even if, the higher average family size per household was reported in the Northern part of Ethiopia, the higher proportion of independent family member in the current study was important for availability of family labour for different dairy activities.

5.1.2. Household educational background

In terms of educational level Dugda Woreda has higher proportion of educated person per household than the report of Kedija (2007) who indicated that only 15% the household read and write and very few household (4.2%) in the Mieso district joined elementary school. Higher proportion of educational level is an important tool to bring fast and sustainable development and had roles in affecting household income, adopting technologies, health, and as a whole the socio-economic status of the family as well. This might had a good contribution to adopt technologies in the study area.

5.1.3. Household religion

With regard to religious character, in the current study the percentage value of Ethiopian Orthodox Christian follower was lower than the previous report in Ada'a (87.5%) and in Lume (91.4) by Kassahun (2013) in East Ada'a and Lume districts of Shoa Zone. This indicated that the presence of large proportion of Orthodox can negatively affect the demand for milk and milk products during the fasting season. Ethiopian Orthodox Church abstain the followers for 200 days annually from milk consumption then as result the consumption/the demand for animal products goes down. This shown that fasting was the major reason for milk consumption variation in Ada'a and Lume districts (Bilatu *et al.,* 2013). Also UNIDO (2009) reported that the extended fasting periods of Ethiopian Orthodox Christian church highly affects the demand for milk in the country.

5.1.4. Livestock holding

Livestock holding play the vital role in the study areas. Having huge number of livestock especially in the rural area, the owners considered to be wealth and respected person. Today,

overall percentage of livestock in the study area was higher than the average value of livestock structure per household by Sintayehu *et al.* (2008) in Shashamane-Dilla areas. The predominant livestock species compositions kept in the current study area include cattle, sheep, goats and donkey where the average tropical livestock for cattle in the district was the highest. This was similar with report of Asrat *et al.* (2013) in the Southern part of Ethiopia

Regarding milk production, local and cross breed dairy cattle were the only sources of milk. This finding was in agreement with the report of Abebe *et al.* (2014) in Gurage Zone of Southern Ethiopia who reported that cattle are only important source of milk. However, camel and goats are the sources of milk in addition to dairy cow in Mieso district (Kedija, 2007; CSA, 2014). For instance, out of a total national annual milk production, about 81.2% was obtained from cattle (CSA, 2009). The rural dairy production system in the studied area was dominated by low producing local breed cows and very few cross breeds. This finding is in line with national livestock survey (CSA, 2014) which has shown that about 98.71% of cattle in Ethiopia were indigenous local breeds, while the rest (1.15% and 0.14%) are hybrid and cross breed, respectively.

5.1.5. Purposes of livestock keeping

Livestock keeping had multipurpose role in the study area. In the urban and peri urban production system, farmer kept their cattle mainly to satisfy both the need of milk production and traction purpose. This finding was in agreement with the finding of Sintayehu *et al.* (2008) who reported that farmers in the rural areas kept female cattle to produce milk for household consumption and male calves to assist the crop production by providing draught power. However, the majorities of household in urban dairy production system keep their cows only

for the purpose of milk production. This is in line with the report of Zewdie (2010) who indicated that about 90% and 95% of households keep their cow for milk production in Sebeta and Jima, respectively. Generally, livestock keeping play a great role for providing meat, input for crop production and used for fuel production. This result was in harmony with the idea of LOL (2010) which state that livestock production performs many functions in household economy by providing food, input for crop production and soil fertility management. Moreover, Asrat *et al.* (2013) reported that farmers used cattle as an asset that can readily be converted into cash needed for the purchase of farm inputs like fertilizers and improved seeds for the next crop production cycle.

5.2. Gender roles in dairy production

Division of family labour and role of gender in dairying varies among three dairy production systems in the study area. The dominant source of labour across the production systems is family labour. The experience in the rural dairying system of the current study showed that female household had the responsibility in milking dairy cows. This is contrary to the findings reported for the rural highland dairy production systems of Fogera and Bure, where milking is the responsibility of adult males followed by women, boys and hired labour (Belete *et al*., 2010). In the urban dairy production system of Debrezeit, however, women are responsible for milking of cows (Million *et al*., 2014). Similarly, in the urban and peri-urban dairy production system of Shashemene-Dilla milk shed, milking is predominantly handled by women (Sintayehu *et al*., 2008).

In the current study, cattle herding were carried out mainly by male family members of the household head. This was in line with the report of Zewdie (2010) who indicated that cattle

herding was mainly performed by male in Jima and Sebeta. Based on the availability of feed, feed collection was mainly the responsibility of male family member. This finding was in agreement with the report of Kedija (2007) and Zewdie (2010) who indicated that feed collection activities were largely performed by male in Mieso district and Central Rift valley, respectively.

Milk and milk products marketing was the responsibly of female household in most cases in the study area. However, in the case of Debrezit urban dairy production systems, the son had a major responsibly (40.5%) followed by daughters (24.3%) and employed person (16.2%) for dairy products marketing (Million *et al*., 2014). However, live animal marketing was the responsibility of male in the current study area which is not consistent with the finding of Kedija (2007) who indicated that the responsibility to marketing live animal was both men and women.

Barn cleaning was the responsibility of male in the current study area which was in disagreement with the finding by Belete *et al. (*2010) who reported that barn cleaning was the responsibility given to women by the majority of respondent in Fogora Woreda.

5.3. Milk utilization

In the rural dairy production system of the studied area, the majority of the households (44.4%), used whole milk primarily for home consumptions, while slightly less amount of milk produced was processed (traditional) in to products (43.9%). However, the recent finding by Azage *et al.* (2013) in the rural highland dairy production system of Fogera woreda indicated that about 20.6% of daily milk produced was consumed by the households, while 65.5% is processed into milk products and used for home consumption and sale.

On the other hand, the household in urban production system of the current study revealed that the higher proportion of milk produced (43.3%) was sold. According to Bilatu *et al* .(2013) about 94% of the milk produced in East shoa Zone (Ada'a and Lume districts) was sold while only 6% was retained for home consumption. Kassahun (2008) also indicated that the highest amount of milk was allocated for sale in the same study area. Nigussie (2006) also reported that 79% of the milk produced by urban dairy farmers in Mekele area of Northern region was marketed. There were many factors that affected milk consumption. Previous studies in different parts of the country showed that during fasting period's demand of dairy product is getting lower than non-fasting time (Kassahun, 2008). Availability and consumption of these products was high immediately after fasting as most of the milk during fasting period is processed into other dairy products for later sales and consumption

In the study area, the majorities of the respondents reported that the highest proportions of milk consumption was given for children and followed by male household heads. This finding is comparable with thee report of Lemma and Mekonnin (2015) children were the first priority followed by husband in Ada and Gimbichu districts.

5.4. Productive and reproductive performance dairy cows

The overall mean daily milk yield obtained for crossbred cow was closer to the report of Zewdie (2010) and Yitaye (2008) who estimated an overall average daily milk yield of 7.6 l and 7.8 kg/cow/day in Central Rift Valley and for Borana crossbred cows in urban and peri-urban areas of North Western Highlands, respectively. However, the present finding was lower than the previous reports by Belay *et al.(* 2012) from crossbred dairy cows (8.52 liters) in Jimma

Town of Oromia region and Kefalegn *et al*. (2014) who reported an average milk yields of 10.70,11.11 and 11.88 lit in Adama, Lume and Ada'a, respectively.

With regard to daily milk yield obtained from local breed cows, the average milk yield obtained was higher than the national average which was 1.37 litre (CSA, 2014) and that of Kedija (2007) who reported 1.2 kg/day/cow for local zebu breed in Meiso .However, the overall mean estimated milk yield in the current study areas was slightly lower than the value reported by Zewudie (2010) and Kefelegn *et al.* (2014) in crop livestock areas of Central Ethiopia. Similarly, in the other areas of the country, higher mean daily milk yield of 2.2 lit/day (Ulfina *et al.*, 2013) in Western part of Oromia and 1.8 lit/day (Abebe *et al*., 2014) in southern part of Ethiopia was reported. Adugna and Aster (2007) also reported 2.2 lit/day/cow of milk for Boran breed in Borana Zone for local cows. For both breed type, the difference might be associated to feed shortage and poor quality of the available feed. Million and Tadelle (2003) conclude that indigenous breeds of cattle are low yielders under poor management conditions.

The average values of lactation length in the current finding in urban dairy production system was comparable with the reports of Adugna and Aster (2007) in Borana Zone for Boran breed and Kedija (2007) for local zebu breed in Mieso district who reported 7.3 months. Also the values recorded in peri urban and rural dairy production systems was nearly similar with the value reported by Lemma *et al. (*2005) which was about 9.5 months for Arsi zebu breed.

The reported average lactation length of cross breed cows in the current study was lower than the mean value recorded in many literatures. Lemma and Mekonnin (2015) found an average lactation length per month of which varied from 9.32 to 11.66 month for crossbreed for at the three location of East Shoa Zone (Ada'a, Gimbichu and Boset). Also in other parts of the

country Deresse (2009) reported 9.97 and 10.1 months for urban and peri urban farms, respectively. Mulugeta and Belayneh (2013) in North Shoa and Yetaye (2008) in North Western Highlands reported average lactation of about 11.1 and 11.2 months for cross breed cows, respectively. Similarly, in Jimma Town of Oromia region; Belay *et al*. (2012) reported the higher value (9.13months) of average lactation length for crossbred dairy cows. This variation might be variation in environmental condition including management such as feeding.

The estimated overall mean age at first calving interval in the current study is in agreement with the result reported by Ibrahim *et al.* (2011); Kefelegn *et al.* (2014); Lemma and Kebede (2011) who reported of 34.5, 31.8, 34.7 and 33.2 .2 months, respectively, in different location of Ethiopia .However, higher values was reported by Mureda and Mekuraiw (2007) and Kefelegn *et al.* (2014) which was 36.2 and 39.5 months for crossbreed and 38.0 months for exotic breed. On the sides of indigenous breed, the current study had lower values of age at first calving than the previous reports by Kefelegn *et al*. (2014) which was 51.8, 49.1 and 51 in Adama, Ada'a and Lume, respectively.

The estimated mean values of calving interval in the current finding for local cows was closer to the mean values reported by Kefelegn *et al.* (2014) who estimated about 18.68, 20.41 and 20.71 months mean calving interval for indigenous breed cattle in the three districts of East shoa zone Adama, Lume and Ada'a, respectively. However, the average value of calving interval observed in the present study is lower than that reported for Central Rift Valley around Ziway (22.05months) for indigenous cattle (Zewdie, 2010).Similarly, Abebe *et al.* (2014) in the Southern of the country reported higher values of calving interval for local breed cows.

On the other hand, the observed calving interval for cross breed cow in the present study is in agreement with the report by Kefelegn *et al.* (2014) in Lume (17.38 months), and higher three values reported in Adama (15.56 months) and Ada'a (15.76 months).However, Diriba *et al*. (2014) and Zewudie (2010) reported lower values of mean calving interval for cross breed of about 15. 73 and 16.57 months in the East shoa zone, respectively. In the current study, generally, there is variation among the production systems and breed differences. The reason might be variation of level of management among production systems and breed types. Million *et al. (* 2010) concluded that long calving interval reduce yearly production cycle and the amount of milk a cow likely to produce in given period of time, which might be associated with environmental factors, poor nutrition, poor housing, lack of sufficient bull and AI services and poor health and reproductive management.

The estimated mean days open among dairy production systems in the study area was significantly different. Nibret (2012) reported shorter (87 and 100) days open for crossbred under urban and peri urban production systems in Gonder Amhara region, respectively, than the current report. Belay *et al*. (2012) reported about 156 mean days open for crossbred in Jima town of Oromia region. On the other hand, Tadele and Nibre (2014) estimated about 87 days open for indigenous dairy cow maintained in small dairy units under farmer's management in North Gondar of Amhara regional state. Local breed's cows in central rift valley had the longest (382) mean days open (Zewdie, 2010). As De Vries (2006) suggested, decreased in the length of days open would increase pregnancy rates, profit per cow and decrease breeding and labour cost.

Number of service per conception for local breeds was similar with the report of Kefelegn *et al.* (2014) that valued 1.56, 1.45 and 1.57 in Adama, Lume and Ada'a, respectively. However, the results of this study for cross breeds were less than result reported by Kefelegn *et al.* (2014) which was 2.33 .1.98 and 2.25 in Adama, Lume and Ada'a, respectively. Belay *et al*. (2012) reported the higher mean for number of service per conception (2.0.) in North Gondar Zone. Higher or smaller values would resulted mainly depending on the breeding techniques.Moges (2012) concluded that the higher values of number of service per conception was the result of uncontrolled natural breeding than hand-mating and artificial insemination. Masama *et al. (*2003) concluded that productive and reproductive performance of dairy cows could be affected by factors such as feed shortage, lack of access to land, disease prevalence, low level of management, lack of proper breeding management such as lack of accurate heat detection and timely insemination results to long days open, late age at first calving, calving interval, short lactation length and low milk production.

5.5. Mating systems

The two types of animal breeding systems were practiced in the study area. In peri urban and rural dairy production system, most of the households used natural mating, while only few households used the combination of natural mating and artificial insemination. A few number of households who had crossbreed cows used AI.A similar result was reported by Sintayehu *et al.* (2008) in Shashamane-Dilla of Southern Ethiopia who indicated that about 81.7% of household used local bull for mating, while about (10%) used AI.

On the other hand, the majority of dairy producers in urban dairy production systems used artificial insemination. This result is in accordance with the report of Gebrekidan and Zeleke

(2014) who shown that about 77.21% of the respondents use AI services. Furthermore, the research conducted by Million *et al.* (2014) in Ada'a Liban woredas indicated that artificial insemination was main breeding systems for all households in urban dairy production systems. Relatively higher proportion of the households was using AI services in peri urban dairy production system of the current finding. This is due to the fact that dairy producers in urban and peri urban areas had better awareness than the respondents in rural areas in using AI services.

With regard to the sources of mating bulls, the majority of the farmers in the study area used their own bulls, while small number of the farmers used neighbour's bull and private cross breed bull. This is in consistent with the finding of Belete(2006) who indicated that the majority of the household in Fogora Woreda breed their cows by their own bull(43.6%) followed by neighbour bull(41.5%) and the rest(5.2%) breed with crossbreed bull. In contrary, most of the farmers in the rural lowland system of Metema (73%) did not have their own bulls where they rely on neighbour bulls (39.5%) and use open mating in communal grazing (33.5%)(Azage *et al*.,2013).

5.6. Milking practices and milk handling

Milk handling and preservation methods are totally based on traditional practices and involved personal hygiene, animal and milking utensils sanitation. The majority of urban dairy producer household used plastic utensils and most clean their milking utensils before and after milking cows. The result of the current study was in agreement with the report of Alganesh and Fekadu (2012); Fikrineh *et al*. (2012) and Sintayehu *et al.* (2008) who reported that washing udder and milking utensils before milking the cows are the most important practices in different parts of

Ethiopia. However, it is not common practices to sanitize teats before milking in the most rural dairy production systems. The research conducted by Azage *et al.* (2013) was comparable with present result who reported that udder washing before milking is not well known in the rural dairy production systems. Similar notion also was reported by Kedija (2007) and Lemma *et al.* (2005) in Mieso district and East shoa Zone of Oromia regional national state.

In the current study area, the majority of milk producers clean milking and milk storage utensils by smoking with local plant species known as Ejersa *(Olea africana)* and "Bargemo adi" *(Eucalyptus globules)*. These techniques are used to improve the flavour, taste and quality of milk and milk products, and extend the shelf life of dairy products (Sintayehu *et al*., 2008). Out of the different plant species used in different sites of East shoa Zone"Ejersa" (*Olea Africana)* is the most frequently used plant for smoking milk vessels (Lemma *et al.,* 2005).

5.7. Milk processing

Traditional home processing method is the sole method of milk processing in the study area. It involves processing of fluid milk into fermented milk, butter and cheese. This was in accordance with the finding of Bilatu *et al. (*2014) who reported that fermented milk, butter and cheese as the main products processed locally in Ada'a Lume districts of East shoa Zone. Similarly, the majority of household in peri urban and rural area of the studied districts locally processed milk into butter. The current finding in peri urban and rural areas was in agreement with the finding of Sintayehu *et al.* (2008) who reported that about 87.7 of the households in crop-livestock production system processed milk into butter as primary dairy products. However, this finding was in disagreement with urban dairy production of Shashamane-Dilla areas dairy production systems.

4.8. Feed Resources and Feeding systems

Animal feeds represent the major input in any dairy operation. Common feed resources in the studied areas varied among production systems. In the rural dairy production system, grazing natural pastures, crop residues, crop aftermath and rarely weeds from crop farm and nonconventional feeds were feed resource. Overall residues from cereals such as wheat straw, maize stovers, teff straws, haricot bean straw and barley straws form the basal diets of the animals in the study area. This finding is in line with Gebrekidan and Zeleke (2014) who indicated that the major basal feed resources for cattle are natural pastures, crop residues and grazing stubbles in the highlands of Ethiopia. The proportion of dairy cattle holding in households who practiced grazing natural pasture were higher in peri urban and rural areas, whereas urban dairy producers mainly depends on zero grazing. This was due to the expansion of urbanization and agricultural activities are the main reasons why the access of grazing land absent in urban dairy producers.

Among crop residues, wheat straws, maize stover, and teff straws were mostly used by the majority of households in the peri urban and rural dairy production system and followed by haricot bean and barley straws. This is similar to Azage *et al*. (2013) who reported that teff, wheat and barley straw and maize stovers are important feed resources in the rural highland system of Bure and Fogera. Similarly, Zewdie (2010) reported that crop residues such as maize stover, wheat straw, teff straw, haricot bean straw and barley straw were the major feed resources in Central Rift Valley.

Contrary to this, the majority of dairy producers in the urban production system use purchased agro industrial by products feeds from different sources and used some crop residues such as

wheat straw, teff straws and maize stovers. The notions of current finding is in consistent was with Alemayehu (2005) who reported the use of improved forages and agro-industrial by products is minimal. Million *et al.* (2014) also reported that the major feed resources for dairy cattle in urban dairy production systems of Ada'a Liban districts were agro-industrial by products, commercial concentrates and purchased crop residues. Different types and different feeds sources reported in the current study are in agreement with many reports Adebabay (2009); Million *et al.* (2014) and Sintayehu *et al.*(2008) who reported that the major feed resources such as crop residues, natural grazing ,commercial feeds and non conventional feed(local brewery) were common feed resources based on availability and production systems.

4.9. Estimation of feed dry matter production

The average utilizable feed DM yield per household of the current study was lower than the recent report of Dawit *et al.* (2013) who indicated that the average utilizable feed DM yield per household farm from crop residues in peri urban and rural kebeles of Adami Tullu Jiddo Kombolcha district was 9.69 and 7.69 tons per year, respectively. However, in the current study 7.88 and 8.70 ton per annum crop residues were estimated by using 10% loss for peri urban and rural kebele, respectively. The higher values of feed DM was annually produced per household in present finding than the values of 7.6 tons of feed DM that reported by Bogale *et al.* (2008) in the Bale highland. In the current study, out of the total amount of feed DM obtained annually from crop residues, the largest proportion of feed DM was obtained from maize stover. The result is in agreement with the result of Dawit *et al.* (2013) who shown that about 73.63% of the total DM was obtained from maize stover. Similarly, the report of Zewdie (2010) indicated that among crop residues, maize stover contribute the largest portion for dry matter production in Central rift valley around Ziway.

5.10. Estimated annual feed balance

In the current study, the annual utilizable feed DM satisfied about 90.72% of the livestock maintenance requirement for rural area which is lower than the report of Dawit *et al.* (2013) who reported the value of 99% in Adami Tullu Jido Kombolcha. This result indicated that there is feed shortage in the study area. The negative balance in this finding was in line the observation of Dawit *et al.* (2013) and Zewde (2010) in the Central rift valley of Ethiopia. However, the positive value for DM requirement reported by Amare (2006) and Mulu (2009) in north Gondor and Bure woreda might be because of the small livestock population and fertility of the land.

5.11. Cattle housing practices

From the interviewed household, the majority of the respondents in overall production systems kept their cows in open barn. However smaller proportion of households across production systems of the current study area reported housing of dairy cows in a separate built few distance far from the family house. This finding is similar to the report of Zewdie (2010) in the Central Rift valley around Ziway where animal houses were of the type corral. The type of dairy house varies from household to household as well as production systems. Relatively, higher proportion of household in urban dairy production system kept their cattle in barn of concrete based floor covered by iron sheets. However, the majority of peri urban and rural areas, the majority of households kept their cattle within open barn. This finding is in disagreement with Asrat *et al.* (2012) and Asrat *et al*. (2013) in Boditti and Abebe *et al.* (2012) in Guraghe areas who reported that all most all households (80%) in rural or mixed crop/livestock system kept their cattle within family house because of the fear of thieves, to protect animals from extreme

environmental hazards, while the minority (10%) the farmers used a separate shelter for their animals and open bar nor fences within their own compounds.

5.12. Watering management

Sources of water in the study area varied among dairy production systems. In urban dairy production of the current study, the majority of household used pipe water for watering their livestock. This finding was in agreement with the report of Gebrekidan and Zeleke (2014) who reported pipe water as the major sources of water in urban area of in Tigray. Similarly, Sintayehu *et al.* (2008) showed comparable usage of water sources in which the majority of the urban dairy producers obtained water from pipe water. However, in the overall dairy production of the current study, lake was the main sources of water for watering livestock. This finding was in disagreement with the report of Asrat *et al*. (2013) in Boditi and Zewdie (2010) in Debre Birhan who reported that river was the main sources of water for watering livestock. According to the respondents, farmers who are far from the lake, trek long distances for water searching which causes weight loss of animals. A similar research report by Girma *et al*. (2009) indicated that animals consume less water if they have to travel further to the source.

Frequency of watering to dairy animals varies from one production system to another. In the current study, the majority of the households in the production systems water their cattle once. This is similar with the report of Asrat *et al.* (2013) who reported that about 71.6% of interviewed households water their cattle once a day.

5.13. Constraints in dairy production systems

Problems related with the shortage of feeds and purchasing costs are the key factors in the study areas. The majority of dairy producers in the study area ranked feed shortage and purchasing

cost as the main constraints. This was in agreement with the finding of Sintayehu (2008) who reported that about 55 and 73% of producers in the mixed crop-livestock and the urban system highly stressed the problem of seasonal variation in availability and the high price of feeds. As indicated by the respondents, milk production is constrained primarily by shortage of feed and prioritized as the serious problems. The result was comparable with report by Derese(2008) in West Shoa Zone who indicated that unavailability of feed probably limit the milk production potential of cows with good milk producing ability more than any other single factor and is the most serious constraint to improve dairying.

Diseases are also the most important factors affecting milk production. Mastitis is the most important diseases affecting milking cows through reduction in milk production especially in urban dairy production. A similar result was reported by Milliom *et al.* (2014), in Ada'a Liban Woredas who reported mastitis as the most economic loss for the majority of dairy producers through reduction in milk yield.

The cost of concentrates feeds was unaffordable for the majority of the farmers in peri urban and rural dairy production. This is in consistent with the report of Gebrekidan and Zeleke (2014) that depicted that the majority of the farmers faced with the unfair prices of concentrates because the majority of urban dairy producers rely on concentrate feeds for increased milk yield.

Regarding market related constraints, across all production systems milk marketing is a common problem, being the highest for the rural followed by peri urban dairy production systems. This finding is in agreement with the report of Azage *et al* (2013) who reported that lack of training in milk handling and marketing, lack of access to market, cultural taboo to sell

milk, spoilage of milk and high transport cost were the major reasons for weak market access. Generally, market for dairy products was the major problems affecting dairy cattle production such as low price of milk during fasting period and higher cost of feed. This idea was similar with the reports of Adebabay (2009); Kassahun (2008); Sintayehu *et al.* (2008) and Million *et al.* (2014) in different parts of Ethiopia

Breed and reproductive related constrained the majority of dairy farmers in the peri urban and rural production system. The research conducted in the current study is in accordance with the finding of Abebe *et al.* (2014) in Guraghe Zone and Sintayehu *et al.* (2008) in Shashamane-Dilla area who reported the unavailability of AI services as constraint which hindered genetic improvement in different dairy production system. Derese (2008) concluded that artificial insemination service provision has not been successful to improve reproductive performance of the countries dairy industry. Problems related with reproductive performances were also identified as the major problems that affected dairy herds. This is in agreement with the report of Asrat *et al.* (2013) who reported that calving interval, abortion and late age at first maturity as the serious problem that affected the performances of dairy cattle.

5.14. Consequence of feed shortage

The consequences of feed shortage for livestock in the production systems include weight loss, lower milk yield, mortality, abortion and absence of heat. The degree of this consequence varies according to production systems. In the current study, reduction of milk yield and animals weight loss was the serious problems. This finding was in agreement with Zewdie (2010) who indicated that decreased milk yield and weight loss of animals was the main consequences of shortage of feed in the Central Rift Valley of Ethiopia. Similarly, Derese (2008) reported that

unavailability of feed limit the milk production potential of cows with good milk producing ability more than any other single factor.

5.15. Mitigation measure to overcome feed shortage

There were different mitigation options among household throughout dairy production systems. The strategy they practiced varies among household as well as production systems. The major mitigation option such as feed from the stock of the rainy season, give feed in smaller quantity, give less feed to certain type of animals, purchase crop residues, purchase supplement feeds, selling the animal and using nonconventional feed were identified in the study area. This finding is in line with the report of Gebrekidan and Zeleke (2014) who indicated that mitigation option such as feed from the stock of the rainy seasons, provision in small quantity of feed, use less amount of feed for certain type of animals and selling of the animal was used as possible as mitigation option in urban and peri urban areas of the Northern part of Ethiopia. In the same manner Zewdie (2010) reported using farm produced crop residue, purchase supplement, purchase crop residues and using nonconventional feed as the major mitigation measures in the Central Rift Valley. Moreover, from the personal observation during the supervision, it was observed that some farmers were practicing mixing of atella with the crop residues to soften it and increase its palatability.

5.16. Milk and milk product marketing

Dairy marketing in the country can be categorized as informal and formal marketing system. The common marketing system identified in the current study was informal marketing system .This observation is comparable with the report of Belete *et al.*(2010) ;Dessalegn *et al.* (2013); Azage *et al.*(2013) and Abebe *et al.* (2014) who indicated that informal marketing systems was

the dominant dairy marketing practices where they sell their products to neighbours and sale to itinerant traders or individuals in nearby towns or local markets. Similarly, Zelalam *et al.* (2011) indicated that about 95% of the marketed milk at national level is channelled through the informal system.

However, the sale of fresh whole milk was not a common practice in the rural areas because of different reasons. The lack of sale of whole milk in the current studied area is in line with the report of Sintayehu *et al.* (2008) and Abebe *et al.* (2014) who indicated that shortage of milk, cultural restrictions (taboo) and lack of the market access are the most common. Whole milk, fermented milk, butter and cheese are common marketable product in the urban areas, whereas traditional butter and cheese are the most important dairy products used for marketing in rural dairy production systems. The recent finding by Million *et al.* (2014) showed that raw milk, butter and cheese are the most important dairy products used for marketing in urban dairy production system of Ada'a Liban Woreda.

6. SUMMARY AND CONCLUSION

The study was conducted in Dugda district of East Shoa Zone in eight Kebeles which categorized into the three production systems, namely the urban, peri urban and rural dairy production systems. Among the production systems, urban production system was characterized by having relatively large number of crossbreed, better management and has no access to farmlands where most of the time and depends on purchased feeds. However, peri urban and rural dairy production system was extensive and largely depends on grazing lands and crop residues. Cattle in the peri urban and rural production system had multipurpose use, while dairy cows in urban production systems were mainly kept for milk production. Family labour was the major source of labour for performing dairy activities where the majority of milk related activities were the responsibility of women in the production systems. Dairy cows milking and milk marketing were the responsibility of women whereas cattle herding, feed collection, house construction and live animal marketing were the responsibility of the male as reported by the majority of the respondents.

The most important feed resources identified in the study area included crop residues, grazing land, crop aftermath in peri urban and rural area, whereas purchased supply feed was the major feed for urban dairy production system. The most important types of crop residues frequently used in the study area were maize stover, wheat straw and followed by teff straw. Grazing own pasture and communal land was also commonly used as feed resources.

The major constraints for dairy development in the area included unavailability and high costs of feeds, shortage capita, marketing problems, and lack of improved dairy animals, underdeveloped animal health services, processing and marketing.

In conclusion, milk processing, milking practices and milk handling were traditional based. Dairy cattle in the study area were dependent on low milk producing local cows. Also the productive and reproductive performance of dairy cows varied among production systems due to mainly level management practices in production systems.

The result showed that the DM produced under all production system was below what is required by livestock. Therefore, improving the nutritive value of crop residues and enhancing the fodder conservation and utilization is critical to dairy production. The majority of urban dairy producers sold whole milk through informal marketing systems. Such marketing system could influence the quality and price of milk as there is no standards in Ethiopia.

To alleviate the problems in the study area the following areas need attention if dairy production is to develop into a market-oriented business operation in the district.

- Conserving available natural pasture and improved forage production with proper management systems should be implementing.
- Since the area dominated by feeding crop residues, improving the nutritive value of crop residues through treating with urea treatment should be encouraged.
- Further training on milk and milk products marketing and milk handling should be recommendable.

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8. APPENDEX

Appendix Table 1Conversion factors of livestock number to Tropical Livestock Unit (TLU)

No	Livestock species	TLU
1	Local oxen/bulls	1.1
2	Cross bred oxen/bulls	1.9
3	Local cows	0.8
4	Crossbred cows	1.8
5	Local heifers	0.5
6	Crossbred heifers	0.7
7	Local calves	0.2
8	Crossbred calves	0.4
9	Sheep	0.1
10	Goats	0.1
11	Horses	0.8
12	donkeys	0.5

Source: Gryseels (1988) and Bekele (1991), TLU=Total Livestock Unit.

Appendix Table 2 Grain to residues dry matter conversion factor

Natural pasture	2.0
Private grazing land	3.0
Aftermath	0.5
Forest / woody land	0.7
Fallow land	1.8
Irrigated land	0.3
Wheat	1.5
Barley	1.5
Teff	1.5
Broad bean	1.2
Field bean	1.2
Haricot bean	1.2
Chickpea	1.2
Maize	2.0
Sorghum	2.5

Source: FAO (1987)

Appendix Table 3 Questionnaires used

Section I

General Information

1. Date---------- 5. Kebele's name ----------

2. Enumerator name ---------- 6.Name of householder----------

3. Zone---------- 7.Sex----------

4. Woreda---------- 8.Age----------

HOUSEHOLD CHARACTER

9. Religion---------- 10. Marital status----------

11. How many family members do you have?

A) Male---------- B) female---------- C) Adult (≥15-64 years----------

E) Dependents (<14,>65 years) ----------

12. Educational status

A. Adult education---------- D. Junior Secondary School----------

B. Higher education…… E. Secondary School----------

C. Primary school……. F. High School ----------

13. Land holding and land use system

A. Total area of land owned by the household----------ha

B. Food crop production----------ha

C. Grazing land----------ha

D. Fallow land----------ha

E. Forest and woodland----------ha

F. Rented/contracted land----------ha

G. Irrigation land ----------ha

14. Land utilized for major types of food crops

13. Grain yield obtained from major crops

A. Wheat----------Quintal.

B. Barley----------Quintal.

C. Teff ----------Quintal

F. Haricot bean ---------- Quintal

G. Chick pea ---------- Quintal

I. Maize---------- Quintal

J. Sorghum---------- Quintal

K. other---------- Quintal

14. Cattle herd structure

No	Type of animal	Total
1	Local oxen/bulls	
2	Cross bred oxen/bulls	
3	Local cows	
4	Crossbred cows	
5	Local heifers	
6	Crossbred heifers	
7	Local calves	
8	Crossbred calves	
9	Sheep	
10	Goats	
11	Horses	
12	donkeys	

15. Purpose of keeping cattle

a. Traction, yes----------, no----------

b. Milk, yes----------, no----------

c. Both traction and milk, yes---------- no, ----------

d. Savings, yes---------- no, ----------

e. Other (specify) ----------

16. Labour division of the family member in livestock management activities

Type of activities	Sex of individuals
Milking	
Barn cleaning	
Animal house construction	
Herd feeding/watering	
Milk and milk product marketing	
Feed collection	

17. Which gender group plays a great role in dairy production?

A. Males B. Females C. Both almost equally

Section II.

Dairy cattle Production and Reproduction

2. What type of dairy breeds do you have?

A) Local B) cross C) combination the two

3. What is the total number of milking cows do you have currently?

A) Local cows -------- B) Cross breed--------

4. Milking frequency per day

A) Once per day B) twice per day C) thrice per day

5. Milking times

A) Morning B) early afternoon (13:00-14:00 Pm) C) evening

6. What is the total amount of milk yield per day?

A) Local cows------ (litre/day/cow) B) crossbred cows------ (litre/day/cow)

7. How long the Lactation length of your cow?

A) For crossbred cows----------days/months and for Local cows-------days/months

8. Age at first calving for local heifers----------years/months

9. Age at first calving for crossbred (pure exotic breed) heifers----------years/months

10. Calving interval for local bred cows----------months/year

11. Calving interval for crossbred (pure exotic bred) cows----------months/year

20. How do you breed your dairy animals?

A) Using natural mating (breeding bulls) B) AI C) Both

21. If natural mating is used where is the source of the breeding bull?

A) Own bull B) neighbour bull C) Private cross breed bull

Section III

Feeding management of animals

1. How do you feed your dairy animals?

A. indoor feeding (confined in a house) using individual feeding system

B. in a collection yard using group feeding

C. let to graze in a grazing land (grazing in an improved forage pasture land, natural pasture land or both?

D. tethering in a grazing land

E. other specify

2. If your cows are fed indoor, can you list the major types of feed you have provided to them?

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3. Do you have access to grazing land? A. Yes B. No

5. What is the size of your grazing land? ----------ha

A. is the grazing land your own or contracted?

B. if your own, how many ha? ----------And if contracted how many ha? ----------

-

6. If your cows are confined, do you know the amount of each feed type given to them daily?

A) Yes B) No

7. And if yes what is the amount of:

B. supplement:

i. noug cake----------kg/day/cow

ii. Cotton seed cake----------kg/day/cow

iii. Wheat bran----------kg/day/cow

iv.Concentrate.....kg/day/cow

8. Do you believe that are your cows getting sufficient feed?

a. Yes

b. No

9. And if No, why?

_____

_____

_____

10. What are the common feed resources in your kebele? Prioritize it

A) Crop residues B) Natural pasture C) Aftermath D)Industrial by product

11. What do you feed animals at different seasons?

Feeding resources and feeding systems	Wet season	Dry season
Grazing own pasture		
Grazing communal land		
Grazing on crop residues		
Crop aftermath grazing		
Zero grazing		
Weeds from crop farms		

11. Is the grazing resource adequate to your animals?

A) Yes B) No

12. At which season do you face feed shortages?

A) Rainy season B) dry season

13. What are the major consequences of feed shortages?

A) Weight loss of animals B) Reduced milk yield C) Increased mortality D) Abortions E)

F) Do not come in heat

14. Do you feed crop residues to your animals? a) Yes b) No

15. List the major types of crop residues you feed to your animals in your area? ----------

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18. What is the source of crop residues?

A) Purchased B) produced on farm

1. What is the main constraint out of the following constraints for your dairy? Rank it

1. Feed shortage 5 inefficient breeding services

2. High feed prices Market availability

3. High medicament cost Disease

4 Lack of capital

What are the major problems breed related constraints?

A) Long calving interval B) Low rate of conception C) Shortage of crossbreeds

D) Late age at maturity E) Insufficient AI services

What are the major problems of market related constraint?

A) Lack of training D) Distance from market place

B) Spoilage of milk E) Cultural taboo

C) Seasonal fluctuation F) Shortage of milk

4. Shortage of land for grazing or forage development

33. What measure do you normally take when there is feed shortage for your dairy animal?

A) Feed from the stock of the rainy season

B) Give feed in smaller quantity

C) Give less feed to certain type of animals

D) Purchase certain feed

E) Selling the animal

F) Use nonconventional feed

34. Did you move with your animal for feed and water searching?

Section IV

Animal health

1. What are major animals health problems affecting your herd?

Pleas rank them (in decreasing order) and specify the way used to overcome them?

Are your dairy cattle vaccinated, against which diseases, how often and who decide to vaccinate? 1=HOUSEHOLD 2= Government

2. What are the major diseases mostly affect the dairy animals?

Dairy animal type	common dairy animal diseases
Dairy cattle	

Watering management

1. What type of water sources you use for dairy animal watering, specify the type of water source, the average distance to the water source?

2. How frequent you provide water for your dairy animals per day?

Milk products consumption and marketing

1. How milking is done?

A. Hand milking B. Machine milking

2. Did you use milk for home consumption? If yes how many litter consume per a day?

3. Which family group consumes more milk?

A) Children B) women C) men D) vulnerable group of family

4. How do you utilize your milk?

	Milk Utilization pattern	Amount in liters/day
A	Total Milk produced	
B	For calf feeding	
C	For home consumption	
D	For processing	
E	For sales	
F	For other purposes	

5. Do you practice milk selling?

A. Yes B. No

6. If yes where do you sell milk?

A. To local market b. To milk collection centre

7. For whom do you sell your dairy products?

A. To individuals B. To caterers C. To retailers

8. How do you transport milk to market?

8. In what form do you process milk?

A. butter c. Cheese

b. Yoghurt d. Whey

9. At what season of the year do you get more milk?

A. dry season B. wet season

10. At what season of the year do you sell more amount of milk?

A. dry season B. wet season

11. What is the price per liter/kg of whole milk during?

A. dry season----------birr

B. wet season (long rainy season) ----------birr

C. short rainy season----------birr

12. How do you conserve milk products? For how long can you keep it?

What type of plant used to smoking?

Is there loss (spoilage) of milk during storage time? 1= yes 2= no

13. What is the price per kg of butter during?

A. dry season----------birr

B. wet season ----------birr

14. What is the price per liter/kg of yoghurt during?

A. dry season----------birr

B. wet season (long rainy season) ----------birr

15. What is the price per liter/kg of whey during?

A. dry season----------birr

B. wet season (long rainy season) ----------birr

16. What is the price per kg of cheese during?

A. dry season----------birr

B. wet season (long rainy season) ----------birr

17. During which holidays do you sell more milk and milk products with better price? List in order----------

18. At what season of the year do you get the lowest milk yield?

A. Dry season, B. Wet season, C. Short rainy season

QUESTIONNAIRES FOR GROUP DISCUSSION

9. What are the main constraints in dairy production?

2. Could you rank the most important ones?

a) Feed shortage _____

2) Diseases _____

3) Shortage of land _____

4) Capital _____

5) Market _____

3. What is your appropriate measure to solve these problems?

4. What are the most important supportive institutions in your kebeles?

BIOGRAPHICAL SKETCH

The Author was born on August 26, 1986 in South West Shoa. He attended his elementary school at Gaba Jimata and secondary school at Tullubolo Hibret Fire High School. He joined Bahir Dar University College of Agriculture and Environmental Sciences since 2007. He graduated with a B.Sc. degree in Fisheries, Wetland and Wildlife management on June, 2009. Before he joined Hawassa University for post graduate study in Animal Production in October 2013, he was working as head office at Dugda Woreda Livestock resource and Fishery development office.