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**STUDY OF INPUTS AND MANAGEMENT SYSTEM OF CROSSBRED  
DAIRY COWS IN AND AROUND ADAMA**

**MSc THESIS**

**BY**

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June, 2019

Bishoftu Ethiopia

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**A Thesis Submitted to the School of Graduate Studies of  
Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of  
Master of Science in Animal Production**

**By**

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I declare that this thesis is my own work and that all sources of materials used for this dissertation have been duly acknowledged. This dissertation has been submitted in partial fulfillment of the requirements of degree of Masters in Animal Production at Addis Ababa University, College of Veterinary Medicine and Agriculture and is deposited at the University/College library to be made available to borrowers under rules of the Library. I solemnly declare that this thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma, or certificate.

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## **LIST OF ABBREVIATIONS**

AFC	Age at First Calving
AI	Artificial Insemination
AIBP	Agro-industrial By-products
AIT	Artificial Insemination
CADU	Chillalo Agricultural Development Unit
CBP	Crop By-product
CI	Calving Interval
CR	Conversion Rate
CSA	Central Statistics Agency of the Federal Democratic Republic of Ethiopia
DDE	Dairy Development Enterprise
EPID	Extension and Project Implementation Department
FAO	Food and Agriculture Organization of the United Nation
FMD	Foot and Mouth Disease
GDP	Gross Domestic Products
GP	Grain Production
Hec	Hector
LSD	Lymph Skin Disease
MOARD	Ministry of Agriculture and Rural Development
NAIC	National Artificial Insemination Center
NGO	Non-governmental Organization
NMSA	National Meteorological Services Agency
NS	Natural Service
PD	Pregnancy Diagnosys
QU	Quintal
SDDP	Small Scale Dairy Development Programs
SNNP	South Nation and Nationalities and People
SNV	Netherlands Development Organization
SPSS	Statistical Producers for Social Science
WADU	Wolaita Agricultural Development Unit
WFP	World Food Program

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## ABSTRACT

*This study was conducted in urban and peri-urban areas of Adama town small holder dairy farms to investigate the inputs and management systems of crossbred dairy cows. In the study dairy inputs, husbandry practices, major constraints of dairy production were investigated. For this study, 130 smallholders were selected and interviewed from both urban and peri-urban kebeles. Data were collected using questionnaire, field observation, focus group discussion and feed characterization. Statistical package for social science (SPSS) was used to analysis and summarize the data. The study revealed that all of the respondents were working age group and educational status of 71.5% of them was literate. The major feed resources in the study area were crop residues, agro-industrial by-products and some cereal hulls. Among the respondents 72.3% and 84% were used AI breeding system and stall-feeding system respectively. All the respondents (100%) ranked high cost and low quality of feed as the first dairy constraints, followed by 94 % reduced income, 85 % lack of secured working area for dairy 81% disease incidence, and 78% inadequate AI service. Lack of land and shortage of space per cows within the existing farms were identified as a problem by the respondents. The mean age at first service, age at first calving, calving interval, and service per conception were  $18.12 \pm 0.30$ ,  $27.73 \pm 0.34$ ,  $13.6 \pm 0.07$ , and  $1.6 \pm 0.08$  months respectively. In the study area 85% of the respondents responded the main purpose of keeping was for income generation. The major water source households used for dairy operation was tap water and some amount of wheel water. Ventilation of the house was good 46.2%, medium 40 % and poor 13.8%. During the field observation the cause of medium and poor ventilation in dairy house was identified as the shortage and position of dairy house.*

**Key words:** - Adama, crossbred, constraint, dairy inputs, crossbred management systems, small holder, urban and peri-urban

## 1. INTRODUCTION

Ethiopia is believed to have the largest livestock population in Africa. This livestock sector has been contributing considerable portion to the economy of the country, and still promising to rally round the economic development of the country. It is eminent that livestock products and by-products in the form of meat, milk, honey, eggs, cheese, and butter supply, provide the needed animal protein that contributes to the improvement of the nutritional status of the people (CSA 2016/17).

The total cattle population for the country is estimated to be about 59.5 million (CSA 2016/17). Out of this total cattle population, the female cattle constitute about 55.5 percent and the remaining 44.5 percent are male cattle. On the other hand, 98.20 percent of the total cattle in the country are local breeds. The remaining are hybrid and exotic breeds that accounted for about 1.62 percent and 0.18 percent, respectively. This suggests that the total number of both exotic and crossbred female cattle produced through the cross-breeding work for many decades in the country is quite insignificant indicating unsuccessful cross breeding work. This again suggests that Ethiopia needs to work hard on improving the productive and reproductive performance improvements of cattle through appropriate breeding and related activities (CSA 2016/17).

The estimate of total cow milk production for the rural sedentary areas of the country during the reference period (2017) is about 3.1 billion liters, the 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 liters (CSA 2016/17). A total of about 458 thousand holders, which is less than 1 percent of the total holders were involved in livestock extension packages during 2017, from this only about a quarter of them were engaged in dairy development packages (CSA 2016/17).

Dairy cattle and livestock make an essential contribution to agriculture, food and rural development. They provide products and services such as milk, meat, draught power and manure for fertilizers and fuel (FAO, 2010). Dairy farming is seen as one of the few

agricultural activities that can provide enough income to maintain the economic viability of smallholder farms (Staal *et al.*, 1996).

Development of the dairy sector in Ethiopia as in any other developing countries can further be augmented with the selection within the local cattle besides crossbreeding (Yilma *et al.*, 2011). However, any formal pedigree and performance recording systems are virtually non-existent with the livestock keepers in most of the tropical countries, thus under those conditions the only option left is to select animals based on their phenotypic traits like body size, udder size etc (Bebe *et al.*, 2003).

The success of dairy production in general and crossbreeding programs in particular needs to be monitored regularly by assessing the productive and reproductive performance under the existing management system. Evaluation of reproductive and productive performance of indigenous and crossbred dairy cattle under small holder production systems is essential for the development of appropriate breed improvement strategies (Negussie *et al.*, 1998).

In Ethiopia, Livestock Feed resources are classified as natural pasture, crop residue, improved pasture and forages, agro industrial by products, other byproducts and vegetable refusal, of which the natural pasture and crop residue contributes the largest feed type. A natural grazing land is a predominant feed source for livestock in country. This is especially true for the pastoral and agro-pastoral areas, and the grazing areas are usually communally owned. Crop-residue and agro-industrial by-products represent a large proportion of feed resource in mixed crop-livestock system (Alemu, 2009). Feed shortage in terms of quality and quantity is the major constraint regardless of the dairy Production system and agro-ecology. Both roughage and concentrate feeds are either too expensive or unavailable in sufficient quantity and quality to improve dairy production (Azage *et al.*, 2013).

Regarding to marketing, as is common in other African countries, dairy products in Ethiopia are channeled to consumers through both formal and informal dairy marketing systems. In the country, until 1991, the formal market of cold chain, pasteurized milk was exclusively dominated by the dairy development enterprise (DDE), which supplied 12 percent of the total fresh milk in Addis Ababa area (Holloway *et al.*, 2000). Recently, however, private businesses have begun collecting, processing, packing and distributing milk and other dairy

products, still, the proportion of total production being marketed through the formal markets remains small (Muriuki and Thorpe, 2001).

To improve the genetic potential of local dairy cattle crossbreeding program in tropical countries is practiced to combine superior hardiness, heat tolerance, disease resistance and environmental adaptability of indigenous cattle with superior high milk yield, faster growth rates and early maturity of exotic, temperate breeds (Walshe *et al.*, 1991). The efficiency of cross breeding like AI service in Ethiopia, however, has remained at a very low level due to low accessibility of infrastructure, managerial limitation such as methods of husbandry, feeding, low estrus detection, semen handling and transition cow management, and financial constraints, as well as poor heat detection, improper timing of insemination and death of embryo (Tesfaye *et al.*, 2015).

Crossbred dairy cow is an animal that having best reproduction and productive performance compared to indigenous animal, which mainly due to recombination and heterosis effect. Accordingly, enormous efforts have been made to improve the genetic potential of local cattle through cross breeding with exotic breeds and inputs that are required for improvement of dairy cows with different management practice. Even though milk yields of crossbreds are believed to be higher than that of local zebu, as well as they have better reproductive and production performance such as; short age at puberty, age at first calving, days open, calving interval and number of services per conception (Abera, 2016).

The study area is located in the central rift valley of Ethiopia south east direction from the capital city Addis Ababa. In the study area, there are a lot of dairy farms in and around town with a low milk yield due to inadequate input supply and management practice. The availability of inputs like AI and veterinary service, the amount of credit supplied for dairy holder, dairy holder's knowledge and management systems such as heat detection, assessment of disease symptoms, housing and feeding practices, and record keeping practice were not well studied in the previous studies. In general, there is a requirement of detection of the major challenges to expand crossbred dairy cattle and input delivery, milk and milk product marketing problem under current dairying system.

## **Objectives**

General objectives of this study were to assess the study of dairy production inputs and its constraint, management systems applied under the current dairy production in the study area.

### **Specific objects**

- To identify and characterize the inputs in the small holder urban and peri-urban dairy production systems of the study area
- To identify the management systems of crossbred dairy production in the study area.
- To identify constraint and opportunities of small holder urban and peri-urban dairy production systems in the study area.

## **2. LITERATURE REVIEW**

### **2.1 The Role of Dairy Production in Ethiopia**

At household level dairying is important in one way or another in all the farming systems of Ethiopia. In pastoralist farming system and the crop farming areas milk is the most important source of protein (Tilahun,1995). In the mixed farming systems milk is also used mainly as food to the household and to a lesser extent as a source of income (FAO, 1999). In the urban and peri-urban areas dairy production is practiced mainly as a source of income. At macro-level, there is scarcity of information that estimates the share of the dairy sector in the GDP. However, the report of Azage and Alemu (1997) indicted that 800, 000 metric tons of milk are produced every year. The very low per capita consumption of milk (20 kg per annum) is lower than the average for Sub-Saharan Africa, and this indicates that the actual level of dairy productivity is extremely low.

Livestock perform multiple functions in the Ethiopian economy by providing food, input for crop production and soil fertility management, raw material for industry, cash income as well as in promoting saving, fuel, social functions and employment (APBMDA, 1999). In the majority of the rural areas of Ethiopia, livestock production plays an important role in the provision of draft power, food, cash income, transportation, fuel and, especially in pastoral areas, social prestige. In the highlands, oxen provided draft power in crop production. In addition, dairy production plays significant role as a source of additional income to the farming community through sale of raw milk, processed milk products and live animals (EEA, 2002).

### **2.2 Dairy Production System in Ethiopia**

#### *2.2.1 Traditional smallholder dairy production systems*

The traditional smallholder system is part of the subsistence farming system, which includes pastoralists, agro-pastoralists and mixed crop-livestock producers (Tsehay,2002). It is roughly corresponding to the rural milk production system and supply 97% of the total national milk production and 75% of the commercial milk production. This sector is largely dependent on low producing indigenous breeds of cattle, which produce about 400-680 kg of

milk /cow per lactation period (Gebrewold *et al.*, 2000). The milk produced is mainly consumed by the household in the traditional system.

### *2.2.2 Peri-urban dairy production systems*

This system is found in the outskirts of the capital city and regional cities and mostly concentrated within 100 km distance around Addis Ababa which includes dairy farms ranging from smallholder to commercial farmers (Felleke and Geda, 2001). The main feed resources in this system include agro-industrial by-products and purchased roughage. The system comprises small and medium sized dairy farms that own crossbreed dairy cows. Dairy farmers use all or part of their land for forage production. The primary objective of milk production in this system is generating additional income to the household (Azage *et al.*, 2000).

### *2.2.3 Urban dairy production system*

It consists of dairy farms ranging from smallholder to highly specialized, state or businessmen owned farms, which are mainly concentrated in major cities of the country. These dairy farms have no access to grazing lands (Yitay *et al.*, 2007) and basically keep exotic dairy stocks (Azage *et al.*, 2000). Currently, a number of smallholder and commercial dairy farms are emerging mainly in the urban of the capital Addis Ababa (Azage, 2004) and most regional towns and districts (Ike, 2002; Nigussie, 2006).

### *2.2.4 Intensive dairy production system*

This system is a specialized market oriented dairy operation practiced by the state sector and very few private commercial farms. Most of these farms are located in and around Addis Ababa and basically keep exotic dairy stock Ketema and Tsehay (1995) and Azage *et al.*, (2000). The herd is dominated with improved/cross breed dairy cattle and the production system is market oriented and milk production is for sale (surplus production) (Ahmed *et al.*, 2004), owned by the state sector and few private commercial farms (Tegene *et al.*, 2013). It is a market-oriented dairy procedure, which is a specialized operation. Most of the farms are situated near Addis Ababa and fundamentally possess exotic dairy stock. In this system,

dairy animals do not offer draft, but their manure is used as fertilizer on crops (Matawork, 2016).

### **2.3 Milk Production Opportunities in Ethiopia**

The dairy industry contributes to the rural livelihood of Ethiopia and it is potentially the largest rural employer in the Ethiopian highlands and pastoral/agro-pastoral areas (SNV, 2008). Due to expansion of urbanization, growing population size, there is huge demand for milk by the children and younger generation relying on dairy industry to narrow down the gap between demand for milk and supply (SNV, 2008). Moreover, the dairy industry has further potential to contribute significantly towards increased income and employment. The ultimate goal of the intervention in the dairy industry in general and Milk Value Chain in particular is to increase rural incomes by increasing the number of rural households deriving their livelihood from dairy business through managing high productivity enterprises, while delivering quality and affordable dairy products to the market (SNV, 2008).

### **2.4 Marketing of Dairy Products in Ethiopia**

As is common in other African countries (e.g., Kenya and Uganda), dairy products in Ethiopia are channeled to consumers through both formal and informal dairy marketing systems (Holloway *et al.*, 2000). Until 1991, the formal market of cold chain, pasteurized milk was exclusively dominated by the DDE which supplied 12 percent of the total fresh milk in the Addis Ababa area (Holloway *et al.*, 2000).

From 2001 onwards, however, private businesses have begun collecting, processing, packing and distributing milk and other dairy products. Still, the proportion of total production being marketed through the formal markets remains small (Muriuki and Thorpe, 2001). Formal milk markets are particularly limited to peri-urban areas and to Addis Ababa. However, unlike the early phases, the formal market appears to be expanding during the last decade with the private sector entering the dairy processing industry in Addis Ababa and Dire Dawa in the eastern part of the country.

The DDE remains only the government enterprise involved in processing and marketing dairy products. The DDE collects milk for processing from different sources, including large

commercial farms, collection centers that receive milk from smallholder producers and to a lesser extent WFP powder milk. The enterprise at present operates 25 collection centers located around Addis Ababa, 13 of them near Selale, 5 near Holetta and 7 around Debre Brehane. However, since its inception the enterprise has only utilized its full capacity during the four-year period from 1987 to 1990 (Staal,1995). The reasons for low capacity utilization include management problems, financial difficulties, and unstable and low consumption levels of processed milk in the society due to fasting that prohibits the orthodox Christians (about 35-40 percent of the population) from consuming dairy products for almost 200 days every year (Yigezu, 2000).

From 2000 onwards, promotional efforts have focused on dairy marketing. Milk marketing cooperatives have been established by the SDDP with the support of Finnish International Development Association. These groups buy milk from both members and non-members, process it and sell products to traders and local consumers. The units also process milk into cream, skim milk, sour milk, butter and cottage cheese. The number of these milk cooperatives reached to 32 in total, 2 established by FAO/TCP (Technical Cooperation Program) and World Food Program (WFP) while 30 by SDDP (Redda, 2000).

## **2.5 Dairy Inputs and Constraints in Ethiopia**

### *2.5.1 Artificial insemination service delivery*

Artificial insemination (AI) is the technique of transferring semen collected from a male animal and manually placing the spermatozoa in the reproductive tract of a female animal to insemination in order to get the female impregnated, and it is widely used for livestock breeding around the world, and a necessary tool in sustainable farm animal breeding (Gamborg and Sandoe, 2005).

Artificial Insemination in cattle developed in the 1940's and has since then come to be used and developed by the dairy industry in great parts of the world. Every year about 100 million cattle are inseminated, which are about one fifth of the female reproductive cattle population (Thibier, 2005). Artificial Insemination being simple, economic and successful is the most

important assisted reproductive technology in developing countries (Rodriguez-Martinez, 2012).

In Ethiopia, the National Artificial Insemination Centre (NAIC) was established in 1981 through the Ethio-Finnish cooperation on dairy development, which supported and equipped the NAIC in Kaliti, with the main objective to achieve an efficient and reliable artificial insemination service, and had the mandate to serve nationwide. The liquid nitrogen plant with a well-equipped semen processing laboratory was installed in 1984 sourcing frozen semen from 25 Holstein and 10 Brahman bulls donated by the Cuban Government and 44 800 and 2 000 doses of Friesian and Jersey imported semen, respectively (Felleke and Gedda, 2001). Most of the semen (75.3 percent) was produced from Friesian bulls followed by Jersey bulls (10.5 percent). The Holetta bull/dam farm serves as the base for nucleus bull production, testing and rearing (Yilma, 2011).

National Artificial Insemination Center distributes semen to nine sub-centres: two in Oromia (Nekemt and Asella), two in SNNP (Wolaita and Wolkite), two in Amhara (Bahir Dar and Dessie), two in Tigray (both in Mekelle) and one in Harari (Harar). These places are selected for their strategic locations and all the semen is sent on request to the Regional Agricultural Bureaus, which are responsible for distributing liquid nitrogen and semen to sub-centers in their respective regions (Yilma, 2011).

#### *2.5.2 Bull mating as the substitute during semen supply shortage*

An efficient, systematic and operational breeding strategy is necessary to bring about improvement in the dairy sector. Such a strategy needs to consider selection within the local cows and crossbreeding local cows of good production potential with sires of known exotic dairy breeds. This should be accompanied by a well-designed recording system.

The breeding strategy should also take into consideration the agro-climatic and production system as well as socio-economic conditions of the country. Felleke *et al.*, (2010) reported that the use of selected breeding bulls is not only common in the lowland areas of Ethiopia but is also effective. Bull service was first organized by MoA. It was started by the Extension and Project Implementation Department (EPID) and then has been continued by the Animal and Fisheries Resource Department. During the bull service period, 75 percent of crossbreed

bulls were distributed along with crossbreed heifers. Small Scale Dairy Development Program was also engaged in the bull service through the distribution of breeding bulls to individual farmers and establishment of breeding bull stations. Breeding bulls were sourced from commercial dairy farmers in and around Addis Ababa, Asella Livestock Farm, Wolaita Jersey Bull Ranch and DDE.

### *2.5.3 Animal Feed Resources in Ethiopia*

Livestock feed resources in Ethiopia are mainly obtained from natural and improved pastures, crop residues, forage crops, agro-industrial by-products and non-conventional feeds (Tolera, 2009). The contribution of these feed resources, however, depends up on the agro-ecology, the type of crop produced, and accessibility and production system (Ahmed *et al.*, 2010). Natural pasture is the major source of livestock feed in Ethiopia. However, its importance is gradually declining because of the expansion of crop production into grazing lands, redistribution of common lands to the landless and land degradation (Berhanu *et al.*, 2009). Urban and peri-urban dairy production depends on purchased concentrate and roughage feeds with limited grazing (Azage *et al.*, 2013).

In Ethiopia 73 percent of the feed is provided from natural grazing, 14 percent from crop residues, only 0.2 percent from improved forages and the remaining 12.08 percent from other feed sources such as hay. There is a seven percent deficit in the amount of dry-matter required by the livestock (Felleke and Geda, 2001). Crop residues may be the only source of feed for dairy cows over a period of one to two months (at the end of the long rains after harvests) when the natural pasture is drastically reduced.

In a study of feed resources and nutritional management of dairy herds in urban and peri-urban dairy production systems, Mekasha (1999) reported that roadside grazing is practiced by 6.7 percent of the intra-urban dairies, while grazing pasture land is practiced by 33 percent of the large peri-urban dairy farmers. Hay is utilized by all production systems, with the exception of 40 percent of the secondary town dairy farms. There are a number of feed mills mostly around Addis Ababa and also in different regions of the country that are engaged in preparing and supplying balanced dairy cattle concentrate feeds. However, they are not affordable by most small-scale rural and peri-urban dairy farmers. As reported by SNV

(2006), the concentrate feeds are mainly used by urban dairies. Among the non-conventional feeds, *Atella* (a traditional home brewery residue) and pulp hulls are utilized by 80 and 47 percent of the farmers, respectively. *Atella* has high crude protein (20 percent) and organic matter (97 percent) content (Mekasha, 1999).

In the country feed marketing is not well organized and informal marketing is the dominant system in Ethiopia. The major feed resources marketed include grass hay, crop residues, green grass, while marketing of Napier and Rhodes grass was also practiced in some parts of Ethiopia. Apart from basal diets, urban and peri-urban dairy production system markets agro-industrial by-products as well. The dominant feeding system in rural and peri-urban dairying system is grazing of private or communal pasture lands, while stall feeding dominates in landless urban dairy production system (Tegegne *et al.*, 2013).

#### 2.5.4 Veterinary service delivery/Health care services

The intensification of dairy production, especially under hot and humid condition, presents new disease problems (Shiferaw *et al.*, 2003). Among the major health problems in dairy cows are reproductive problems, metabolic diseases and lack of hygienic practices are of the primary concern. Reproductive health problems cause considerable economic loss to the dairy industry due to slower uterine involution, prolonged inter conception and calving interval, negative effect on fertility, increased cost of medication, drop in milk production and early depreciation of potentially useful cows (Lobago *et al.*, 2006).

Besides, several factors are often reported to affect the health and vigor of the dairy cows. Proper nutrition is fundamental for dairy cows and for the general profitability of dairy cow enterprise. Livestock housing conditions greatly affects health and productivity. Cleanliness of the barn influences cow health, as cows housed in unclean barns are at higher risk of diseases than cows housed in clean barns (Wudu *et al.*, 2008). Miller (2012), reported malnutrition and poor animal husbandry as the major predisposing factors to poor animal health among smallholder farms. The combination of health and nutrition challenge in dairy production implies further suppression of animal productivity in terms of milk yield and fertility.

Study at Mekele by Hulagersh *et al.*, (2017), reported, even though many dairy farms in urban and peri-urban found surrounding Mekelle that are aimed at provision of milk and milk products to the society, productivity is not as much as farmers' expectation due to different disease conditions and poor management practices. Respondent in the study area mentioned several health problems were external parasitosis (87.6%), respiratory (48.8%), and wound (29.4%) problems and diarrhea (50.7%) as health problems of dairy cattle (Hulagersh *et al.*, 2017).

#### 2.5.5 Credit service

Many farmers are aware of the existence of improved technologies that can offer them higher returns as compared with their conventional practices. However, most of the poor farmers do not have the financial means required to make the initial investment and acquire the associated technological inputs. Financial support or credit facilities to smallholder farmers who intend to enter into commercial dairy farming are very much limited. The importance of establishing credit facilities is a crucial step to the country's dairy sector as indicated in the livestock development master plan (GRM International BV, 2007).

In Ethiopia, the sources of financing for livestock development generally include government owned banks, private banks, micro-finance organizations or NGOs. Microfinance institutions (Dedebit in Tigray; ACSI in Amhara; OCSI in Oromia; Omo Microfinance and Sidama Microfinance in the SNNPR) provide credit for livestock development. However, their interest rates vary and have upper limits on credit access which in most cases do not encourage larger investments in the livestock sector. The involvement of commercial banks is limited and most often they provide credit in situations where the government provides incentives for special agricultural development activities or are supported with guarantee funds against loss of animals or low repayment conditions. These sources of financing, generally involving subsidized, low-interest credit, tend not to allow smallholders to borrow money unless they are organized in groups or through cooperative arrangements (ILRI, 2010).

Although investments in the livestock sector can be considered as high risk, some microfinance and NGO credit schemes have become successful through the application of

appropriate approaches and methodologies. For example, according to FAO (1992), the Grameen Bank in Bangladesh extends its credits to about 40–50% of landless farmers to acquire and raise livestock. Similar practice in India, particularly focused on women livestock keepers, has also been successful (FAO, 1992).

## **2.6. Dairy Cow Management System**

Dairy production is an important enterprise in most Sub-Saharan African countries and comprises of commercial farms and smallholder farms. The difference between commercial and smallholder farms is mainly determined by herd size, breeds raised and management level (Borner *et al.*, 2012). The reasons for keeping livestock are very diverse in communal systems. Increasing milk yield depends on a number of management practices. (Bebe *et al.*, 2003). Smallholder farmers keep few animals that are mostly crossbreeds using a low input production system (Nicholson *et al.*, 2004).

### **2.6.1 Dairy Housing Management**

In cattle management, construction of animal barn is the most important. In the Central Rift valley, around Ziway the majority of farmers kept their animal in corral house (Zewdie, 2010). Whereas, in Boditi and Guraghe almost 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 (Zewdie, 2010).

The result of the study by Misgana *et al.*, (2015), also indicate that there are three types of dairy cattle housing system in rural and peri-urban area of *Nekemte*. In the rural and peri-urban of *Nekemte* the traditional housing system (open crush barns) shares 49.52% of cattle housing system. Fenced roofed shades type of housing system was used in all locations and contributes 15% of housing type. Closed barn housing system was mainly used for urban dairy housing and 33.33% of the sampled households use closed type of dairy house. Concurrently, Herrero *et al.* (2009) indicated that advantages of adequate housing as increased production of milk; better utilization of labour; production of higher quality milk

and milk products; better health of animals; decrease in mortality rate of calves; proper disease control; better care and supervision of animals; Better productive and reproductive efficiency of animals and proper and controlled feeding of animals also occurred.

### 2.6.2 *Feed and Feeding management/system*

Feeds and feeding system is the main constraint of cattle production in Ethiopia. Misgana *et al.*, (2015), reported that the types of feeding systems in rural and peri-urban area of Nekemte noted were grazing (own and communal pasture), intensive feeding, combination (grazing, cut and carry and intensive) and tethering. The study identified that the majority of the sampled households in the study area (66.7%) feed their animals through free grazing on own pasture land and only 7.6% were using communal pasture. These two feeding systems were observed mainly in rural areas. Zero grazing and combinations of feeding systems were mainly the characteristics of urban and peri urban areas. Only 10.5% of the respondents use stall (intensive) feeding and 11.4% practice a combination of feeding system. This study also indicated that the major sources of feed for cattle in the study area are natural pasture, grass hay, crop-residues, improved forage plants (elephant grass, Rhodes grass), concentrate feeds and non-conventional feedstuffs such as mill house by product (hulls and scrubs) and 'Atela', locally produced brewery by product (Misgana *et al.*, 2015).

Worku (2014) reported, the major sources of feed for dairy cows in Kersa Malima were natural pasture, crop residues, hay and non-conventional feedstuffs and also during group discussion, farmers were asked to provide the types of feed resources available in the area. Accordingly, they identified natural pasture, aftermath grazing, crop residues and hay were the major feed resources of the study area. He reported also Free grazing was practiced in the study area. But, for crossbred cattle, farmers graze their animals for 2- 4 hours per day in the morning and evenings when sun light drops and use cut and carry system of feeding for the remaining periods of time.

### 2.6.3 *Dairy cows Health management*

Animal health inputs and services in Ethiopia includes Preventive services and vaccinations, Education/extension including public health education, Regulatory services to control occurrence of new diseases, Clinical services which include diagnosis and treatment of sick

animals, Supply of livestock drugs, Meat inspection services at abattoirs, Public health in relation to zoonotic and food-borne disease control, hygiene, food and feed safety and the environment (ILRI, 2010). The government is the major animal health service provider with limited involvement of the private sector and NGOs in the provision of drugs and animal health services. A few years back, there have been attempts to promote privatized veterinary services, but that has not been effectively materialized. Due to the nature and variability of livestock production system in Ethiopia, some animal health services have public good characteristics. The widespread nature of killer diseases, limitations in accessibility, cross-border animal movement and drug supplies, lack of adequate infrastructure and the presence of incomplete markets contribute to market failure in the provision of animal health services. This situation is not different from many African countries (de Haan and Bekure, 1991; Smith, 2001).

In Ethiopia, public sector involvement and support has often been associated with disease surveillance, eradication campaigns, vaccine production, drug and vaccine quality control, quarantine, and food hygiene and inspection measures. Eradication and control programs of killer diseases call for national and international efforts, and surveillance and control measures often require national coverage including remote and inaccessible areas. However, the public sector has been limited by lack of adequate resources to deliver the services. Shortage of manpower in quantity and quality, lack of transport, availability of drugs and other supplies, poor information, communication and reporting systems, and limited finances are some of the reasons frequently raised by professionals in the field. (ILRI, 2010)

### **3. MATERIAL AND METHODS**

#### **3.1 Description of the Study Areas**

Adama town is located at 8°33'35"N - 8°36'46" N latitude and 39°11'57" E – 39° 21'15" E longitude about 99 km south-east of Addis Ababa the capital city of Ethiopia. It is one of the largest and fast-growing towns in Oromia Regional State with the total population of 355,475 (CSA, 2017). It is situated at an altitude ranging from 1400 to 2700 meters above sea level. The area receives an average annual rainfall ranging from about 600 to 1150 mm which is erratic in nature. There is a significant seasonal variation in the amount of rainfall. More than 67% of the mean annual rainfall occurs in the four rainy months: June, July, August and September. Some additional rains (about 23%) occur in the remaining dry months with mean monthly values of rainfall as low as zero millimeters. The minimum and maximum daily temperatures of the area are 12 and 33°C, respectively (NMSA, 2010).

Adama district (around the town) is in Oromia regional state in East Shoa zone at about 99 km south east of Addis Ababa (39.17°E and 8.33°N) with an altitude of 1500 to 2300 meters above sea level in the rift valley. Its annual rainfall ranges from 400 mm to 800 mm and has a temperature of 10°C to 32°C. It is approximately 9799 km<sup>2</sup> which is about 16% of the total area coverage of Oromia region. Adama district is one of the districts found in Oromia region. Cultivated land is approximately 439,120 ha and the rural population is 189,988 (CSA, 2017). This area is known for its high production potential for crops such as Teff, Wheat, Maize, Barley, Faba Bean, Haricot bean, Lentil, Peas and livestock such as cattle, sheep, goat, horse, donkey and camel. Its elevation ranges from 900 to 2400 m.a.s.l (ESZLFD, 2017).

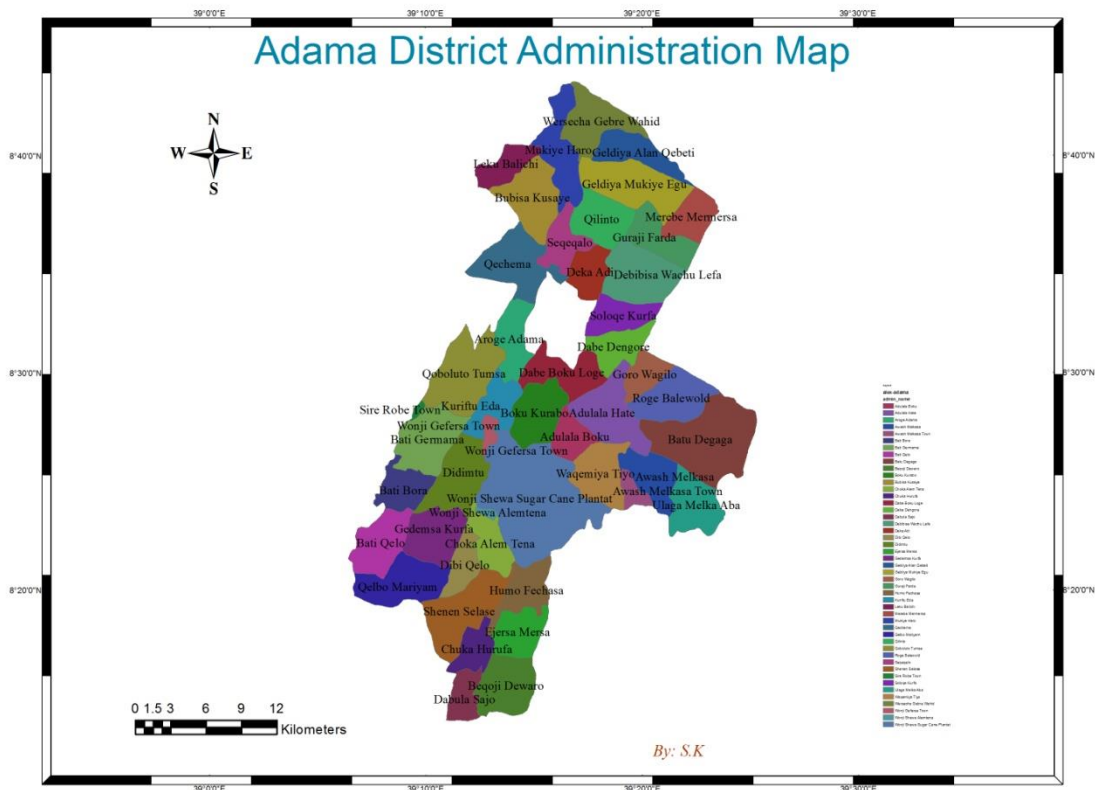


Figure 1. Map of the study area

### 3.2 Study Design

A cross sectional study design was employed to assess dairy animal inputs and management systems and milk yield of cows under the current production system in Adama town and its surrounding of Adama district.

### 3.3 Method of Data Collection and Sources of Data

Both primary and secondary data were collected using semi-structured questionnaire surveys from smallholder household, district and town livestock and fishery wealth development offices, CSA, focus group discussions, and field observation.

#### 3.3.1 Questionnaire survey

Household level data were collected using employing questionnaires from 130 smallholders. The questionnaires were pre-tested and readjusted before the actual data collection started.

Moreover, field observations on production inputs and services, management systems, and dairy constraint were an important component of the study process. The contents of the questionnaires focused primarily on dairy inputs, management systems and major constraint of dairy cows and associated problems and constrain.

### *3.3.2. Focus group discussions*

Group discussions consisting of 7-9 participants were conducted. The group discussions involved 1 group in each 5 *kebeles* and the researcher facilitated the discussions at all sites. The main points for discussion included dairy inputs, management systems, and associated problems and constraint.

### *3.3.3. Field level observation*

During the questionnaire administration, dairy cows' husbandry practices (housing, feeding practice, inputs used, milking practice and milk handling, watering point conditions and sanitary conditions) were observed to compare the observed fact with the response of the households.

## 3.4. Study procedures

A single-visit formal survey method was followed to gather data. The survey was focuses on types of dairy inputs and inputs related issues, their utilization, and constraint and management system. Following a ranking exercise in focus group discussions, the major inputs of dairy cows and the management systems were identified. For this study, of 37 *kebeles* of Adama *district*, 5 peri-urban *kebeles* were selected purposively from 10 pre-urban *kebeles*, and from Adama town the smallholder dairy farms were included in four direction of the city. A total of 43 farmers of Adama *district* and 87 crossbred dairy owners from the city have been selected randomly from the total small dairy holders. For this study the total of 130 dairy holders from urban and peri-urban were interviewed.

## **3.6. Feed Characterization and Analysis**

The representative feed sample (hay, crop residues and Agro-industrial by-product) offered for dairy cattle were identified and collected. The feed sample was collected from dairy

holder. The feed samples were kept and transported to national veterinary institute and it was analyzed for DM, CF, EE, MM, Ca.

### **3.5. Data Analyses**

The data collected from individual farmers was stored in Microsoft excel spread sheet. The primary data collected for this survey were analyzed using descriptive statistics such as mean, frequency distribution, range, percentages, standard deviations and charts in the process of examining and describing crossbred dairy inputs in the study area, management systems and constraint of crossbred dairy cows using SPSS (Version.22).

## 4. RESULTS

### 4.1 Socio Economic Characteristics of the Studied Households

#### 4.1.1 Age, Sex, marital status and occupation of the respondent

The general information of the respondent on age group, sex, marital status and types of employment in the study area are presented in Table 1. In this survey 86 male and 44 female dairy holders were engaged on dairy farming and the survey totally conducted on 130 farmers by which 66.9 % from urban and 33.1 % from peri urban dairy holders. The Marital status of respondent was 95.4 % married and 4.6 % single. The age of the respondent was 11.5 (%) 20-30 years, 30 (%) 31-40 years 25.5 (%), 41-50 years. 20.5 (%), 51-60 and 9.2 (%) of the respondent were >60 years. The study indicated that in the study area married people were more engaged on dairy operation to generate income for their livelihood, and about 55.5 % of dairy holders were ranged from 31-50 years. The study also showed that the educational background of the interviewed households were 28.5 %, 60.7 %, 10.8 % were illiterate, literate and advanced education respectively.

Table 1. Scio-economic information of the dairy holders

Parameter	Urban	Peri-urban	Chi-square	N 130 (%) total
	N 87(%)	N 43 (%)		
<b>Sex</b>				
Male	49 (56.3)	37 (86)	11.3	86 (66)
Female	38 (43.7)	6 (14)		44 (33.8)
<b>Marital status</b>				
Married	84 (96.6)	40 (93)	0.8	124 (95.3)
Single	3 (3.4)	3 (7)		6 (4.7)

N= sample size

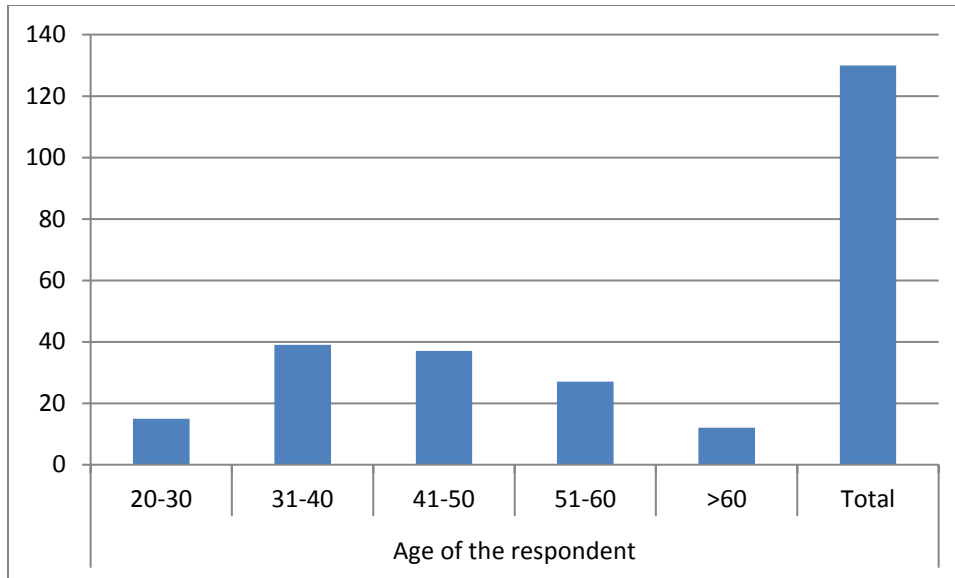


Figure 2 Age of the respondents

#### 4.1.2 Land holding of the respondent

The average values of the land holding in the study areas are presented in Table 2. The Study indicated that the average land holding capacity of the household was  $0.15\pm 0.03$ ,  $1.08\pm 0.71$  ha for crop,  $0.00\pm 0.00$ ,  $0.05\pm 0.01$ ha for grazing and  $0.02\pm 0.01$ ,  $0.07\pm 0.01$  ha for forage which indicate the adoption of farmers in cultivating improved forage for dairy feed, and  $0.00\pm 0.00$ ,  $0.03\pm 0.02$  for irrigation in peri-urban and urban area. Households responded that the shortage of land in urban area was very critical as land is the basic inputs for urban dairy production.

Table 2. Land holding and of the study area

<b>Parameter</b>	<b>Urban (Mean± SD)</b>	<b>Peri-urban (Mean± SD)</b>	<b>Total (Mean± SD)</b>
<b>Land holding</b>			
Land for crop	$0.15\pm 0.03$	$1.08\pm 0.71$	$0.44\pm 0.05$
Land for grazing	$0.00\pm 0.00$	$0.05\pm 0.01$	$0.01\pm 0.00$
Land for forage	$0.02\pm 0.01$	$0.07\pm 0.01$	$0.03\pm 0.00$
Land for irrigation	$0.00\pm 0.00$	$0.03\pm 0.02$	$0.06\pm 0.01$

SD= standard deviation

#### 4.1.3 Source of livelihood

The source of livelihood in the study area was showed in table 3. The livelihood of the farmers participated in the survey 29.9 % and 76.7 % of the farmer involved on dairy and crop agriculture, 26.4 % and 9.3 % on dairy and other livestock rearing, 5.7% and 4.7 % on dairy and government employment, 12.6 and 4.7 % on dairy and private employments in urban and peri-urban respectively. The remaining 16.1 % and 4.7 % involved on dairy and trade, 9.2 % were pensioners. All farmers responded that dairy products especially whole milk selling was the major livelihood income in comparing to other additional activities in urban area.

Table 3. Livelihood of the sample households of the study area

<b>Parameter</b>	<b>Urban</b>	<b>Peri-urban</b>	<b>x<sup>2</sup></b>	<b>N (130) Total</b>
	<b>N (87)</b>	<b>N (43)</b>		
Dairy and other livestock	23 (26.4)	4 (9.3)	26.9	27 (20.8)
Dairy and crop production	26 (29.9)	33 (76.7)		59 (45.4)
Dairy and government employee	5 (5.7)	2 (4.7)		7 (5.4)
Dairy and private employee	11 (12.6)	2 (4.7)		13 (10)
Dairy and trade	14 (16.1)	2 (4.7)		16 (12.3)
Dairy and pensioner	8 (9.2)	0 (0)		8 (6.2)

N=sample size

#### ***4.1.4 Dairy farming experience, purpose of keeping and sources of foundation stock***

The work experience, purpose of keeping and sources of foundation animal was indicated in table 4. In the study area the work experience of the dairy holders ranged from 1 to 23 years. The study indicated that among the respondent 62.2 % were involved on dairy production for 1-10 years, 27.7 % for 11-20 years, and 3 % for more than 20 years. The sources of foundation animal in the study area were 43.8, 25.4 and 30.8 were purchased from market, from parent or relatives and from the cross of local zebu and Holstein Friesian respectively.

85.4%, 12.3% and 2.3% of the household in the study area kept dairy cattle for market, for home consumption and market and for saving respectively. The 62.9% and 30.8% of the household responded the breed of first cow when start dairy farming was cross and local cow respectively. Most of the respondents were aware about dairy production from heritage and other individuals and by government extension system. The sources of first stock in the study area were 43 % purchased, 25.4 from parent/heritance and 30.8 was by AI/ crosses of local cow and exotic animal.

Table 4. Dairy farming experience and sources of foundation animal

	<b>Urban</b>	<b>Peri-urban</b>	
<b>Parameter</b>	<b>N (87)</b>	<b>N (43)</b>	<b>N (130) Total</b>
<b>Purpose of keeping dairy cattle</b>			
For market	79 (90.8)	32 (74.4)	111(85.4)
For home and market	6 (6.9)	10 (23.3)	16 (12.3)
For saving	2 (2.3)	1 (2.3)	3 (2.3)
<b>Work experience</b>			
1-10	50 (57.5)	40 (93)	90 (69.2)
11-20	33 (37.9)	3 (7)	36 (27.7)
>20	4 (4.6)	0 (0)	4 (3.1)
<b>Breed of foundation cows</b>			
Local	15 (17.2)	25 (58.1)	40 (30.8)
Cross	72 (82.8)	18 (41.9)	90 (69.2)

N=sample size

#### ***4.1.5 Livestock holding of the study area***

The mean livestock holding of the study area per household is presented in Table 5. The livestock holding capacity of the households was very different thorough out the households. In most households rearing crossbred dairy production in urban area, rearing other livestock was limited because of the attention given for economically important crossbred dairy cattle. But in peri-urban area rearing other livestock was common due for other agricultural activities, saving and social issues. The study revealed the number of crossbreds were larger in urban than peri-urban and in contrary the number of local cattle larger in peri-urban than urban. In both cases the difference was significant with  $p < 0.05$  for crossbred cows.

Table 5. Livestock holding in the study area

	<b>Urban</b>	<b>Peri-urban</b>	
<b>Parameter</b>	<b>N (87)</b>	<b>N (43)</b>	<b>N (130) Total</b>
<b>Cross cattle</b>			
Cow	3.58±0.35	1.72±0.17	2.96±0.25
Calves	2.06±0.13	1.06±0.15	1.73±0.10
Heifers	0.59±0.98	0.34±0.07	0.51±0.07
Bull	0.05±0.02	0.00±0.00	0.03±0.01
<b>Local cattle</b>			
Cow	0.00±0.00	2.30±0.27	0.76±0.13
Calf	0.00±0.00	0.13±0.05	0.04±0.01
Heifers	0.00±0.00	0.18±0.07	0.06±0.02
Bull	0.00±0.00	0.18±0.06	0.06±0.02
Oxen	0.00±0.00	1.16±0.19	0.38±0.08
<b>Other livestock</b>			
Sheep	0.65±0.16	0.69±0.24	0.66±0.13
Goat	0.18±0.09	2.41±0.60	0.92±0.22
Donkey	0.04±0.03	0.69±0.15	0.26±0.06
Horse	0.24±0.04	0.30±0.07	0.26±0.03
Chicken	7.00±2.08	7.81±1.26	7.26±1.45

N= sample size

#### 4.1.6 Crossbred dairy cattle herd structure of the study area.

The average numbers of crossbred (Holstein-Friesian X local cow) dairy cattle in the study was shown in Table 6. In the study area the dairy cattle herds were the composition of pregnant cows, lactating cows, dry cows, heifers, bull, female and male calves. The dairy herd composition between urban and peri-urban was significantly different. ( $p>0.05$ )

Table 6. Dairy cattle herd structure of the study area.

Parameter	Urban	Peri-urban	$\chi^2$	N (130) Total
	N (87)	N (43)		
Lactating cows	3.34±0.34	1.69±0.18	25.738	2.80±0.24
Pregnant cows	1.10±0.15	0.81±0.11	6.727	1.00±0.11
Heifer >1 year	1.17±0.12	0.46±0.10	14.129	0.93±0.09
Heifer <1 year	0.91±0.10	0.53±0.11	7.829	0.79±0.08
Bull	0.04±0.02	0.09±0.04	1.103	0.06±0.02
Male calves >1 year	0.05±0.02	0.06±0.03	0.075	0.06±0.02
Male calves <1 year	0.12±0.04	0.23±0.06	6.641	0.16±0.03

## 4.2 Milk Production System

### 4.2.1 Urban production system

In the study area the milk production was conducted in the city by the small dairy holders' little numbers of large-scale farms. Urban dairy has been implemented in almost all administrative unit of the city. Dairy holders reared the dairy animal to produce and sold the milk production for income generation for the life of families and overall economic issues. The types of animals reared in the area were crossbred dairy cattle with low to high blood level. Types of feeds used in the production area were purchased roughage, agro-industrial by products and non-conventional feed.

#### 4.2.2 *Peri-urban production systems*

This production is similar with urban milk production system except a little difference in management system and input used. The production area was found surrounding the city which includes the administrative unit under the city and Adama district. The input used was purchased roughage, agro-industrial by-products with an availability of little grazing area and other green leaves for animal feed. The milk production in the study area was urban and peri-urban production system.

### **4.3. Dairy Cattle Management Systems**

#### 4.3.1 *Feed resources and feeding systems*

In the urban area respondents answered that the major feed for dairy animal were crop residues such as teff straw, wheat straw, barely straw in which farmers was more proffered for feeding of teff straw and grass hay due to accessibility in the market. Non-conventional feed used in the area were cabbage leaf, bean hull, pea hull, barely hull and local beer *atela* were reported by the respondents. Respondents reported that in urban area there were no opportunity to cultivate forages due to the shortages of land, while in peri-urban area the feed resources for dairy animal were natural pasture in little amounts, crop residues produced by dairy holders, some amounts of improved forage due to the availability of lands and forage seed from district and zonal livestock and fishery wealth development.

The other sources of dairy feed were agro-industrial by products such as *noug* cake, linseed cake, cotton seed cake, from oil industries, and wheat bran from flour factories. Respondent reported that crop residue and grass hay were supplied from other area by suppliers and agro-industrial by products were from agro-industries with in the town and from other towns. The major problems regarding to animal feed were quality problems, high costs, unavailability of green feed were among the others. The feeding systems applied were stall feeding in urban and stall and semi-extensive systems in some peri-urban area. All respondents answered as used basal feed, but in peri-urban area 39.5 % households have opportunity to feed use natural pasture. All the respondent in urban and peri-urban area used teff straw as dairy feed, but barley and wheat straw were not available as needed. Only 81.6 % and 44.2 % of the

household used grass hay and the remaining were not used due to high price and low quality of hay. The other feed resources was AIBP, 70 % and 62.8 % households used *noug* cake in urban and peri-urban area respectively and households have negative perception on feeding *noug* cake. Among the respondent 77.4 % and 88.4 fed cotton seed cake for the animal, 88.5 and 95.3 households used linseed cake for dairy animal. Non-conventional feed such as bean hull, pea hull, cabbage leaf, local drink *atela* and brewery by-products were used by the majority of households for dairy feed.

**Table 7. Feed resources and feeding systems in the study area**

Parameter	Urban	Peri-urban	chi-square P value		Total
	N (87)	N (43)			
<b>Feeding crop residues</b>					
Teff straw	87 (100)	43 (100)			130 (100)
Barely straw	18 (20.7)	4 (9.3)	2.65	0.103	22 (17)
Wheat straw	38 (43.7)	4 (9.3)	15.54	0.000	42 (32)
Cane top	0 (0)	36 (83.7)	100.73	0.000	36 (28)
Grass hay	71 (81.6)	19 (44.2)	18.91	0.000	90 (69.2)
<b>Agro-industrial by products</b>					
Noug seed cake	61 (70)	27 (62.8)	0.706	0.401	88 (67.7)
Cotton seed cake	65 (74.7)	38 (88.4)	3.263	0.115	103 (79.2)
Linseed cake	77 (88.5)	41 (95.3)	1.608	0.205	118 (90.7)
Wheat bran	87 (100)	43 (100)			130 (100)
<b>Non-conventional feeding</b>	87 (100)	43 (100)	130	0.000	130 (100)
<b>Feeding systems</b>					
Stall feeding	87(100)		22 (51.2)		109 (83.8)
Semi-extensive	0 (0)		21 (16.2)		21 (16.2)

#### 4.3.2 Sources of water for livestock in the study area.

The sources of water in the study area are reported in Table 8. Respondent answered that 100 % of households in urban used tap water, while only 27.9 % of the households in peri-urban used tap water. The remaining 72.1 % were used wheel water for dairy animals. In peri urban area clean water was scarce because of the deep wheel water was hot (warm) water. The frequency of watering in a day were two times and one time per day.

Table 8. Sources of water for livestock in the study area

<b>Parameter</b>	<b>Urban</b> N (87)	<b>Peri-urban</b> N (43)	<b>N (130) Total</b>
<b>Sources of water</b>			
Pipe/tap	87 (100)	12 (27.9)	99 (76.1)
Wheel	0 (0)	31 (72.1)	31 (24.8)
<b>Frequency of watering</b>			
Once a day	13 (14.9)	41 (95.3)	54 (41.5)
Twice	74 (85.1)	2 (4.7)	76 (58.5)
<b>Quality of water</b>			
Cold water	87 (100)	12 (27.9)	99 (76.1)
Warm water	0 (0)	31 (23.8)	31 (23.8)

N=sample size

#### 4.3.3 Dairy cattle breeding system

In the study area the dominant breeding system is AI with very little natural mating system. From the total respondent 72.3 % answered as used AI for breeding and only 21.5 % and 6.2 % answered as using both AI and natural mating respectively. The preference of the farmers for AI was due to the shortage of space and difficulty to manage Owen bull, the fear for reproductive disease infection to use neighbor bull and the positive efficiency of AI to upgrade blood level of dairy cows. Among Farmers in the study area the peri-urban area was got service only from government AIT with limited access due to few numbers of AIT, so they have been used natural mating as alternate breeding systems. In urban dairy production systems farmers got AI service both from government and private AIT.

Table 9. Breeding methods in the study area

<b>Parameter</b>	<b>Urban</b> N (87)	<b>Peri-urban</b> N (43)	<b>N (130) Total</b>
<b>Breeding methods</b>			
AI	77 (88.5)	17 (39.5)	94 (72.3)
Bull	4 (4.6)	4 (9.3)	8 (6.2)
Both	6 (6.9)	22 (51.2)	28 (21.5)
<b>Source of AI</b>			
Government AIT	53 (60.9)	41 (95.3)	94 (72.3)
Private AIT	12 (13.8)	0 (0)	12 (0.2)
Both AIT	22 (25.3)	2 (4.7)	24 (18.5)

N= sample size

#### 4.3.4 Dairy cows housing system and facilities

Table 10 indicated the housing systems and facilities in the study area. In the study area all of the dairy holders were reported that indoor housing was the main shelter for dairy cattle. Farmers in the study area also reported that shortage of space per animal was the challenge to manage the existed herd and to expand the herd size. The construction materials were

corrugate iron sheet, plastic, wood and combination of the two for wall, plastic and corrugate iron sheet for roof, and concrete floor for cleanliness of the barn. The basic problems of housing system in respective area was no housing management in production level such as milking house, house for pregnant cow, isolation pen due to shortage of land. regarding to house facility 43.8 % of the dairy house in the study area have electric facility to ease of management of the herd at night and at early milking time. Among the interviewed dairy holders 36.7 % have the store near the dairy house which helped for storage of dairy feed and equipment, 86 % of the respondent accessed to road and only 30.8 % of the respondent have own carts for transportation.

Table 10. Dairy house and facilities

	<b>Urban</b>	<b>Peri-urban</b>	
<b>Parameter</b>	N (87)	N (43)	N (130) Total
<b>House system</b>			
Indoors	87 (100)	43 (100)	130 (100)
<b>House ventilation</b>			
Good	43 (49.4)	17 (39.5)	60 (46.2)
Medium	30 (34.5)	22 (51.2)	52 (40)
Poor	14 (16.1)	4 (9.3)	18 (13.8)
<b>Dairy house facilities</b>			
Electric power	52 (59.8)	5 (11.6)	57 (44)
Store	33 (37.9)	14 (32.6)	47 (37)
Crash for treatment and breeding	3 (3.4)	0 (0)	3 (2.3)
Road access	87 (100)	35 (81.4)	112 (86)
Transport/cart	23 (26.4)	17 (39.5)	40 (31)
<b>Space of house per cows</b>			
Shortage	44 (50.6)	5 (11.6)	49 (37.7)
Enough	43 (49.4)	38 (88.4)	81 (62.3)
<b>Location of dairy house</b>			
In the residence compound	87 (100)	43 (100)	130 (100)

#### 4.3.5 Milking and activities during milking

Table 11 showed the milking and activities during milking in the study area. In the study area respondent told that cow milking was done two times per day at morning and at evening, 46.9 % with suckling of a calf and 53.1 % without suckling of calf. Among the respondent 26.9 % and 73.1 % use warm water and normal water for teat and udder cleaning and 89.2 % and 10.8 % drying the teat and not drying the teat respectively. Cleaning the barn, washing utensil, washing hands, etc. are among the activities done before and after milking.

Table 11. Milking and activities during milking

	<b>Urban</b>	<b>Peri-urban</b>	
<b>Parameter</b>	N (87)	N (43)	N (130) Total
Barn cleaning	76 (87.4)	26 (60.5)	102(78.5)
Clean and drying the teats	75 (86.2)	30 (69.8)	105 (80.7)
Detect mastitis	65 (74.7)	25 (58.1)	90 (69.2)
Letting calf before milking	34 (39)	27 (62.5)	61 (47)
<b>Milking utensil</b>			
Plastic jar	87 (100)	43 (100)	130 (100)
<b>Milking frequency</b>			
Twice a day	87 (100)	43 (100)	130 (100)

#### 4.3.6 Dairy cattle health management and health service delivery

The health management and health service delivery in the study area were presented in Table 12. In the study area respondent responded dairy cattle health management were based on proper sanitation and feeding, and treatment of sick animals by veterinarians. The health service delivery was done by government and private veterinarians in whom the private service was more preferred due to access and quick responsiveness, while in peri-urban area

the health management activities including regular vaccination, treatment of sick animal by veterinarian who assigned in animal health post for general health issues. The major dairy disease in the study area were mastitis, LSD, FMD, calve deharria, anthrax, blotting and hypocalcemia were among the others. In urban area attention given to vaccination for dairy animals was very low because of the shortage of government veterinarians and low attention of private veterinarians for vaccine.

Table 12. Dairy health management and service in the study area

<b>Parameter</b>	<b>Urban</b>	<b>Peri-urban</b>	<b>N (130) Total</b>
	<b>N (87)</b>	<b>N (43)</b>	
<b>Major dairy disease</b>			
FMD	34 (39)	38 (88.4)	72 (55.4)
LSD	67 (77)	31 (72)	98 (75.4)
Mastitis	87 (100)	34 (79.1)	121 (93)
Hypocalcaemia	82 (94)	19 (44)	101 (78)
<b>Animal treatment trend</b>			
Symptom detection then treatment	75 (86.2)	37 (86)	112 (86.2)
Symptom detection, diagnosis and treatment	12 (14.0)	6 (14.0)	18 (14.0)

N= sample size, FMD= Foot and Mouth Disease, LSD= Lymph Skin Disease.

#### 4.3.7 Record keeping practices

The trends of record keeping in the small dairy holders indicated in table 13. in the study area the trend of record keeping was not well organized. As reported by respondent keeping a record was in its infant stage, among the respondent 36 %, 66 % and 44 % were recorded the milk production, breeding date and inputs purchased using informal sheet and exercise books respectively. Some farmer's record keeping was not well practiced due to lack of awareness about the importance of record keeping, and personal motivation. In peri-urban area record keeping was at low level, so no record keeping was practiced.

Table 13. Recording keeping practice in the study area

	<b>Urban</b>	<b>Peri-urban</b>	
<b>Parameter</b>	N (87)	N (43)	Total
<b>Milk production recording</b>			
Full recording	32 (36.8)	4 (9.3)	36 (28)
Partial recording	12 (13.8)	12 (27.9)	24 (18)
No recording	43 (49.4)	27 (62.8)	70 (54)
<b>Animal health recording</b>			
Full recording	7 (8)	2 (4.7)	9 (7)
Partial recording	17 (19.5)	11 (25.6)	28 (21.5)
No recording	63 (72.4)	30 (69.8)	93 (71.5)
<b>Breeding record keeping</b>			
Full recording	55 (63.2)	11 (25.6)	66 (51)
Partial recording	12 (13.8)	12 (27.9)	24 (18.5)
No recording	20 (23)	20 (46.5)	40 (31)
<b>Dairy inputs recording</b>			
Full recording	39 (44.8)	5 (12)	44 (34)
Partial recording	13 (14.9)	14 (32.6)	27 (20.7)
No recording	35 (40.2)	24 (55.8)	59 (45)

N= sample size

#### 4.3.8 Labour division of the respondent in the study area

The sources of labor for dairy operation were different among peri-urban and urban area. In the peri-urban area the main sources of labor for dairy activities was family labor by which the contribution of the women was very high and hired labor was almost nil, but in the urban area especially house holder having medium to high herd size the source of labor was hired labor with full time and part time, while the part time hired labor in the study area was

involved only on milking/management activities. The study indicates that among the routine dairy activities milking, feeding, milk selling and barn cleaning in the peri-urban area belongs to women and feed collection, inputs purchasing was given to men. In urban area milking, feeding, barn cleaning was done by hired labor and family members. The remaining activities such as milk selling, inputs purchasing and breeding issues were belonging to householder either they are male or female.

Table 14. Labour division of the study area

<b>Parameter</b>	<b>Urban</b> N (87)	<b>Peri-urban</b> N (43)	<b>N (130) Total</b>
<b>Milking</b>			
Husband	12 (13.8)	3 (7)	15 (11.5)
Wife/female household	46 (52.9)	36 (83.7)	82 (63)
Son/girl	2 (2.3)	2 (4.7)	4 (3)
Hired labor	27 (31)	2 (4.7)	29 (22.3)
<b>Barn cleaning</b>			
Husband	7 (8)	10 (23.3)	17 (13)
Wife/female household	36 (41.4)	18 (37.2)	54 (41.5)
Son	18 (20.7)	15 (32)	33 (25.4)
Hired labor	23 (26.4)	2 (4.7)	25 (19.2)
<b>Herd feeding</b>			
Husband	19 (21.9)	23 (53.5)	42 (32.3)
Wife/female household	28 (32.2)	6 (14)	34 (26)
Son	19 (21.8)	12 (27.9)	31 (24)
Hired labor	21 (24)	2 (4.7)	23 (18)

#### 4.3.9 Major constraints of dairy production in the study area

The major constraints of dairy production in the study area were mentioned in table 15. As respond by the dairy holders, the major constraints were shortages of feed because of high price of feed from time to time, shortage of AI, lack of credit services, lack of extension service, lack of improved heifers and shortage of land to expand the dairy production. Due to the shortage of feed, dairy holders fed the animal by poor quality feed like *Atela*, brewer to survive the costs of the feed.

From the respondents 100 % were answered feed as the major dairy constraint in terms of price and quality. The other problems identified by respondent were unavailability of improved dairy heifers, low quality and accessibility of veterinary services such as vaccine and treatment, shortage of lands to expand the dairy farming and to plant improved forages for dairy feed, inadequate numbers of public AIT and veterinary technicians which hamper the dairy development in the study area. Lack of own bull, repeat breed of the inseminated cows, unwanted feed cost when AI failed, the lack of diagnostic laboratory in the town, discontinuous or absence of vaccination are also a dairy problem in the study area.

Table 15. The major dairy production constraints in the study area

<b>Parameter</b>	<b>Urban</b>	<b>Peri-urban</b>	<b>N (130) Total</b>
	<b>N (87)</b>	<b>N (43)</b>	
High costs and low-quality feed	87 (100)	43 (100)	130 (100)
Lack of secured dairy working area	82 (94.3)	28 (65)	110 (85)
Lack of scheduled vaccine	71 (81.6)	13 (30.2)	84 (65)
High cost of calcium injection	67 (77)	23 (53.4)	90 (69.2)
Lack of green feed/grass	67 (77)	14 (32.6)	81 (62.3)
Disease incidence	80 (92)	25 (58)	105 (81)
Less attention for dairy sector	61 (70)	29 (67.4)	90 (69.2)
Lack of capital	51 (58.6)	30 (70)	81 (62.3)
Reduced income due to high cost of feed	82 (94.3)	40 (93)	122 (94)
Inadequate AI service delivery	68 (78)	33 (77)	101 (78)

#### **4.4 Reproduction and Production Performance of Crossbred Dairy Cows in the Study Area**

Reproduction and production performance of dairy cows in the study area was indicated in Table 16.

##### *4.4.1 Age at first service*

The respondent of the study reported that age at first service was ranged from 12-25 months following the management difference between the dairy holders. The study showed that the mean age at first services was 18.12 month. The difference in management practices between dairy holders were caused by dairy work experience, low capital, shortage of feed and feeding practices, inadequate supervision of dairy holders, were identified during focus group discussions. Some respondent told that early age at first service due to the difference of high blood level and attention given to calves' management in the operation. The dairy holders answered also that due to repeatedly born of male calves the female calves managed with special attention such as letting female calves to suckling the milk by itself to have replacement heifers.

##### *4.4.2 Age at first calving*

Age at first calving is the period between birth and first calving. Influences both the productive and reproductive life of the female, directly through its effect on her lifetime calf crop and milk production and indirectly through its influence on the cost invested for up-bringing (Gebrekidan *et al.*, 2012). During the study age at first calving was identified as it is ranged from  $27.73 \pm 0.34$  months and AFC were influenced by age at first service.

##### *4.4.3 Calving interval*

Calving interval (CI) refers to a time elapsed between two consecutive successive parturitions (Gebrekidan *et al.*, 2012). The mean calving intervals in the area were 13.6 months. The long calving interval of crossbred dairy cows were expected by farmers as it is due to shortage of feed due to high feed price, inadequate components of feed (e.g. Many dairy holders fed their dairy animals poor quality feed such as local *Atela*, cereal hulls.

Table 16. Reproductive and production performance of crossbred dairy cattle in month

<b>Parameter</b>	<b>Urban</b>	<b>Peri-urban</b>	<b>Total</b>
	Mean±SE	Mean±SE	Mean±SE
<b>Reproductive performance</b>			
Lactation length of the herd	10.11±0.07	10.5±0.11	10.24±0.06
AFS	16.7±0.34	20.9±0.31	18.12±0.30
AFC	26.16±0.38	30.9±0.31	27.73±0.34
CI	13.7±0.08	13.3±0.12	13.6±0.07
NSC	1.49±0.08	1.83±0.17	1.6±0.08

SE= Standard Error

#### 4.4.4 Daily milk yield

The milk production in the study area at different lactation phases was indicated in table number 17. Milk production is the major product of crossbred dairy cows which is used to income generation and for home consumption. In the study area 100 % of respondent answered that the total milk produced from their dairy cows was delivered to local market. The overall mean daily milk yield in the study area was 15.4 liters.

Table 17. Milk yield of cows in the study area

<b>Parameter</b>	<b>Urban</b>	<b>Peri-urban</b>	<b>Total</b>
	Mean±SE	Mean±SE	Mean±SE
<b>Milk yield</b>			
High yielding cows	18.17±0.55	9.83±0.33	15.41±0.51
Low yielding cows	13.52±0.42	7.79±0.35	11.63±0.38

#### 4.5 Animal Sold from the Herd/Culling and Dairy Inputs

The activities of dairy market in the study area were indicated in table 18. The dairy output sold identified by respondent was whole milk in regular way; butter and cheese in the time of

fasting due to decline in demand for milk. In the study area Male calves was sold from the herd in order to save feed and management time since it is not for replacement, so 13.8% respondent sold the male calf out of the herd, 15.4 % sold animal due to shortage of space, 10 %, and 10.8 % were sold animal due to old aged and repeat breed respectively.

Table 18. Overall reason for animal sold in urban and peri-urban area

<b>Reason for sold</b>	<b>N (130) frequency</b>	<b>Percent</b>	<b>Rank</b>
Repeat breed	13	10.0	4
Shortage of space	20	15.4	1
Male calf	18	13.8	2
Aged cow	14	10.8	3
Combination of more than two	9	6.9	5
No animal sold	56	43.1	

#### 4.5.1 Feed chemical analysis

The chemical composition of the major feed in the study area is presented in Table 19. The DM of Agro-industrial by-products were low in wheat bran (89.03) and in *noug* seed cake, cotton seed cake and line seed cake were relatively equal ranged from 94.2, for noug seed cake to 94.9 for cotton seed cake. The DM in crop residues also relatively closed to each other which were 94.5, 95.03 and 94.4 for grass hay, wheat straw and teff straw respectively.

Table 19. Feed chemical composition

<u>Sample type</u>	<u>DM %</u>	<u>MM (%)</u>	<u>CF(%)</u>	<u>CFat(%)</u>	<u>Ca(%)</u>
Noug seed cake	94.467	12.879	15.243	4.848	2.823
Cotton seed cake	94.900	4.496	25.184	6.744	4.039
Line seed cake	94.233	5.730	3.502	10.060	5.483
Wheat bran	89.033	3.856	8.199	3.482	4.493
Homemade feed	91.120	3.512	8.889	3.007	5.483
Grass hay	94.500	8.395	28.889	0.988	4.938
Wheat straw	95.033	10.172	36.303	1.922	3.858
Teff straw	94.400	5.791	41.102	2.083	1.589
Brewery by-produ	92.367	1.335	12.992	10.610	3.609
<i>(Tella- Atela)</i>	<i>92.767</i>	<i>4.312</i>	<i>29.321</i>	<i>9.917</i>	<i>3.953</i>

#### 4.5.2 Dairy inputs and services in the study area

The dairy inputs identified as important one in the study area were categorized as breeding; feed resources, health care, housing and dairy services. The breeding inputs discussed with the respondent were artificial insemination (AI), semen, liquid nitrogen, estrous synchronizations hormone, PD test, heifers supplied by government and NGO, heifers purchased from open market and AI equipment were among the many. Inputs under feed category were natural pasture, agro-industrial by-products, formulated feed, supplemented feed such as calcium and non-conventional feed resources. Under dairy health management; disease prevention, disease controlling, sanitation and hygiene and other health issues were discussed.

#### 4.5.3 Breeding inputs category

**Artificial insemination:** the study conducted in the study area was indicated all the respondents have an access to AI service even though the service was interrupted by different reasons. The service was given by four AIT which employed by government livestock sector and three private AIT. According to city and district livestock office, in 2018/192011 EC) 1455 and 3452 cows were inseminated and conceived by 66 % and 54 % respectively. Respondents revealed that, over 90 % preferred AI for improving genetic potential of local

cows, the potential of AI to upgrade genetic than natural mating and to avoid the transmission of reproductive disease from bull to cows.

Table 20. Overall access of inputs and service for dairy breeding

Availability of Inputs	N (130)	Frequency	%	Supplier
Artificial insemination		130	100	Livestock office
Semen		130	100	Livestock office
Liquid nitrogen		130	100	Livestock office
Estrous synchronization hormones		45	35	Livestock office
Pregnancy diagnostics		78	60	Livestock office
Improved heifers				
From open market/ through farm		55	42.3	Dairy holders
From own herd		75	57.7	Household

AV= available:

#### 4.5.4 Feed inputs category

In the study, 13.1 % farmers answered the availability of natural pasture in peri-urban area, all responded the availability of *Teff* straw and 32.3 %, 16.9 % and 48.5 % responded the shortage of wheat and barley straw and high costs of grass hay.

**Table 21. Roughage feed**

Availability of Inputs	N (130)	Frequency	%	Supplier
<b>Natural pasture</b>				
Natural pasture		17	13.1	
Teff straw		130	100	Own, retailer, farmers
Wheat		42	32.3	Own, retailer, farmers
Barely		22	16.9	Own, retailer, farmers
Hay		63	48.5	Own, retailer, farmers
Sugar cane top		37	28.5	farmers,

### *Agro-industrial by product*

Agro-industrial by product produced in Ethiopia includes by-products from flour milling, sugar factory, oil processing factories abattoirs and breweries. Agro-industrial by-products have special value in feeding livestock mainly in urban and peri-urban livestock production system, as well as in situations where the productive potential of the animals is relatively high and require high nutrient supply. The availability and consumption of these inputs and the suppliers indicated in table below

Table 22. Overall household response in utilizing AIBP

AIBP	N (130)	Frequency	%	Suppliers
Noug cake	88		67.7	Retailers
Cotton seed cake	103		79.2	Retailers
Linseed	118		90.8	Retailers
Wheat bran	130		100	Retailers
Homemade feed	130		100	household
Formulated feed	69		53	Alema, Ethio-feed, Wonji Union

N= Sample size, AIBP= Agro-industrial by-products

### *Non-conventional feed*

Non-conventional feed resources generally refer to all those feeds that have not been traditionally used for feeding livestock and are not commercially used in the production of livestock feeds (Amata, 2014). Non-conventional feeds such as vegetable refusals, sugar cane leaves, *Enset* leaves and fish offal used as animal feed (Endale, 2015). In the study area dairy considered as non-conventional feed were bean hull, pea hull, cabbage leaf *Atela* and the like.

Farmers in the study are 69 %, 79 % and 26 % were fed their animals by those non-conventional feed. Local drink *Atela* and brewery by-product also used at higher rate.

Non-conventional feed resources considered in the present study are presented in table 23.

Table 23. Access to non-conventional feed and trends in using it

Feed	<u>Urban</u>	<u>Peri-urban</u>	Total
	N (87)	N (43)	N (130)
Bean hull	75 (86)	15 (35)	90 (69)
Pea hull	81 (93)	22 (51)	103 (79)
Cabbage leaf	34 (39)	0 (0)	34 (26)
Brewery by-product	74 (85)	14 (32.5)	88 (68)
<i>Atela</i>	41 (47)	36 (84)	77 (59)

Table 24. Dairy feed available and their corresponding price in Adama area

S /N	Category of feed	Current price in kg at the time of survey	
	<b>AIBP</b>		
1	<i>Noug</i> cake	9	00
2	Cotton seed cake	10	00
3	Linseed cake	26	00
4	Wheat bran	9	00
5	Wheat milling	9	70
5	Teff straw	3	00
6	Wheat straw	3	00
7	Barely straw	-	-
8	Hay	5	00
9	Improved forage	NA	
9	Pea hull	8	00
10	Bea hull	9	00
11	Barely hull	7	00
12	Cabbage leaf	NA	

NA= not available

*Crop residues produced from grain yield in the study area*

Crop residue is the by-product of cereal grain and it is calculated using conversion rate. Crop residues were used as animal feed in the study area. The crop residue fed to dairy animal was purchased from market and in some amount produced by the dairy holders who found in peri-urban area. Accordingly, the amount of crop by-product was calculated and summaries in table 24.

Table 25. Crop residues produced

Annual crop residue production in (Qu) in urban and peri-urban/District area in 2018								
Crop	Urban				peri-urban/District			
	Land/hec	GPr	CR	CBP	Land/hec	GPr	CR	CBP
Teff	2081	61411	1.5	921168	13357	114139	1.5	171208
Wheat	66	1650	1.5	2475	3558	67757	1.5	101635
Barely	29	812	1.5	1218	1904	30623	1.5	45934
Maize	188	10904	2.0	21808	3254	67025	2.0	134050
Haricot bean	91	2007	1.2	2408	2925	23101	1.2	27721

GPr=Grain production, CR= conversion rate, CBP=crop by-product; Sources for conversion rate= AdugnaTolera, 2007, Adama city and Adama district agriculture office

#### 4.5.5 Veterinary service

In the study area veterinary services delivered were treatments of sick animals, vaccination service, and prevention of disease. In the study area, all respondents have an access to veterinary services, in urban respondents comment on the lack of scheduled vaccination program. The primary actor of animal health service was government organization and the secondary actor was private veterinary actors. The health service in the study area was somewhat different in urban and peri-urban area. In urban area veterinary service was focused on treatment with low attention for vaccination, while in peri-urban area the service was included the treatment of sick animal, vaccination, parasite control and other animal health care activities in regular and as demand bases. Veterinary drug was supplied by about 16 private pharmacies/ stockiest in the study area.

Table 26. Accessed to health inputs and services

<b>Access to health</b>	<b>Urban</b>	<b>Peri-urban</b>	
<b>Inputs and services</b>	<b>N (87)</b>	<b>N (43)</b>	<b>N (130) Total</b>
Vaccination	42 (48)	43 (100)	85 (65.4)
Treatment	87 (100)	43 (100)	130 (100)
Veterinary drugs availability	61 (70)	32 (74.4)	93 (71.5)

N= sample size

*Veterinary professionals and institute*

The numbers of veterinary professionals and institutes in the study area was indicated in table

Table 27. Veterinary professionals and institution in the study area

Parameter	Urban/ City	Peri-urban/total livestock District served
<b>Veterinarians</b>		
Vet. Technicians	0	17
BVSC	0	4
DVM	1	3
<b>Government veterinary clinic</b>		
Level B	0	1
Level C	0	0
Level D	0	10
Drug shops/ pharmacies	16	1

**Sources:** city and district livestock office

**Extension service:** in the study area the delivery of dairy extension service by development agent was not similar in urban and peri-urban area due to the difference in experience. In peri-urban area the contact of DA to farmers was unequal. In urban area only 20 %households respond have a contact in irregular ways, but the major householder in the city are didn't have contact at all. In peri-urban area extension service delivery was conducted by DA's in regular ways. Accordingly, more than 80 % of the household were got extension services from livestock sector. These differences may be due to long experience in peri-urban/rural area in service delivery and the weak organization of livestock staff in urban area.

**Access to credit:** according to the household in the study area more than 30 % of the respondents not accessed to credit service while they want to borrow money, 55 % of respondents responded as they didn't have information about the accessibility of credit services and 15 % households responds uninterested to borrow money. This situation indicated that information delivery through extension service was not as expected.

## 5. DISCUSSION

### 5.1 Characteristics of the Household

In this study the household interviewed during survey were 66.2 male and 33.8 female engaged on crossbred dairy productions. This result is similar to the findings reported by Desalegn (2017), at Bishoftu and Akaki but different from findings reported by Diriba (2014), in Bako Nekemte peri-urban areas. This is indicated that farmers involve in dairy production for additional income generation. In case of marriage among the respondents 94 % were marriage and only 6% were single. This suggested that the marriage households can able to use the family labor for dairy operation.

About 67 % of age of the respondent age among the interviewed household were ranged between 20 and 50 years of age category. This is accounted as opportunities of dairy sector since these age groups were very productive age. Regarding to education, 28.5, 31.5, 29.2, 3.8, and 6.9 were illiterate, primary school, high school, vocational and higher education respectively. This indicates that about 60 % of the respondent educational status was ranged from primary to high school which is positively correlated with dairy production.

Since the household family is the major labour power in dairy farming, the family member identified by the current study was considered as a good source of human power. The average land holding of the household in the study area very small, .5808, .0019, .0000 and .0115 ha for crop, forage, grazing and irrigation respectively which is similar with the finding of shiferaw *et al.*, (2003), More than 90 percent of the urban dairy farmers live in the medium and low density areas and use their residential units as places where dairying is carried out, and also Msangi *et al.*, (2005), which found Urban areas have limited space for dairying and due to small land holdings, zero grazing is common. In the study area respondent have their own resident and all of them kept the animal within the main house residence which indicates the shortage of land to keep dairy in separate area for dairy operation which is similar to the finding of Sentayehu *et al.*, (2008).

The sources of livelihood in the study area are the dairy production and other additional activities. Accordingly, among the respondents 45.4 % engaged on dairy and crop

agriculture, 20.8 % on dairy and other livestock rearing, 5.4 % dairy and government employee, 10 % private employment, 12.3 % dairy and trade, 8.5 % dairy and other different activities and 6.2 % were pensioners. The dairy work experience of the household in the study area was ranged from 1-23 years in which 49.2 % experienced for 1-5 years, 23 % for 6-10 years and about 27.7% experienced for about more than 11 years. These figures showed that the dairy farming was accepted by the society as a potential production area in the urban and peri-urban areas by the productive age group.

## **5.2 . Crossbred Dairy Management Systems**

In the study area, 83.8 % of the respondent uses stall feeding system which is similar with the findings of Abebe *et al.*, (2018) for urban Bishoftu, Assela and Sululta, and peri-urban Assela, Bishoftu and Holeta which the majority of the respondent revealed that stall feeding was the main feeding system. The major feed resources in the study area were crop residues, AIBP and non-conventional feed in which the crop residues and AIBPs have higher proportion that was similar to the finding of Asrat *et al.*, (2013) in Boditti, south Ethiopia, where the type of feed commonly used in urban production system include purchased concentrates and roughages of conventional and non- conventional sources. In the study area 86.9 % of the respondent responded unavailability of grazing pasture in urban area, this finding was similar to the results stated by Yoseph (1999) for Addis Ababa and Dire Dawa, and 13.1 % of the household from peri-urban responded the availability of grazing pasture land due to the presence of communal land. The study revealed that, 97.7 % of the respondents fed teff straw for dairy cows, while 32.3 % and 16.9 %, respondents preferred wheat and barley respectively if it is available. Households in the urban area were highly interested for improved forage feeding, especially for green fodder, however the lack of land limit them from cultivating and planting it.

Households in the study area responded that agro-industrial by-products were good sources of dairy feed. The demand for AIBP were different from low to high percentage which accounts 90.8 %, 79.2 % and 16.9 % respectively for linseed cake, cotton seed cake and *noug* cake. In this study the researcher observed that the negative perception of respondent for *noug* seed cake as it affects the milk composition (thickness) when lactating cows fed it and

cotton seed cake as it caused calve blindness when the pregnant cows feed it after second trimester. In the study area non-conventional feed also used by households for dairy feed. The non-conventional feed available were pea hull, bean hull, barely hull, brewery, local beer *atela*, etc. those feed is used as regular feed during shortage and price of feed increased. Calcium and salt are used as supplement feed by the householder. The household responds there are high demand for calcium and low supply so high price of calcium injection raised by respondents as a basic problem. The 109 % and 21 % households used stall feeding and semi-intensive systems respectively. No free grazing feeding system in both urban and peri-urban area and semi-intensive feeding were available in peri-urban because of personal cultivated land and little communal land.

In the study area the respondents answered that 76.2 % and 23.8 % used water from pipe and deep wheel by which the water from wheel is warm so farmers fill the water into tanks before provided to animals. In the study area 78.5 % and 21.5 % of the dairy holders provide water twice and once per day for dairy cows respectively.

### **5.3 Breeding System**

Dairy breeding systems in the study area were AI, natural mating and both AI and natural mating. Accordingly, 72.3 %, 21.5 % and 6.2 % of households were used AI, both AI and natural mating and natural mating respectively which is similar with the finding of Abebe et al., (2018) for peri-urban Bishoftu, urban Bishoftu, urban Assela, urban Holetta, peri-urban Holetta and peri-urban Assela, respectively. The farmers preferred AI for interest to upgrade the genetic potential of the dairy animals, to prevent the reproductive disease transition from sire to dam and due to lack of own bull. Farmers responded the shortage of land and difficulties to manage bull behavior were raised as a problem to have own bull. The AI service delivered by two parties namely government and private sector, by which in urban both parties provide the service, while in peri-urban area the service given only by government AIT. So that, 68.5 %, 31.5 % and 53 % of respondent were got the AI service from government, 31.5 % from private and 53 % from both parties. Respondents in the study area were evaluate AI service and responded 24.6 % enough and 75.4 % constraint with the

basic issues' unavailability of AIT in all the time needed, delayed response of AIT, lack of timely insemination, very low heat detection.

### 5.3.1 Dairy housing systems and facilities

In the study area dairy housing system was indoor systems, 100 % of the respondents used indoor/ close shelters to manage, feeding, and protect from any disasters. Among the dairy house 95.4 % was in the main residence compound which is related to the finding of Asrat *et al.*, (2013) more than 97.3 % of interviewed respondent run dairy farming in main resident compound. In the study area lack of or shortage of land was a big challenge to modernize the dairy activity. In Dairy shelters construction HCB, plastic and wood, used for wall construction which accounts 19.2 %, 50 % and 30.5 % respectively, and CIS and plastic for roofing of dairy shelters accounts 42.3 % and 57.7 % respectively. During field observation, dairy housing in production level such as house for pregnant cow, milking house, calf pen and isolation pen were identified as the limitation of dairy shelters implemented in the area. Regarding to house facilities, 43.8 %, 56.9 %, 36.2 %, have electric, drainage and store respectively as well as only 30.8 % have own transport means. In case of ventilation, 46.2 %, 40 % and 13.8 % of dairy shelters categorize as good, medium and poor, due to the reason inappropriate location, problems of construction, using the human house for dairy shelters and lack of awareness about ventilation. The space per individual cows were identified as shortage during the field observation, also 63.1 % respondent answered the space for cows was very small/shortage Overstocking of dairy cattle as a result of lack of sufficient space is one of the major concerns in urban and peri urban dairy units (Ishagi *et al.*, 2002). 73 % Of respondent answered dairy house cleaning was done two to three times in a day during milking, feeding and when the faces dropped and accumulate on the floor which is different with the finding of Yitay, (2008) 32.8 and 50 % of farmers cleaned two and three times in a day respectively.

### 5.3.2 Milking and activities during milking

In the study area all households practiced cleaning utensils and cleaning hands before milking which are very important to minimize milk contamination, but 89.2 % and 90 % of households practiced cleaning and drying teats and barn cleaning before milking. In the study

area 73.1 % households wash hands and cows' teats using normal pipe water and 26.9 % household use warm water for hand washing and clean the cow's teat before milking. In the study area 46.9 % and 69.2 % of households practiced milking with calf suckling and check for mastitis. The above discussion indicated that the dairy holders grew from time to time in adopting the dairy management practice in all aspects in comparing the past five ten years. During field observation the researcher identified the management practices implemented by dairy holders different from one edge of the city to the other edge based on accessibility of information, the presence of experienced dairy holders, the accessibility of dairy extension, adoption of dairy technologies, the amount of land own and lack of continuous supervision were among the many. Farmers responded that let female calf to suckle in order to get replacement heifers but not allow the male calf to suckle because it is not required in the herd. Almost all households use plastic jar for milking but in the meantime livestock office/ agriculture office started to promote the improved milk utensil in collaboration of PAID which the utensil have better quality in compared to the formers plastic jar.

### *5.3.3 Dairy cattle health management and health service delivery*

In the study area farmers attained on sanitation and tried to provide proper feed to prevent the occurrence of disease. The major dairy animal diseases in the study area were FMD, LSD, mastitis, calf deharria, and hypocalcaemia and calf blindness. Veterinarians treat the animal by detecting the disease symptom and then treat the sick animal which caused the curative capacity of given drugs. Farmers in the urban area complain the lack of veterinary clinic and the low number of government veterinarians in the city agriculture office. Animal vaccination was not as required by the dairy holders because of single government veterinary worker in the city who can't able to cover all dairy farms, and the unwillingness of private veterinarians to vaccinate the dairy animal, as vaccination door to door was a challenge in urban to implement timely vaccinations schedule. So, in urban area dairy holders proffered government veterinarian for vaccination purpose and fair of service fee, but preferred private for treatment of sick animals as they were fast responsive and full of logistics in compared to government veterinarians.

#### *5.3.4 Record keeping practices*

In the study area the trends of record keeping was on the infant stage. In the current study attempt was conducted to assess record keeping practice on different dairy activities. The study showed that 27.7 % of households adopted the importance of milk production record keeping, have full of record, 18 % record only the milk sold and 53.8 % households not adopt milk production record keeping. As identified by the survey and assessed during field observation, farmers especially in urban part, 50.8 % households well focused on fully recording the breeding date because of the hope to have new calf, and inputs purchased to know the cost of inputs in the operation and also the current study indicated recording sick animal, treated animal, and animal health related issues were not well adopted. This indicated that dairy holders adopted the dairy operation recording system in irregular situation which required further support to transform the farmer attitudes.

#### *5.3.5 Major constraints of dairy production in the study area*

Urban and peri-urban dairy production knows with its challenges. In the study area respondents respond feed and feed related issues as a major dairy constraint in the area. 100 % of the respondent answered shortage of feed, low quality of feed and high price of feed as the obstacle of dairy operation. The lack and shortage of dairy farm area/ location suitable for general dairy operation was ranked as the constraint followed to feed related issues. Disease incidence and high cost of calcium were ranked by the respondent as the third constraint of dairy activities. Attempt to improve genetic potential of the dairy cattle faced different challenges. In the study area low efficiency of AI, repeat breed, small numbers of AIT in urban, the absence of private AIT alternative in peri-urban area, shortage of semen and liquid nitrogen supply, excess work load on AIT, lack of improved forage seed in urban while low adoption of farmers to cultivate improved forages, low dairy extension service in urban due to small numbers of extension agent and low attention given to dairy sector by the city agriculture office, lack of veterinary clinic in the city among the constraints hampered dairy holders.

### 5.3.6 *Reproduction and reproduction performance*

#### *Age at first service (AFS)*

The age at first service in the study area is  $18.12 \pm 0.30$  months which is shorter than the finding of Desalegn (2017) in Bishoftu and Akaki and different from the findings of Belay (2012) in Jimma town and Zewude (2010) in highlands and central rift valley area. The difference may be due to the difference in management practices of the dairy holders in the current study area, geographical difference and current farmer production performance.

#### *Age at first calving (AFC)*

The age at first calving in the study area was  $27.73 \pm 0.34$  larger than the finding of Desalegn in Bishoftu and Akaki, but lower than the finding of Yifat *et al.*, (2009) in Zeway who reported  $31.9 \pm 0.22$ , Hunduma (2012) in Asella who reported  $34.8 \pm 1.7$ , and kumar and Tkui (2014a) in mekele for crossbreed cows. The prolonged of AFC assumed due husbandry practices, feeding system and low attention of the dairy holders for dairy operation. In the current study area, dairy husbandry practice was improved through time which positively correlated with dairy production.

#### *Calving interval (CI)*

The average calving interval in the current study area was  $13.6 \pm 0.07$  which is related to the finding of Desalegn (2017) in Akaki, but in line 13.6 months reported by Yifat *et al.*, (2009) in Zeway. In the current study area respondents revealed that improved management practice such as feeding, health care, sanitation and housing were the reason for reproductive performance improvements.

## **6. CONCLUSION AND RECOMMENDATIONS**

### **6.1. Conclusion**

The two major dairy production systems, which mean the urban and pre-urban–livestock systems, were identified and assessed. Dairying was found as a good source of income for urban and pre-urban small holder as they are selling their dairy products primarily. Milk was the dominant marketable products in the study area. Family labor was the major source of dairy activities, but some of the respondent has hired labor in full time employment and a small number of respondents hired a labor only for milking as part time. The major feed resources identified in the area included hay and purchased roughage, concentrate feed such as noug seed cake, line seed cake, cotton seed, different cereal hulls and nonconventional feeds like atella, and brewery byproduct were used. Among crop residues teff straw was more preferred in the studied area because of more accessibility than the other straw. Wheat and barley straw were not accessible as the teff straw does.

Majority of the respondents, used AI technology for breeding, while small numbers were used natural mating. In the study area no popular bull due to shortage of space and difficulty to managing bulls. The cow heat sign adopted by the farmers were mounting the other animal, shouting, red vulva, vulva discharge, reduced milk and feed intake, still the problem is seen in identifying silent heat. Farmers in the study area were complained the interrupted or absence of vaccination strongly and repeatedly. Sick animal treatment is basically based on symptom detection due to the lack of laboratory in the town. Services like AI, health service, extension service, training and information was disseminated by government DA's, veterinarians and AIT in peri-urban area relatively in regular manner than for urban area. In urban area no animal health center/clinic under the city administration, while in per-urban area the service delivered was better than urban area.

Reproductive performance in the area was improved from time to time due to good management practices in the farms. Farmers well manage the herds to protect any loss from the herd because dairy animal is sensitive to any stress and losing a single cow was highly affecting the life of the holders. Farmers in the area were kept the animal indoors and used stall feeding systems. Regarding to milk yield, the overall average milk yield per cow was

15.4liters per day. Dairy holders sell produced milk to surrounding neighbors, milk collectors, retailers and restaurants as per their demand.

## **6.2. Recommendations**

Based on the collected and analyzed information the following issues are recommended.

- The low attention given to the sector should be improved by the intervention of respected responsible body and the dairy stakeholders to enhance the production system by intervening through training, health care, arranging breeding program, improving different dairy services.
- Shortage of land is challenging the dairy holders to expand the farm in the studied area. So, it is advisable, the city administrative should have to solve the problems by allocating the dairy working area at the edge of the town.
- Service such as credit service, continuous and programmed training, and animal health service should be managed to serve the dairy holders.
- In the area establishing dairy cooperative assumed to solve the milk market fluctuation especially the problems faced during the fasting.
- The selling of low-quality feed and unexpected increase of price challenging the farmer to get quality feed, therefore, controlling the related issues is mandatory.
- Dairy animal health care required close attention than before especially in urban small holder farms where the dairy operation is crowded.

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## APPENDIX 1. Data Collection Questionnaire

### Questionnaire for the Data Collection on the Study of Inputs and Management Systems of Crossbred Dairy Cows in and Around Adama

#### General information

1. Date \_\_\_\_\_ Kebele \_\_\_\_\_
2. Enumerator name \_\_\_\_\_
3. Name of householder \_\_\_\_\_ phone number \_\_\_\_\_
4. Sex \_\_\_\_\_
5. Age \_\_\_\_\_
6. Religion \_\_\_\_\_
7. Marital status a. marital \_\_\_\_\_ b. single \_\_\_\_\_ c. divorce \_\_\_\_\_ d. other \_\_\_\_\_
8. Educational background of the family member

Educational status	Male	female	Total
a. Illiterate			
b. 1-4 female			
c. 5-8 female			
d. 9-12			
e. Higher education			
Total			

#### 9. Livelihood sources of respondent.

Item	Ranking
1. Dairy farming only (1)	
2. Dairy farming + government employee (2)	
3. Dairy farming + Other livestock rearing (beef, poultry, shoat others) (3)	
4. Dairy farming + Crop Agriculture (maize, barley, teff, others) (4)	
5. Dairy farming + Private sector employment (5)	
6. Dairy farming + Daily labour (6)	
7. Dairy farming + Trade / Shopkeeper (7)	
8. Dairy farming + others in combination (8)	
9. Others specify _____	

#### Land holding and land use system for peri-urban and urban

10. Total area of land owned by the household..... ha

Allocation of land	Timad/m <sup>2</sup>
a. Food crop production (1)	
b. Grazing land (2)	
c. Fallow land (3)	
d. forage cultivation (4)	
e. . irrigation (5)	
f. other (6)	
g. land for residence	
h. land for dairy operation	
Total	

11. livestock holding of the house hold: when firs start dairy production, at the time of survey

	When start dairy operation			At the time of survey		
	Local	Cross	Exotic	Local	Cross	Exotic
1. cattle						
- cow						
- calves						
- heifers						
- bull						
2. equine						
- sheep						
- goats						
3. donkey						
4. mule						
5. horse						
6. poultry						
- chicken						
<b>Total</b>						

12. What is the Purpose of keeping dairy cattle in your operation? Multiple options.

- a. For home consumption only (1) \_\_\_\_\_
- b. For market only (2) \_\_\_\_\_
- c. For both (3) \_\_\_\_\_
- d. To diversify income (4) \_\_\_\_\_
- e. For draught power (5) \_\_\_\_\_
- f. For saving (6) \_\_\_\_\_ Others (7) \_\_\_\_\_

**Section two**

**A. Feed and water resources and feeding management**

- a. Do you fed the basal feed for your dairy? Yes \_\_\_\_\_ No \_\_\_\_\_

13. If yes what is the basal and supplement feed used for your dairy?

	Summer	Spring	Autumn	winter	Whole the year
<b>Basal feed</b>					
1. Natural pasture					
2. Cultivated pasture					
3. Crop residues					
Teff					
Barely					
Wheat					
Maize corn					
Cane tope					
<b>Supplement</b>					
1. Cotton seed					
2. Linseed					
3. Noug cake					
4. Wheat bran					
5. Alema mix					
6. Ethio-feed mix					

14. What is the mineral supplement used for your dairy cattle? Multiple options.
- Calcium (1) \_\_\_\_\_
  - Salt (2) \_\_\_\_\_
  - Phosphorus (3) \_\_\_\_\_
  - Iron (4) \_\_\_\_\_
  - Others (5) \_\_\_\_\_
15. Do you formulate concentrate feed provided to your dairy farm?
- Yes (1) \_\_\_\_\_
  - No (2) \_\_\_\_\_
16. If yes what is ingredient? \_\_\_\_\_
17. Do non-conventional feed used in your farm?
- Yes (1) \_\_\_\_\_
  - No (2) \_\_\_\_\_
18. If yes what are the unconventional feed used?
- 
19. Do you practice dairy feed preservation?
- Yes (1) \_\_\_\_\_
  - No (2) \_\_\_\_\_
20. If yes what kind of preservation? \_\_\_\_\_
21. What are the feeding systems you apply in your dairy operation?
- Intensive individual feeding (1) \_\_\_\_\_
  - Intensive group feeding (2) \_\_\_\_\_
  - Extensive (3) \_\_\_\_\_
  - Semi-intensive (4) \_\_\_\_\_
  - Others (5) \_\_\_\_\_
22. What is the source of water for your dairy farm?
- Pipe water (1)
  - River (2)
  - Wheel (3)
  - Roof catchment (4)
23. What is the frequency of watering your dairy cows?
- Once a day (1) \_\_\_\_\_
  - Twice (2) \_\_\_\_\_
  - Open at any time (3) \_\_\_\_\_

**B. Dairy farm Housing management and facilities**

24. What types of dairy house constructed for your farm operations?
- Indoor housing (1) \_\_\_\_\_
  - Open caroled (2) \_\_\_\_\_
  - Share the main house (3) \_\_\_\_\_
  - Separate housing \_\_\_\_\_
  - Others (4) \_\_\_\_\_
25. How about the ventilation in the dairy house?

- a. Good (1) \_\_\_\_\_
- b. Medium (2) \_\_\_\_\_
- c. poor (3) \_\_\_\_\_
- d. others (4) \_\_\_\_\_

26. What facilities provided in the dairy farm? Multiple options

Facilities	Yes (1)	No (2)
a. Electric power		
b. Store		
c. Office		
d. Crash		
e. Road		
f. Transport		
g. Others		

27. What is the average space of house in your dairy farm?

- a. Total dairy house space in m<sup>2</sup> (1) \_\_\_\_\_
- b. The space of house per dairy cows in m<sup>2</sup> (2) \_\_\_\_\_

**C. Crossbred Dairy cattle breeding, and reproductive management**

28. When did you start the crossbred dairy farming? \_\_\_\_\_

29. What is the breed you have when first start dairy operation?

- 1. Local (1) \_\_\_\_\_
- 2. Crossbred (2) \_\_\_\_\_
- 3. Exotic (3) \_\_\_\_\_
- 4. Combination (4) \_\_\_\_\_

30. From where did you aware to start the dairy farming? Multiple option

- a. Relative /individual (1) \_\_\_\_\_
- b. Introduced by government (2) \_\_\_\_\_
- c. Introduced by NGO (3) \_\_\_\_\_
- d. Self-motivated (4) \_\_\_\_\_
- e. Inherited (5) \_\_\_\_\_

31. Where did you get the foundation animals when you first start up your dairy farm? rank

- a. Credit from government (1) \_\_\_\_\_
- b. Credit from NGO (2) \_\_\_\_\_
- c. Purchased (3) \_\_\_\_\_
- d. Given from relatives (4) \_\_\_\_\_
- e. By AI (5) \_\_\_\_\_ Other (6) \_\_\_\_\_

32. How many crossbred dairy cattle kept in farm at the time of survey in number?

Production level	Number
a. Lactating cows	
b. Pregnant dry cow	
c. Heifers (more than 1 year old)	
d. Female calves (less than 1 year old)	
e. Male calves (less than 1 year old)	
f. Male fattening cattle (>1-year-old)	
g. Bull (more than 2 years old)	

Other specify \_\_\_\_\_

Other specify \_\_\_\_\_

33. What is the breeding method more preferred in your dairy operation?

- a. AI (1) \_\_\_\_\_
- b. Bull mating (2) \_\_\_\_\_
- c. Both (3) \_\_\_\_\_

34. Do you have your own breeding bull?

- a. Yes (1) \_\_\_\_\_
- b. No (2) \_\_\_\_\_

35. What are the major constraints of breeding in your dairy herd?

- a. Shortage of AI technicians (1) \_\_\_\_\_
- b. Unavailability of AI at weekend and festivals (2) \_\_\_\_\_
- c. Repeat breed per conception (3) \_\_\_\_\_
- d. Long days open (4) \_\_\_\_\_
- e. Most of the calf born is male calf (5) \_\_\_\_\_
- f. Others (6) \_\_\_\_\_

36. Reproductive performance of crossbred dairy cross cows by month /days

Reproductive performance	Month
a. Lactation length (1)	
b. Age at first service (2)	
c. Age at first calving (3)	
d. Calving interval (4)	
e. Number of service per conception (5)	
f. Reproductive life span of male and female (6)	
g. Days open (7)	

**Reproductive management**

37. What are heats sign repeatedly used to detect cow estrous?

\_\_\_\_\_

\_\_\_\_\_

38. At what time did you detect heat estrus in your dairy farms?

- a. Early morning only (1) \_\_\_\_\_
- b. Evening only (2) \_\_\_\_\_
- c. Morning and evening (3) \_\_\_\_\_
- d. Other (4) \_\_\_\_\_

39. Did diagnosis for pregnancy test taken properly?

- a. Yes (1) \_\_\_\_\_
- b. No (2) \_\_\_\_\_

**D. Major Dairy Disease, health management, and use of veterinarians**

40. What disease prevention action takes place in your dairy operation? rank

- a. Regular vaccination (1) \_\_\_\_\_
- b. Sanitation (2) \_\_\_\_\_
- c. De-worming (3) \_\_\_\_\_
- d. Proper feeding (4) \_\_\_\_\_
- e. Others (5) \_\_\_\_\_

41. What are disease control mechanisms in your dairy farm?
- Disease symptom detection - Diagnosis -and treatments by veterinarians (1) \_\_\_\_\_
  - Disease symptom detection- and treatments by veterinarians (2) \_\_\_\_\_
  - Disease symptom detection - purchased drugs from open market - then given to sick animal by owner (3) \_\_\_\_\_
  - Detect disease symptoms – isolate the sick animal (4) \_\_\_\_\_
  - Others (6) \_\_\_\_\_

42. Did any animal died last years?

- Yes (1) \_\_\_\_\_
- No (2) \_\_\_\_\_

43. What are the major Dairy diseases occurred in the operation last years and animal affected?

Disease	Animal affected/died	Season of occurrence			
		summer	spring	autumn	winter
a.					
b.					
c.					
d.					
e.					
f.					
g.					

h. Others (8) \_\_\_\_\_

44. Did any reproductive health problems appeared last year?

- Yes (1) \_\_\_\_\_
- No (2) \_\_\_\_\_

45. If yes, what types of problems appeared?

- Abortion (1) \_\_\_\_\_
- Dystocia (2) \_\_\_\_\_
- Uterine prolapsed (3) \_\_\_\_\_
- Retained placenta (4) \_\_\_\_\_
- Others, specify (5) \_\_\_\_\_

**Milk Production, handling, consumption and marketing**

46. What type of cattle did you sell from your farm last year (multiple options possible)?

Sold animal	Yes	No
1. emaciated (1)		
2. Diseased (2)		
3. Low productive (3)		
4. for income generating (4)		
5. male calf (5)		
6.aged cow (6)		
7.for shortage of feed (7)		
9. shortage of space (9)		
10.due to repeat breeding (10)		

11. Others specify \_\_\_\_\_

47. What is the frequency of milking in your dairy operation?

- a. Once a day (1) \_\_\_\_\_
  - b. Twice a day (2) \_\_\_\_\_
  - c. Thrice a day (3) \_\_\_\_\_
48. What is the regular milking time?
- a. Morning and evening (1) \_\_\_\_\_
  - b. Morning and mid day (2) \_\_\_\_\_
  - c. At any time (3) \_\_\_\_\_
49. Which of the following sanitary practice do you apply during milking?

Milking activities	Yes (1)	No (2)
a. Cleaning the barn		
b. Prepare hot water		
c. Clean utensil		
d. Hand cleaning		
e. Cleaning teats and udder		
f. Let Calf to stimulation		
g. Drying the teat by cloth		
h. Detect mastitis		
i. Hand milking		
j. Machine milking		
k. Others		

50. What is the milking utensil in your dairy?
- a. Plastic jar (1) \_\_\_\_\_
  - b. Aluminum jar (2) \_\_\_\_\_
  - c. Traditional material (3) \_\_\_\_\_
  - d. Others (4) \_\_\_\_\_
51. Did you practice milk selling
- a. Yes (1) \_\_\_\_\_
  - b. No (2) \_\_\_\_\_
52. If yes what is the price of milk selling per litters in maximum and minimum?
- a. Maximum (1) \_\_\_\_\_
  - b. Minimum (2) \_\_\_\_\_
53. What are the milk consumption patterns?

Utilization patterns	In liters
1. For calf feeding (2)	
2. For house consumption (3)	
3. For processing( churning for butter etc) (4)	
4. Whole milk for sale (5)	
5. For other purpose (6)	
<b>6. Total</b>	

#### Record keeping

54. Of the dairy cows on hand, what percent had the individual cow identification?
- a. All of the herd (1) \_\_\_\_\_
  - b. Half of the herd (2) \_\_\_\_\_
  - c. Almost all of the herd.(3) \_\_\_\_\_
55. Which of the following herd identification method did the operation use?
- a. Ear tag (1) \_\_\_\_\_

- b. Tattooing (2) \_\_\_\_\_  
 c. Hot iron (3) \_\_\_\_\_  
 d. Others \_\_\_\_\_
56. Which of the following types of record-keeping systems did the operation use to track individual dairy animals?  
 a. Handwritten records, such as a ledger, notebook or simple sheet? (1) \_\_\_\_\_  
 b. No record keeping system (2) \_\_\_\_\_  
 c. Other systems (Specify: \_\_\_\_\_)
57. In record-keeping systems used individual dairy animals monitor for the following issues?

	Yes	No
a. Milk production (1)		
b. Animal health (2)		
c. Breeding history (3)		
d. New born calves (4)		
e. Cull cow sales (5)		
f. Died animal (6)		
g. Input purchased used (7)		
h. Income (8)		

i. Other (Specify: \_\_\_\_\_)

#### Section four

#### Constraints and prospective of dairy production and marketing

#### Section five

#### Labor division of the family member in livestock management activities

58. What is the division of family members in different activities of the farm?

Type of activities	Responsible individuals						
	H (1)	W (2)	S (3)	D (4)	HL (5)	R (6)	O (7)
Milking							
Barn cleaning							
Animal house construction							
Herd feeding and watering							
Milk and milk product marketing							
Feed collection							
Inputs purchasing							
Decision to breeding							

H= husbandry W= wife S= son D= daughter HL=hired labor R= relatives O= other

#### Part two Dairy inputs

#### Breeding inputs

59. Are there the sources of improved dairy animal in your locality?  
 a. Available (1) \_\_\_\_\_  
 b. Not available (2) \_\_\_\_\_
60. If available what is the source of improved heifers for replacement?  
 a. Born in the operation (1) \_\_\_\_\_  
 b. Purchased from other known farm/ dairy holders (2) \_\_\_\_\_

- c. Purchased from open market from unknown farm/dairy holder(3) \_\_\_\_\_
  - d. Other specify \_\_\_\_\_
61. What is the Problems encountered regarding to replacement heifer?
- a. high prices of heifers (1) \_\_\_\_\_
  - b. deaths of female calves (2) \_\_\_\_\_
  - c. small numbers of female calves born/most born calves is male (3) \_\_\_\_\_
  - d. other, specify \_\_\_\_\_
62. What is the current price for improved dairy animal?
- a. price for cow in Br. \_\_\_\_\_
  - b. price for improved heifers in Br. \_\_\_\_\_
  - c. price for bull in Br. \_\_\_\_\_
63. Is there AI sources in the area?
- a. Yes (1) \_\_\_\_\_
  - b. No (2) \_\_\_\_\_
64. Where are the sources of AI in your dairy operation?
- a. Government/ kaliti (1) \_\_\_\_\_
  - b. Private semen producer company(2) \_\_\_\_\_
  - c. NGO (3) \_\_\_\_\_
  - d. Cooperative (4) \_\_\_\_\_
  - e. Both as available (5) \_\_\_\_\_
65. Do you consider the coverage it enough?
- a. Enough (1) \_\_\_\_\_
  - b. Constrained (2) \_\_\_\_\_
  - c. I don't know (4) \_\_\_\_\_
66. What is the Number of cows to be inseminated in your dairy this year, what number inseminated and how many did conceived?

	Number
Number to be inseminated	
Inseminated	
Conceived	

67. What is/are the basic AI related constraint in your operation?
- \_\_\_\_\_
- \_\_\_\_\_
68. Numbers of dairy holders having Owen bull for breeding \_\_\_\_\_
69. Demands of dairy holders for natural mating:
- a. No demand due to disease transmittion \_\_\_\_\_
  - b. Average \_\_\_\_\_
  - c. High \_\_\_\_\_
- Feed resources in the study area.**
70. Is there the source of pasture/communal land in the area?
- a. Yes (1) \_\_\_\_\_
  - b. No (2) \_\_\_\_\_
71. Do you have cultivated forage for your dairy operation?
- a. Yes (1) \_\_\_\_\_
  - b. No (2) \_\_\_\_\_

72. If yes, what is the size of land for cultivated pasture land (forage, fodder, legumes etc) in your farm or dairy operation? In m<sup>2</sup> \_\_\_\_\_

73. Types of forage you preferred to planted in your operation? \_\_\_\_\_

**Crop residues**

74. What are crop residues produced or marketed in the area? Rank

	Rank
a. Teff,	
b. barely,	
c. wheat,	
d. maize corn,	

75. Where are the sources of crop residues for your dairy?

Season	Wet season	Dry season
a. from surrounding farmers (1)		
b. from suppliers (2)		

76. how much is the Price of crop residues for different types (teff, wheat, barley, etc)

Basal feed	price/100 or 20 kg
a. Teff (1)	
b. Wheat (2)	
c. Barely (3)	
d. Other (4)	

**Agro-industrial by-products**

77. Agro-industrial by-product accessed in the area

	Produced in the area	Transported from Addis	Price/100 kg
Cotton seed			
Linseed			
Wheat bran			
Noug cake			
Molasses			
Animal by-product meal			

78. Producers, Suppliers and distributors of agro- industrial by-products in your locality?

Producers/plants	Suppliers /whole seller	Distributors /retailer
1.		
2.		
3.		
4.		
5.		

79. Animal health service

	Number	
	Urban	Peri urban
a. Animal health post or centers in number	Private	
	Government	
	NGO	
b. Private veterinarians		
c. Government veterinarians		

d. Vet. Drug stockiest		
e. Vet.drug shop/ pharmacy		
f. Vet. equipment shop		
g. Vet. diagnostic laboratory		

80. Dairy Extension intervention

	Peri-urban			Urban		
	Government	NGO	Private	Government	NGO	Private
a. Extension service suppliers						
b. Numbers of development agents in the study area						

81. Types of extension service supplied

Extension service	Yes	No
a. Regular visit		
b. Short training		
c. Field days		
d. Programmed training		
e. Organize self help team		

**Dairy credit service and market information**

82. Who are the dairy Credit suppliers in your area?

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83. Do you have access to credit last year to support your dairy operation?

- a. Yes (1) \_\_\_\_\_
- b. No (2) \_\_\_\_\_

84. If no would you consider borrowing to support in your dairy operation?

- a. Yes
- b. No I don't need

85. What you observe about the challenges of credit services

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86. From whom did you get dairy marketing information

	Rank
a. Livestock office extension channel (1)	
b. Public Media (2)	
c. Trade and market office (3)	
d. From neighbors (4)	
e. From retailers, collectors etc (5)	
f. No information at all (6)	

87. What is the Challenge regarding to market information in your operation?

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**Sources of Land and labor power for dairy**

88. What are the Sources of land for your dairy operation?
- a. Own(1) \_\_\_\_\_
  - b. Rent (2) \_\_\_\_\_
  - c. From government, MSE (medium and small enterprise) by contract (3) \_\_\_\_\_
  - d. Other, specify (4) \_\_\_\_\_
- 
89. What is the Effect of land shortage on dairy operation
- 
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90. Sources of professional dairy man power
- a. Private professionals (1) \_\_\_\_\_
  - b. Government professionals (2) \_\_\_\_\_
  - c. Both as available (3) \_\_\_\_\_
  - d. Other, specify (4) \_\_\_\_\_
91. labor source for dairy operation and management
- a. From family (1) \_\_\_\_\_
  - b. Hired from market (2) \_\_\_\_\_
  - c. Both in combination (3)
  - d. Others, specify (4) \_\_\_\_\_
- Dairy organization in the area**
92. Do any Dairy cooperatives exist in the area?
- a. Yes (1) \_\_\_\_\_
  - b. No (2) \_\_\_\_\_
  - c. Existed but no functional (3) \_\_\_\_\_
93. If no, do dairy cooperative is necessary for your dairy operation?
- a. Very important
  - b. Important
  - c. I don't know
  - d. Not necessary
94. Do Drug stockiest exist in the area?
- a. Yes (1) \_\_\_\_\_
  - b. No (2) \_\_\_\_\_