Reproductive and Productive Performances of Crossbred and Indigenous Dairy Cattle under Rural, peri-urban and Urban Dairy Farming Systems in West Shoa Zone, Oromia, Ethiopia

M.Sc. Thesis

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Jimma, Ethiopia

Reproductive and Productive Performance of Crossbred and Indigenous Dairy Cattle under Rural, peri-urban and Urban Dairy Farming SystemsIn West Shoa Zone, Oromia, Ethiopia

M.SC. THESIS

Submitted to the school of graduate study of jimma university college of agriculture and veterinary medicine in partial fulfillment of the requirement for the degree of master of science in agriculture (Animal Breeding and Genetics)

BY

MEGERSA ABERA AYANO

February , 2016

Jmma, Ethiopia

APPROVAL SHEET

Jimma University College of Agriculture and Veterinary Medicine

Thesis Submission Request Form (F-05)

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I have completed my thesis work as per the approved proposal and it has been evaluated and accepted by my advisors. Hence, I kindly request the Department to allow me to present the findings of my thesis and

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We, the undersigned, member of the Board of Examiners of the final open defense by **Megersa Abera** have read and evaluated his/her thesis entitled **"Reproductive and Productive performance of Crossbred and Indigenous Dairy Cattle under Rural, Peri-urban and Urban Dairy Farming System in West Shoa Zone, Oromia, Ethiopia "** and examined the candidate. This is therefore to certify that the thesis has been accepted in partial fulfillment of the requirements for the degree Master of Science in **Animal Breeding and Genetics.**

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STATEMENT OF THE AUTHOR

I hereby declare that this thesis is my bona fide work and that all sources of materials used for this thesis have been duly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for M.Sc. degree at Jmma University and is deposited at the University Library to be made available to borrowers under the 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 AND ACRONEME

AFC	Age at first calving
AFS	Age at first service
AI	Artificial insemination
AP	Advanced Placement Program
ARC	Agricultural research center,
CADU	Chilalo Agricultural Development Unit
CI	Calving interval
CSA	Central statistical agency
DDE	Dairy development enterprise
DA	Developmental Agents
DO	Day open
EARO	Ethiopian agricultural research organization
ESAP	Ethiopian Society of Animal Production
ETB	Ethiopian birr
FAO	Food and Agriculture Organization
Fig	Figure
IAEA	International Atomic energy Agency
ILCA	International Livestock canter for Africa
ILRI	International livestock research institute
IPS	International Project Service
LFRO	livestock and fish resource Office,
LIVES	Livestock and irrigation value chain for Ethiopian small holders

LIST OF ABBREVIATIONS AND ACRONEME (Continued)

MOA	Minister of agriculture
MOARD	Minister of Agriculture and Rural development
NAIC	National Artificial Insemination Centre
NARS	National Agricultural Research System
NGO	Nongovernmental organization
NMA	National Meteorology Agency
PA	Peasants association
RBs	Repeat breeders
SE	Standard error
SPDDPP	Selale Peasant Dairy Development Pilot Project
SPSS	Statistical Producer for social science
TLU	Total livestock unity
UN	United nation
VOCA	Voluntary organization cooperative agency
WADU	Wolaita Agricultural Development Project

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Reproductive and Productive Performances of Crossbred and Indigenous Dairy Cattle under Rural, peri-urban and Urban Dairy Farming Systems in West Shoa Zone, Oromia, Ethiopia

ABSTRACT

The aim of the study was to assess productive and reproductive performance of indigenous and their crossbred of different exotic blood level of dairy cows and factors affecting their performance in Rural, peri-urban and urban, farming system of West Shoa Zone, Oromia State, Ethiopia. A total of 180 small-scale dairy cows owners were purposively selected and interviewed with pre-tested structured questionnaire to obtain information. For Monitoring study from 180 farmers 40 Dairy farmers who have lactating cow by identifying exotic blood level of each crossbred animal (0%, <50%, 50-75% and >75% were purposively selected. Monitoring study was also conducted to obtain milk production based on, lactation stages production system and exotic blood level and parity of cows. The results of the study showed that from the follow-up study, the average daily milk yield for local, <50%, 50-75% and > 75% caws was 2.31L, 7.51L, 15.74L and 18.57L respectively. Daily milk yield of the cows found in monitoring study was support milk yield found in survey study. From the survey results, the overall average lactation length for indigenes and their crossbred of < 50%, 50-75% and > 75% was 8.23, 8.76, 10 and10.3 month respectively and average mean for crossbred was 9.69 months. The mean age at first service (Months) for local and their crossbred of < 50%, 50-75% and >75% was 43.44, 37.98, 21.88, 20.64 respectively and average for crossbred was 26.83, age at first calving (Months), for local and their crossbred of < 50%, 50-75% and > 75% was 52.35, 46.79, 31.27 and 29.56 respectively and the average for all crossbred was 35.87, Days open till conception (Days) for local and their crossbred of < 50%, 50-75% and > 75% was 216.9, 187.2, 90.82, 89.3 respectively and average for all crossbred was 122.4, Calving interval (Days) for local and their crossbred of <50%, 50-75% and >75% was 738.8, 466.8, 429.23 and 417.07 respectively and average for all crossbred was 417.8, and number of services per conception for local and their crossbred of < 50%, 50-75% and > 75% was 3.3, 3.13,1.8 and1.5 respectively and average for all crossbred was 2.14 , Longevity/replacement (year) for local and their crossbred of < 50%, 50-75% and >75% was 13.33, 11.96, 10.43 and 9.17 respectively and average for all crossbred was 10.52. There was observed that all exotic blood level of crossbredand indigenous animals are good performed under urban than peri-urban and rural setting. The present study showed that even if productive and reproductive performance of crossbred cows owned by rural, peri-urban and urban dairy producers in study area was comparatively good, it need to advance breeding strategy to assign right exotic blood level at right production system and also supply of improved genotypes and dairy inputs like (feed, health care and artificial insemination), proper breeding management in the study area suggested.

Key words: *Crossbred, Productive and Reproductive traits, Rural, Peri-urban, Urban, West Shoa Zone*

1. INTRODUCTION

Ethiopia is believed to has the largest livestock population in Africa. The subsector contributes about 16.5% of the national Gross Domestic Product (GDP) and 35.6% of the agricultural GDP (Metaferia et al. 2011). It also contributes 15% of export earnings and 30% of agricultural employment (Behnke 2010). The livestock subsector currently support and sustain livelihoods for 80% of all rural population. The GDP of livestock related activities valued at birr 59 billion (Metaferia et al. 2011). The total cattle population for the country is estimated to be about 54 million. Out of this the female cattle constitute 55.5 percent i.e 30 million and the remaining 44.51 percent, i.e 24.036 million are male cattle in number. It is estimated that 98.95 percent of the total cattle in the country are local breeds and remaining are hybrid and exotic breeds that accounted for 0.94 percent and 0.11 percent, respectively (CSA 2012/13). Despite the largest cattle population, reproductive and productive performance is very low. The country's per capita milk consumption is estimated to be about 19.2kg per year, which is far below the average per capita consumption of Africa, 37.2kg per year (FAO, 2000). Livestock productivity in Ethiopia is said to be poor due to a number of reasons among which, the low genetic capacity of the indigenous cattle for milk and meat production is a major one (Shiferaw *et al.,* 2003). In Ethiopia, the poor genetic potential for productive traits, substandard feeding, poor health care and management practices, are the main contributors to low productivity (Zegeye, 2003). Productive and reproductive traits are crucial factors determining the profitability of dairy production (Lobago *et al.,* 2007). In order to improve the low productivity of local cattle, selection as well as cross breeding of indigenous breed with high producing exotic cattle has been considered as a practical solution (Tadesse, 2002). Crossbreeding work in Ethiopia was initiated to cross indigenous zebu with Holstein-Friesian or Jersey cattle to improve milk production in the early 1950s (Aynalem *et al.,* 2011). Unfortunately the activities were not based on clearly defined breeding policy with regard to the level of exotic inheritance and the breed types to be used (Aynalem *et al.,* 2011). Although efforts were made at developing breeding program for various livestock species in the country, all did not materialize due to lack of commitment and consultation with various stakeholders (Aynalem *et al.,* 2011). 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). Given suitable government recognition, access to market and services, there is great potential for development of smallholder dairy scheme in peri-urban and urban areas (Stall and Shapiro 1996). Reproduction and productivity of crossbred's dairy cattle are believed to be higher than that of local zebu, but the performance status of different exotic blood level crossbred and local dairy cows in different farming system of Ethiopian highland both in production and reproductive traits a little understood. A number of researchs have been conducted to evaluate reproductive and productive performance of indigenous and crossbreds especially for different exotic blood levels crossbred of dairy cows under a relatively controlled condition at research centers, government owned farms and in some urban and peri-urban dairy areas of a country (Shiferaw *et al.,* 2003). However, there are a few of such works conducted in rural areas especially under the small holder dairy farming areas(Shiferaw *et al.,* 2003).

1.1. Statement of the Problem

Crossbred 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. 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).

1. A number of researchs have been conducted to evaluate reproductive and productive performance of indigenous and crossbreds especially for different exotic blood levels crossbred of dairy cows under a relatively controlled condition at research centers, government owned farms and in some urban and peri-urban dairy areas of a country.

2. In current study area reproduction and production performance of crossbred with different exotic blood level even for indigenous dairy cattle under small holder of rural, peri-urban and urban dairy production system is not well characterized.

3. Constraints on reproductive and production performance of crossbred with different exotic blood level and local dairy cattle under different production systems are not understood.

4. There is a requirement of detection the major challenges to expand crossbred dairy cattle and input delivery, milk and milk product marketing problem under current dairying system.

1.2. Objectives of the Study

I. General Objective

The general objective of this study was to provide baseline information and knowledge on best matching genotype to rural, peri urban and urban setting of highland of Ethiopia; as a basis for designing breeding and management strategy for better utilization of the crossbred genotype in small scale production system of the study area and the county at large.

II. Specific Objectives

1. To characterize reproductive and productive performance and determinancy factors that affect efficiency of different exotic blood level of crossbred and indigenous dairy cows based on smallholders response perception.

2. To evaluate milk production performance of different exotic blood level of crossbred and indigenous dairy cows by monitoring milk productions in selected Villages

3. To assess input delivery and processing and marketing of milk and milk products for rural, peri-urban and urban producers and develop recommendations

2. LITERATURE REVIEW

2.1. Historical Development in Crossbreeding and Crossbred Cattle in Ethiopia

Ethiopia received its first exotic cattle (Holstein Friesian and Brown Swiss) in the 1950's from the UN Relief and Rehabilitation Administration and since then started commercial liquid milk production on government stations (Ahmed *et al.,* 2004). Crossbreeding itself did not start until 1967/1968 when the Chilalo Agricultural Development Unit (CADU) was formed at Asela station. This project, established jointly by the Ethiopian and Swedish Governments, made the first steps in introducing crossbreeding at smallholder farm level (Kiwuwa *et al.*, 1983). After recognizing the genetic improvement possibilities, similar dairy-development programs were implemented in Ethiopia with assistances from international agencies (MOARD, 2007). The Wolaita Agricultural Development Project (WADU) that was established in 1971 and funded by the World Bank, applied the CADU program (Haile Mariam, 1994) followed this, Production of deep-frozen semen started at CADU in 1973. CADU in Assela, and WADU in Welaita, continued breeding and distributing crossbred dairy cows to farmers using the artificial insemination services available. In 1987, a Minister of Agriculture (MOA) started to improve dairy cattle productivity at the highlands of Ethiopia through the establishment of the Selale Peasant Dairy Development Pilot Project (SPDDPP). SPDDPP introduced crossbred dairy cattle and improved management skills with the objective to increase the living standard of smallholder farmers (Kelay, 2002). The focus of the program was on increasing the milk productivity of local breeds through crossbreeding and distribution of F_1 heifers to farmers' Ethiopian agricultural research organization (EARO1, 2001).

Since 1995, the Smallholder Dairy Development Project, SDDP, that were considered as the continuation of the pilot project with the same objectives but broader spectrum of activities operated in the different parts of the country. The project had been distributing crossbred dairy cows and purebred Friesian and Jersey breeding bulls and introduced improved methods of fodder production in the project areas (MOA, 1996). According to the 1999 SDDP report of the Oromia Regional Government, the project had distributed 167 in calf heifers and 58 breeding bulls to contact farmers at Selale area. Despite of all these trials, the numbers of crossbred cattle make only 1% of the total cattle population of Ethiopia (Workneh *et al.,* 2002).

Until the establishment of National Artificial Insemination Centre (NAIC) in 1981, organizations like, DDA (Dairy Development Authority) and CADU (Chilalo Agricultural Development Unit) /ARDU (Arsi Rural Development Unit) performed a total of 3924, 5800 and 64,887 inseminations, respectively by importing semen and liquid nitrogen. Later on bull stations and semen laboratory were constructed in Assella. Then national artificial insemination centre was established in 1981, with the mandate to serve at the country level. It is a government organization that makes this service available to rural, peri-urban, and urban areas through the regional offices throughout the country. The main objective of the support was to achieve an efficient and reliable artificial insemination service. Initially, service was based on production and use of fresh semen until the liquid nitrogen plant was installed in 1984. Bulls donated by the Cuban Government (25 Holstein and 10 Brahman) and importation of 44,800 doses of Friesian and 2,000 doses of Jersey semen were the source of semen used for frozen semen technology . To date, semen collection was based on exotic and indigenous, as well as crosses of these breeds, namely Friesian, Jersey, Brahman, Boran, Barka, Fogera, Horo, Sheko, and crosses of 50% and 75% Holstein-Friesian indigenous bulls. From the total semen produced, the major share is from Friesian (75.3%), followed by Jersey (10.5%). The NAIC at Kality, is serving as the main semen collection and preservation center; the satellite AI centres to be used for services, and then Holetta bull/dam farm, was the base for nucleus bull-producing, testing and rearing farm (Getachew and Gashaw, 2001). Later production of semen from crossbred animals (Friesian x Fogera, Friesian x Boran, Friesian x Barca, Friesian x Arsi) and from indigenous breeds (Barca, Borana and Fogera) were undertaken since then, from 1981 till 1999 a total of more than 300,000 semen doses were produced and distributed by NAIC. From 1984-2000 a total of 351,037 inseminations and 120,684 births of graded calves were recorded after the establishment of NAIC (NAIC, 1999).

So, crossbreeding has been started by the Institute of Agricultural Research, through the establishment of an on-station Dairy Cattle Crossbreeding Program, using Friesian, Jersey and Simmental sires that were crossed with the local Horro, Boran and Barka dams with the aim of testing the productivity of crossbred dairy cows with different levels of exotic blood

(EARO1, 2001). During the 1970's, governmental and non-governmental organizations have made various efforts to improve the dairy sector by establishing dairy cattle improvement ranches and distributing crossbred F1 heifers to smallholder farmers (EARO1, 2001; Kelay, 2002).

2.2. Land Holding with in Different Production Systems

Land is one of important resource in dairy farming. However due to population pressure and urbanization land size per house hold and communal grazing land has been decreasing. In the high land the number of population is more densely; as a result the ratio of farm size to household is small. According to report of (CSA, 2011), the average land size of the high land Ethiopian is 1.18 ha. Across the production system, Land holding higher in rural low land dairy production system, Moderate in rural high land system, but limited to small back yard in Urban Dairy system as Reported by Azage *et al. (*2013) study under taken in Metema and Mieso districts, Fogora and Bure and peri- Urban shashamene-Dilla milk shead and, Hawasa, Dilla Town and Yirgalem respectively there was a shortage of land reported in urban production system which underlines limitation of land to expand Dairy production in Urban Centers. Also the composition of livestock and preference of livestock species kept by farmers /agro pastoralist based on the agro-ecology, production systems and production objectives (ILCA, 1990)

2.3. Herd Size and Composition with in Systems Production Different

There is a variation in heard size and composition per house hold in different production systems, as reported by Ayenew *et al.* (2008), a larger number of cattle kept by crop-livestock farmers, like in Peri-Urban and Rural area, than by livestock farmers in urban area. The case of large heard size in peri- urban and in rural than in urban reported by Tesfaye *et al.* (2001) is stated that in rural area there is large number of oxen which provide draught power which is imperative for cultivation and reflects the importance of cropping in peri-urban and rural area.

Total number of crossbred cattle was lower in rural than Urban and peri-urban production system as reported from Bure by Azage *et al.* (2013) the proportion of crossbred cattle is very low in rural dairy production system, better in peri-urban and higher in urban dairy production system.

2.4. Reproduction and Production Performance of Dairy Cattle

2.4.1. Reproductive Performance

The reproductive performance of the breeding female is probably the most important factor that is a prerequisite for sustainable dairy production system and influencing herd/flock productivity on, all forms of output, milk, meat, traction, fuel as well as provision of replacement animals. Reproductive performance is influenced by feed, genetics, and diseases and a huge variety of management practices (ILCA, 1990; Perera, 1999).

Reproductive performance is one of the major factors other than milk production that affect productivity and profitability of a dairy herd. Reproductive performance is a biologically crucial phenomenon, which determines the efficiency of animal production. The production of milk and reproductive stock is not possible unless the cow reproduces. Poor reproductive performance is caused by failure of the cow to become pregnant primarily due to anoestrus (pre- pubertal or post-partum); failure of the cow to maintain the pregnancy; and calf losses (Mukasa-Mugrwa, 1989; Perera, 1999).This causes delays in age at first calving and long calving interval.

2.4.1.1. Age at First Calving (AFC)

First calving makes the beginning of a cow productive life and influences both the production and reproduction life of the female, directly through its effect on her life time calf crop and milk production and indirectly it is influence on the cost invested for up-bringing (Mukasa-Mugerwa, 1989) and it is influenced by the time of conception (Perera, 1999). Acceptable and optimum performance of age at first calving under improved small holder system in the tropics is less than 30 and 36 months, respectively (Perera, 1999). Heritability of age at first calving is generally low, indicating that this trait is highly influenced by environmental factors such as feed and health (Mukasa-Mugerwa, 1989).

In Ethiopia the productivity of the indigenous breed is low. Usually cows do not produce their first calve earlier than 35-53 months of age (Mukasa-Mugerwa and Azage 1991). Ages at first calving for local cows in the Oromia regional state were 52 months and for crossbreed were 31.06 months (Kurtu, 2004). Shorter age at first calving for crossbred than indigenes cow was reported by Mureda and Mekuraiw (2007), Ibrahim *et al*. (2011), and Lemma and Kebede (2011) and Dinka, (2012) who reported 36.2, 34.7,33.2, and 34.8 months, respectively, for crossbred cows of unknown exotic blood level in different part of Ethiopia.

2.4.1.2. Calving Interval (CI)

Calving interval refers to the period between two consecutive calving and is a function of a day's open and gestation length. Since gestation length is more or less constant for a given breed, the number of days open becomes the sole variable of calving interval. Long open periods, and hence the long calving intervals, generally reflects problems associated with management but may also given some indication of the condition of the cow's reproductive organ. Calving intervals have low heritability and can be improved through nutrition and early breeding (Mulugeta *et al.,* 1990).

In order to maintain optimum economic benefits under modern intensive dairy systems, it is generally accepted that the CI should be around one year. However, under many dairy systems in tropical countries a one-year CI is often difficult or impossible to achieve and, in some situation, even undesirable. In Ethiopia, zebu cattle raised under traditional management in the high lands, calving interval averaged 26 months (Perera, 1999). The overall calving interval of cows in Oromia region is 18.6 months. In pastoral and agro-pastoral areas shorter calving intervals of 15.5 months and 19 months respectively have been reported (Workneh and Rowland, 2004). In Zebu cattle, calving interval is estimated to range from 12 to 22months (Mukasa-Mugerwa, 1989).

The relative importances of factors that affect reproductive performance vary in the different smallholder farming systems. For instance, under extensive free grazing system nutritional fluctuation due to seasonal shortage cause delays in puberty and the post-partum cycle (Perera, 1999).

Calving interval was shorter in crossbred than indigenes under properly management of animals was practiced, as reported by Yifat *et al.* (2012) crossbreds of unknown exotic blood level have 622.6 days calving intervals in Tatesa Cattle Breeding Center and also another result was reported by, (Mulugeta and Belayneh 2013) and (*Belay et al.,2012*) in North Showa zone and Jimma Zone indicated that crossbreds of unknown exotic inheritance have calving interval of 660 and 640.8±3.84 days) respectively. On other hand Calving interval of crossbred born form indigenes cows with Holstein Frisian/HF with different exotic blood level of Ari XHF of 50%, 75% and 87.5% have Calving interval of 503, 464 and 525 days respectively and crossbred of Zebu XHF of 50%, 75% and 87.5% have Calving interval of 458, 475 and 525 days respectively (Gabriel et al.,1983). As well as crossbred of Borana XHF of 50%, 75% and 87.5% exotic blood level have Calving interval of 440, 471 and 493 days respectively and crossbred of Barca XHF of 50%, 75% and 87.5% have Calving interval of 415, 474 and 512 days respectively (Million and Tadelle,2003)

2.4.1.3. Daily Milk Yield

Indigenous breed of cows are generally considered low milk producers. However, they are the major source of milk in Ethiopia that account for 97 % of the total milk production in the country (Abaye *et al.,* 1991). Milk yield has remained extremely low with national average of 1.09 liter/day/cow (Dagenae and Adugna 1999). Similarly, Lemma *et al.* (2005) reported that the average milk yield of local Arsi cows was 1.0 liter/head/day. For Fogera cattle the overall average estimate lactation yield was 506.78 liters, which is very low due to poor genetic make- up and shortage of feed and poor management conditions (Mulugeta, 2005) and also shorter lactation length (Gebeyehu, 1999). Milk production per day per head is very low and this is further affected by relatively short lactation length and extended post-partum anoestrus resulting in low production efficiencies (Azage and Alemu 1997).

2.4.1.4. Lactation Length

According to CSA (1996), an average lactation length of cows in private holding ragged from 5-7months. Lemma (2005) however reported a longer lactation length of 9.5 months for local cows in the East Showa zone of Oromia. Study conducted in North Showa zone indicated that local breeds had (273.9 days) shorter lactation length than cross breeds (333.9 days) (Mulugeta and

Belayneh 2013). Lactation length of crossbred of different indigenes cows with Holstein Frisian/HF with different exotic blood level of Ari XHF of 50%, 75% and 87.5% have lactation length of 334, 408 and 411 days respectively and crossbred of Zebu X HF of 50%, 75% and 87.5% have lactation length of 378, 378 and 411 days respectively (Gabriel et al.,1983). As well as crossbred of Borana X HF of 50%, 75% and 87.5% have lactation length of 337, 351 and 355 days respectively (Aynalem *et al.*, 2011). Milk production per lactation of crossbred of different indigenes cows with Holstein Frisian/HF with different exotic blood level of Ari X HF of 50%, 75% and 87.5% have milk yield of 1741, 2374 and 2318 Liters respectively and crossbred of Zebu X HF of 50%, 75% and 87.5% have milk yeild of 2352, 2356 and 2318L respectively (Gabriel et al.,1983). As well as crossbred of Borana X HF of 50%, 75% and 87.5% have lactation length of 1740, 2044 and 1902L respectively (Million and Tadelle, 2003). As their statements as exotic blood level is increased all reproductive and productive trait performance of crossbred were increased until 75% exotic blood level and then it shows turn down.

2.5. Factors affecting Reproductive and Productive performance of Dairy cattle

2.5.1. Environment and Genotype Mismatch (GXE)

Reproductive efficiency of indigenous and crossbred dairy cattle is poor in most cattle production systems, mainly because cows either fail to become pregnant primarily due to management problems, shortage of feed and high prevalence rate of reproductive diseases as well as high calf mortality. Sensible year round feeding and herd health plan and adequate AI service are important to improve reproductive efficiency, and hence, economically benefit from the crossbred dairy enterprise (Gillah *et al.*, 2012).

Environmental stress and the challenge of high disease risk in cross breed cows contribute for late age at first calving and first service, high number of services per conception, and longer calving interval which are all the major areas of reproductive loss in cattle (Tegegne *et al.,* 1981; Albero, 1983 and Mukasa-Mugerewa, 1989). Use of crossbreds is also advised under suitable production system. Most likely, 50% crossbreds were more productive in low input production system than higher level of inheritance. This could be either due to complementary or heterosis effect. The idea also supported the level of management achievable under most smallholder conditions in Ethiopia which has been rather unfavorable to higher exotic inheritance levels than 50% inheritance (Aynalem *et al.,* 2009). Prearranged appropriate administration acknowledgment, access to promote and services, there is huge potential for advance of smallholder dairy system in peri-urban and urban areas (Stall and Shapiro 1996). Study conducted in North Showa zone indicated that local breeds had (273.9 days) shorter lactation length than cross breeds (333.9 days) (Mulugeta and Belayneh 2013).Development master plan also recommends crossbred cattle whose exotic blood level ranging 50 to 62.5% is recommended in avoiding the adaptation problems (EARO 2, 2001). As blood level increased, reduction in their performance was observed, for example, slim difference in milk production was observed between 50 and 75% crosses. Furthermore, mean milk production of 87.5% cross breed was lower than 75% cross breeds. Also longer calving interval was reported in 75 and 87.5% cross breeds respectively. Relatively longer calving interval might be indicative of Environmental factors (poor nutritional status, poor breeding management, diseases and poor management practices (Belay *et al.,* 2012)

2.5.2. Dairy Production Systems

Any breed improvement program should be designed in accordance with the production system. Since all the components of the environment cannot be changed, particularly in low-input tropical production systems needs to know which genotypes could be used under such environmental conditions, that is, different types of production environments need different types of animals. Based on management practices, marketing situations, Feed source and feeding system, heard type and size, land use type and objective of keeping animal, dairy production system s catagorzed in three production systems as follows.

2.5.2.1. Urban Dairy Production System

This system is developed in towns located in the different agro-ecology of Ethiopia. It comprises medium to large sized dairy farms which are capable of keeping improved dairy stock. Cattle are housed in improved shelters made of locally available materials (Desta, 2002). As farmers have limited access to farming or grazing land, they are often based exclusively on livestock under stall feeding conditions (Ayenew *et al.,* 2008). The main feed resources are agro-industrial by-products and purchased roughage. The primary objective of milk production is generating additional cash income (Ketema and Tsehay 1995; Aneteneh *et* *al.,* 2010 and Desta, 2002). This production system serves as the main milk supplier to the urban market (Ayenew *et al.,* 2008; Ahmed *et al.,* 2004). Milk is either sold to dairy cooperatives, on the local informal market or directly to consumers from the farmers' gates (Tegegne *et al.,* 2007).

2.5.2.2. Peri-Urban Dairy Production System

This system is located around major cities and towns. It comprises of small sized to medium dairy farms which are also capable of keeping improved and local dairy stock. Cattle are housed in improved shelters made of locally available materials (Desta, 2002). The farmers have small size of grazing land; they use semi-grazing systems and also practice under stall feeding conditions for improved animals (Ayenew *et al.,* 2008). The main feed resources are agro-industrial by-products, purchased roughage and in addition they use crop residue and pasture land. The primary objective of milk production is also generating additional cash income (Ketema and Tsehay 1995; Aneteneh *et al.,* 2010; Desta, 2002).

2.5.2.3. Rural Dairy production system

Most parts of the highlands are used for both crop and livestock production (mixed farming) within subsistence smallholder farming systems (Ketema and Tsehay 1995; Anteneh *et al.,* 2010). Livestock is mainly grazed on natural pastures of non-arable or fallow land between crop fields and additionally fed crop residues (Desta, 2002; et al., 2001). Improved concentrate feed accounts for only 0.25% (CSA, 2011). During wet season an increase of animal weight and milk production is achieved. There are two types of dairy systems in the highlands: the traditional and the market oriented system. The traditional system is based on indigenous breeds which have low production performance (Ketema and Tsehay 1995; Desta, 2002). The milk produced is mainly used for home consumption and feed requirements are entirely satisfied from native pasture, crop residues, stubble grazing or agricultural by-products (Falvey and Chantalakhana, 1999). The market oriented system is based on improved crossbred dairy cattle where milk is an important source of additional cash income (Ahmed *et al.,* 2003). Only a very small part of milk is used for processing and home consumption (Desta, 2002; Ketema and Tsehay, 1995). Farmers need to feed their cows additionally with concentrates and agro-industrial by-products such as brewery residues, wheat bran, oil seed cakes, mineral mixtures and molasses (SNV, 2008) and keep their cattle in improved shelters.

2.5.3. Choice of the Exotic Breed and Level of Exotic Inheritance

Literature reports strongly emphasized the need to utilize different breeds under varying production systems. For example, Jersey breed has been suggested as one suitable breed for low-input smallholder conditions because of having smaller body size, fair amount of milk with higher fat content, better reproductive performance and some heat tolerance. In intensive and semi-intensive production systems, however, the Holstein Friesian will remain the choice. This situation also applies to temperate climates (Aynalem *et al.,* 2011).

When designing breed improvement program, the level of exotic inheritance to be used in the crossbreds also needs to be decided. Milk production, reproduction performance and milk composition traits were all in favor of the 50% exotic cross (Aynalem *et al.,* 2011). Cunningham and Syrstad (1987) made an extensive analysis of results from crossbreeding in the tropics. They concluded that consistent improvements in most performance traits were achieved in 'upgrading' cattle to as much as 50% with temperate dairy breeds. Beyond that, results were variable. A general conclusion is that crossbreeding to produce animals with up to 50% of the genes from temperate breeds can be recommended where crossbreeding is an option for genetic improvement. Crosses with less than 50% B. Taurus genes have been found to be poor dairy animals (Syrstad 1989).

2.5.4. Poor Designing of Crossbreeding Program and Lack of cross Breeding Policy

Development of any genetic improvement strategy requires description of production environment, identifying the availability of infrastructure, setting appropriate breeding objective, selecting traits to be improved based on their influence on returns and costs to the producer and consideration of stockholders (Zewdu, 2004). Thus, designing a breeding program needs decision on a series of such interacting components (Dansh and Jean, 2011). Designing sustainable crossbreeding program is important components to getting better production and fertility from crossbred cattle. Crossbreeding has principally been applied in the tropics aimed to exploit breed complementarities. Specifically, specialized exotic breeds have been crossed with indigenous breeds to combine the high productivity of the former with adaptive attributes of the latter (Kahi, 2002). Exotic animals used in crossbreeding are not naturally adapted to local conditions, so large scale (beyond optimal exotic blood level) crossbreeding should be carried out with caution (FAO, 2009).

However, the current crossbreeding work in Ethiopia, unfortunately was not based on a clearly defined breeding policy with regard to the level of exotic inheritance and the breed type to be used. In general, in Ethiopia, crossbreeding is non-systematic and as an uncoordinated (ESAP, 2009).

2.5.5. Longevity

Longevity is one of the economically most important functional traits in dairy cattle populations. Even if so many definition given to the term longevity, in relation to reproduction and production performance dairy cattle it seems to length of productive life (Arthur *et al.,* 1992; Enyew *et al.,* 1999). The general goal of dairy farms is for cows to produce a maximum amount of milk per day of its life. As reported by keffena *et al.* (2013), the overall least squares mean ± s. e. for the entire lifespan of various crossbred dairy cows was 4036 ± 126.3 days, (about 11 years) and also reported 5.3 years for grade Borana cattle in Tanzania (Trail et al., 1985), the 6.02 years for crossbred cows in Ethiopia (Enyew et al 2000), 7.9 years for dairy cows in Cheffa farm in Ethiopia (Goshu, 2005). As reported by (Abebe, 2005), Study of disposal causes for some farm showed that 51.9% cows were sold at early age.

For a close observer, however, the entire lifespan of dairy cows is often partitioned in to two major time periods: (i) the costly period from birth to the first calving and; (ii) the following productive period from first calving to disposal from the herd. Productive life is usually defined as the total number of days that dairy cows stay in milking in their entire lifespan. In any dairy cattle production enterprise, the lengths of life of a dairy cow have substantial impact on economic performance. Arthur *et al.* (1992) reported that longer lifespan in dairy cows allows producers to be more selective in choosing replacement heifers because only a few have to be chosen each year. Higher longevity also reduces the cost of herd replacements, increases the number of animals available for marketing, and increases the proportion of the high-producing, mature animals in the breeding herd (Arthur *et al.,* 1992). Besides, longer average life will lead to a higher proportion of cows in later high-producing lactations and therefore, increase lifetime productivity of dairy cows. Research evidences (Larroque and Ducrocq, 2001; Zavadilova *et al.,* 2009) showed that type and linearly measured body traits as well as some of the dairy characters in dairy cattle poses negative influence on the length of productive life of a cow.

2.6. Major Challenges on Input and Input Delivery for Dairying

2.6.1. Feed Resources

To sustain dairy development regularly supplying dairy inputs like feed (concentrate feed, agro industrial by product, improved forage), quality and quantity of feed vary among varies production systems. Cattle largely depend on rangeland grazing or crop residues that are of poor nutritive value. Feed is not uniformly supplied and the quality is poor (Ibrahim and Ololaku, 2000). Seasonal fluctuation in the availability and quality of feed has been a common phenomenon, inflecting serious changed in livestock production (Alemayehu, 1998). The feed shortage mostly happens in dry season of the year (Ibrahim and Ololaku, 2000). In contrast, under normal circumstances in lowlands when there is sufficient feed for cow, milk tends to be adequate for home consumption as well as for market (Beruk and Tafesse, 2000). Since rainfall rather than livestock density determines net primary production and vegetation cover, its variability is the most important climatic factors determining the state of the natural resources base. Hence, rainfall variability and net primarily productivity of the vegetation correspondingly determines livestock production (Sere *et al.,* 1996). Using of improved forages and agro-industrial by products is minimal and most of agro industrial byproducts are concentrated in urban and peri-urban areas (Alemayehu, 2005). In adequate supply of quality feed is the major technical factors limiting the productivity of the dairy sector in Ethiopia.

2.6.2. Veterinary Service

Government veterinary staffs are few in number and cannot cover such a vast area to adequately address the veterinary needs of livestock keepers. Besides government staffs need adequate mobile facilities, for which currently the government does not have the capacity to provide (Tafesse, 2001). Animal health care and improved health management is also one of the major constraints of dairy development in Ethiopia, which caused poor performance across the production system. Many of the problems result from the interaction among the technical and non-technical constraints themselves. For instance, poorly fed animals have low disease resistance, fertility problems, partly because the animal health care system relays heavily on veterinary measures. Moreover, poor grazing management systems continue to cause high mortality and morbidity (e.g. internal parasites), many of the diseases constraints which effect supply are also a consequence of the non-technical constraints, for example, insufficient money to purchase drugs or vaccines (Ibrahim and Olaloku, 2002). Contact of livestock brought from varies localities through the use of communal pastures and watering as well as marketing places play an important role in the transmission of economically significant infectious and parasite diseases. Such livestock movements could be the cause of direct or indirect transmission of varies economically important livestock diseases (Zinash, 2004). The low veterinary service performance in the lowlands is the outcome of the government-monopolized services. Government veterinary staffs are few in number and can not cover such a vast area to adequately address the veterinary needs of livestock keepers. Besides government staffs need adequate mobile facilities, for which currently the government does not have the capacity to provide (Tafesse, 2001).

2.6.3. Lack of Improved Genotype

The livestock genetic resources of Ethiopia's have involved largely as a result of natural selection influenced by environmental factors. This has made the stock better addopted to to feed and water shortages, diseases challenges and harsh climates. However the capacity for the high level of production has remained low (IPS, 2000). The consequence of the low genetic potential of indigenous breed for productive traits makes total national milk production to be low (Mukasa-Mugerwa, 1989). The indigenous Zebu breed produces about 400-680 kg of milk/cow per lactation compared to grade animals that have the potential to produce 1120-2500 liters over 279 day lactation. In most of the highlands of Ethiopia, milk production per head is low as compared to the highlands of Kenya due to the wide adoption of upgrading the indigenous breeds through cross breeding (Perera, 1999).

2.6.4. Market Access

Dairy product marketing is limited by the distance of the market from producers, lack of transport facility, and seasonal variation in the volume of milk production which leads to seasonal fluctuation in prices. Enhancing the development of stallholder farmers to reach markets and engage them in marketing activities poses a pressing development challenge. Difficulty in market access restricts opportunities for income generation. Remoteness results in reduced farm gate prices increased input costs and lower returns to labor and capital. This in turn, reduces incentives to participate in economic transaction and results in subsistent rather than market oriented production systems (Ahmed *et al.,* 2003). In general, the development of improved marketing system is pivotal to increase production (Tsehay, 2002). Dairy marketing would generally contribute to the food security of poor households in the lowland areas from the direct effect of providing cash income and indirect effect of delaying sales of animals for some other crisis in the future (Coppock, 1994). The development of market infrastructure and market institution is also very important for inducing efficiency and incentives for market participants on the dairy value chain (Azage et al., 2010).

2.6.5. Artificial Insemination Service Facilities

Artificial Insemination (AI) technology has also led to one of the most successful smallholder dairy systems in the developing world (Stall et al., 2008). However, the use of AI has also failed in many situations in developing countries because of the lack of infrastructure and the costs involved, such as for transportation and liquid nitrogen for storage of semen or because the breeding program has not been designed to be sustainable (Mpofu and Rege, 2002; Philipsson et al., 2005; Azage et al., 1995).

Improper use of AI for crossbreeding indigenous cattle with exotics may be disastrous when information is needed to maintain the appropriate level of exotic genes in an environment for long-term strategy.

2.5.6 Lack of Organized Record Keeping System

The absence of coordinated systems for data collection and record keeping and the maintenance of databases for the livestock sector, including a mechanism for feedback and exchange among the stakeholders for development of livestock-related is a major constraint.

Such data recording, even on a limited scale, is critical for genetic improvement. Success in genetic improvement to a larger extent depends, among others, on accurate recording of the farm operations and periodic analysis of the data to design future plans and take corrective measures as appropriate (Aynalem et al 2011). Lack of record keeping and reporting by AI service providers and farmers has adversely affected national data analysis and decision making on progress and it is also highly believed to have increased the incidence of inbreeding in the country (Desalegn 2011)

2.7. Dairy product processing, Consumption and Marketing in Different Production System

Consumption of processed dairy products was observed even less frequently among the rural low-income households, indicating that the majority of the populations do not consume processed products (butter) to any substantial degree (Coppock, 1994; Lemma *et al.,* 2005). The limited consumption of butter may be due to the higher price associated with it and they need for cash income to buy some necessities. Butter is often consumed on holydays and special occasions in rural low-income households because it fetches routine cash income (Lemma *et al.,* 2005). Butter fetches a higher price compared to other milk products.

Marketing of milk in the rural areas of Harari region is mostly of traditional nature. There are also a number of informal milk traders, agents, retailers, and self-help (rural women milk delivery association) milk groups from the farmers that are involved in milk delivery channel. The differences in distance to different milk market places in the Harar milk shed affect the price of milk (Kurtu, 2004). Milk is transported to towns on foot, by donkey, by horse or by public transport, and commands a higher price there than when sold in the neighborhood (Siegefreid and Brhan, 1991).

In pastoral areas, the diet is based on fresh or sour milk and left over milk is poorly utilized. The herd size per household is large and hence there is great surplus of milk per person than in the highlands (Tsehay, 2002). Fluid milk production and consumption is limited by seasonal variations and lead to fluctuate in price (IPS, 2000). Milk in the lowlands is primarily used as fresh whole milk for consumption. Surplus milk during the rainy season is fermented and processed in to butter (Siegefreid and Brhan, 1991; Getachew, 2003). When milk supply exceeds daily household demand during and soon after extended rainy periods, secondary products such as butter or long term fermented milk are most likely to be produced for home consumption and for marketing (Coppock, 1994).

2.8. Advantage of Crossbred Dairy cattle in Dairy Development

2.8.1. Having Better Productivity

Well-designed crossbreeding programs may lead to exploit desirable characteristics of the breeds or strains involved, and to take advantage of heterosis for traits of economic relevance (López-Villalobos, 1998). Milk productivity in Ethiopia is low; the indigenous zebu breed produces about 400-680 kg of milk/cow per lactation period compared to grade animals that have the potential to produce 1,120-2,500 liters over 279-day lactation. Moreover, mating of different genotypes increases efficiency in animals, and the improvement of reproductive and fitness traits such as fertility, survival, and calving ease, seems to be an important aspect for implementing crossbreeding in dairy cows (Heins *et al.,* 2006a, b), together with an achievable economic advantage in milk pricing systems where fat and protein are rewarded (Weigel and Barlass, 2003). Crossbreeding has been widely used in order to combine the high milk yield potential of exotic breeds with the adaptability of the local ones. Crossbreeding of Boss taurus dairy breeds with local Boss induces cattle is a well-documented strategy to enhance milk production in the tropics (Cunningham and Syrstad, 1987). Another study conducted in North Showa zone indicates that 50% cross breeds (1511.5 L) produce more amount of milk than local breeds (457.89 L) per lactation (Mulugeta and Belayneh, 2013). Belay *et al.* (2012) reported that mean milk production per lactation between Horro and Holstein Friesian was 2333.63 L. This could be either due to complementary or heterosis effect to the achievable environment. Crossbreeding was and still is perceived as "the way forward" to improve productivity of indigenous livestock under smallholder conditions (ILRI, 1999).

2.8.2. Lower Calving Interval

Calving interval is a time elapsed between two consecutive successive parturitions. Average calving interval of indigenous cattle breeds and their 50% crosses were 431.5 and 429 days respectively. Likewise, Yifat *et al.* (2012) reported that cross breeds have slightly shorter calving intervals than indigenous (622.6 days). Another study supporting this verdict reported in North Showa zone indicated that indigenous breeds have larger calving interval (748.2 day) than crossbreds (660 day) (Mulugeta and Belayneh, 2013). However, in contradiction of the expectation, shorter calving interval in higher inheritance level with accurate management, but longer calving interval was reported in 75 and 87.5% cross breeds respectively. Relatively longer calving interval might be indicative of poor nutritional status, poor breeding management, lack of own bull and artificial insemination service, longer days open, diseases and poor management practices (Belay *et al.,* 2012).

In order to maintain optimum economic benefits under modern intensive dairy systems, it is generally accepted that the CI should be around one year. However, under many dairy systems in tropical countries a one-year CI is often difficult or impossible to achieve and, in some situation, even undesirable. In Ethiopia, zebu cattle raised under traditional management in the highlands, calving interval averaged 26 months (Perera, 1999). The overall calving interval of cows in Oromia region is 18.6 months. In pastoral and agro-pastoral areas shorter calving intervals of 15.5 months than 19 months, respectively have been reported (Workneh and Rowland, 2004). In Zebu cattle, calving interval is estimated to range from 12 to 22 months with annual calving rate of 50-60% (Mukasa-Mugerwa, 1989).

2.8.2. Longer Lactation Length

Lactation length of indigenous cattle increased in correspondence of exotic blood level. For example, the average lactation length of indigenous Arsi, Zebu and Boran breeds was 203.75 days while the average lactation length of their 50, 75 and 87.5% cross were 262.25, 284.25, and 294.25 days respectively. Similarly, another study conducted in North Showa zone indicated that local breeds (273.9 days) had shorter lactation length than cross breeds (333.9 days) (Mulugeta and Belayneh, 2013). Even though there was an increment trend in lactation length as blood level increased, they could not reach generally accepted 305 days of lactation length for crossbred. This might be due to the reason of poor nutritional status, poor breeding management, diseases and poor management practices (Belay *et al.,* 2012). Another author also support this idea in which, level of management achievable in Ethiopia is unfavorable to higher exotic inheritance levels than 50% Holstein Friesian inheritance (Aynalem *et al.,* 2009).

3. MATERIALS AND METHODS

3.1. Description of West Shoa Zone

The participants in this study are located in two Districts (Adaberga and Ejere) of West shoa Zone of the Oromia Regional State Ethiopia. The area lies on an elevated plateau ranging from 1000 to 3500' above sea level, where the largest area lies between 2000 and 2500 above sea level. In West shoa Zone the average annual temperature ranges from 11^{o}C and 21^{o}C. Three seasons can be differentiated; the short rainy period (February to May) which receives an average of 91 mm of precipitation/month, the main rainy period (July to October) with 113 mm rainfall/month and the dry period (November to January) with 39 mm of rainfall/ month. June is considered as transition phase between the two rainy seasons with slightly lower rainfall (NMA, 2012).

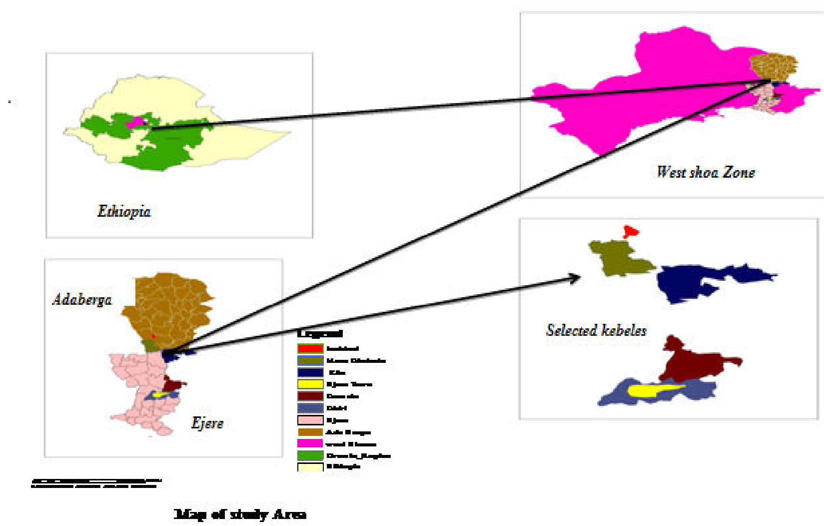

Figure 1: Map and location of West shoa Zone and selected Districts

The Zone is located at 120 km to west from Addis Ababa and found in milk shed are as regional and national. There are three main drainage basins in West shoa zone: Abay, Ghibe and Awash. In addition there is high potential for ground water and smaller rivers like Berga and Abay river basin, the largest basin, covers the majority of the districts in the zone (LIVES, 2012)

3.2. Description of Districts

This study was conducted in Oromia Regional State, West shoa Zone of Adaberga and Ejere Districts. Those two districts were purposively selected for this study based on operation in different dairy production system, potential for dairy production and also existence of crossbred dairy cattle beneficiary in the last long years.

3.2.1 Adaberga District

It is located at a distance of 60 km, West of Addis Ababa. Its capital city is Hinchini. It is situated at an altitude ranging from 1,166 to 3,238 meters above sea level and with an estimated area of 131.12 km ^{2}. The area receives an average annual rainfall ranging from about 887 to 1,194mm. The average minimum and maximum daily temperatures of the area are 11 and 21^{o}C, respectively. The livestock potential of the district is cattle, sheep, and poultry and equines, goats. Concerning livestock production the district consists of 46541 local dairy cattle of whicht 3964 were crossbred dairy cattle, 57,511 sheep and 43,574 goats. The Woreda is highly potential for dairy production and the three dairy production systems (rural, peri-urban and urban) are practiced in area. The major crops grown in the district are wheat, barley, pea, maize, sorghum and minor crop like teff is produced. This district has an estimated total human population of 120,654 out of those 60,288 were females and 60,366 are males (LIVES, 2012)

3.2.2. Ejere District

It is located at a distance of 45 km, West of Addis Ababa. Its capital city is called Ejere. It is situated at an altitude ranging from 2,631 to 3,238 meters above sea level and with an estimated area of 192.78S km^{2}. The area receives an average annual rainfall ranging from about 1,107 to 1,194mm. The average minimum and maximum daily temperatures of the area are 11 and 14^{o}C, respectively. The livestock potential of the Woreda is cattle, sheep, poultry, equines and goats. Concerning livestock production the woreda consists of 20154 dairy cattle, of which crossbred dairy cattle count 4436 number, 41,368 sheep and 10,197 goats and The district is highly potential for dairy production as well as three dairy production systems (rural, peri-urban and urban) are practiced in district. The major crops grown in the district are wheat, barley, pea, maize, sorghum and minor crop like teff is produced. In addition to these irrigated vegetables: potato, onion, garlic and cabbage also produced in the area. This district has an estimated total population of 86,934 of whom 42,712were females and 44,222 were males (LIVES, 2012).

3.3. Production Systems of the Study Areas

Based on management practices, marketing situations, feed source and feeding system, heard type and size , land use type and objective of keeping animal, with in the study areas. Three dairy production systems were identified as (Tsehay, Redda et al., 2000). The following dairy production systems were taken as the sampling frame for this study.

Generally identified three production system in current study area somewhat similar with report of, Tsehay, (2002) state that milk production system can be broadly categorized in to three systems, based on marketing situations, such as urban, peri-urban and rural milk production system; however in current identification more based on management system of dairy animal.

3.3.1. Urban Dairy Production System

The main objectives of dairy farmers in urban dairy production is to sell theiry milk and getting income. All farms found in intra-towns in both Adaberga and Ejere do not have access to grazing land. Hence, mainly depend on purchased hay and agro-industrial by-products. Hay was purchased immediately after the end of rainy season and stored in hay shed for feeding throughout the year. Also locally prepared concentrate feeds and milling factories, pulse hulls and corn were given to animals. Urban farms were also using concentrates since they become conscious about the advantage of using concentrate feeds for increased milk yield and they use pipe water for their animals. Negusie (2006) who reported that the reason for dependence of almost all of the urban farms on hay which was has no quality and less access to other feeds like natural pasture, improved forages and other crop residues due to less land they can’t develop iproved forage.

3.3.2. Peri-Urban Dairy Production system

This system was identified around town and they access to infrastructure than the rurals farmers, they supply their milk to milk union easily. They have small sized dairy farms and are also capable of keeping improved and local dairy stock. Cattle are housed in improved shelters. They access to small size of grazing land; they use semi-grazing systems and also practice under stall feeding conditions for improved animals. The main feed resources for their crossbred animal were agro-industrial by-products and purchased concentrate feed and roughage. The primary objective of milk production is generating additional cash income.

3.3.3. Rural Dairy Production System

Under the rural production system two type of dairy farming has been practiced, which are

3.3.3.1 Traditional Dairy production system.

It is based on indigenous breeds which have low production performance is similar to report of Desta, (2002). The milk produced is mainly used for home consumption and feed requirements are entirely satisfied from native pasture, crop residues, stubble grazing or agricultural by-products.

3.3.3.2 Market Orented Dairy production system.

It is based on improved crossbred dairy cattle where milk is an important source of cash income. This is similar to report of Ahmed *et al.* (2003). In addition to pasture and other crop residues; farmers need to feed their cows concentrates and agro-industrial by-products such as brewery residues, wheat bran, oil seed cakes and molasses which similar to SNV (2008) and keep their crossbred dairy cattle in improved shelters.

Based on management practices, marketing situations, feed source and feeding system, herd type and size, and objective of keeping animal, and location with in the study areas production systems are characterized as Table 1 blow.

Table 1 Mechanisms used to characterize production systems of study area

Differentiate factors	Dairy production systems		
	Rural	Peri-urban	Urban
Location	Far from twon	Surronding the twon	With in twon
Management practices	Extensive	Semi-intensive	Intensive
Marketing situations	Not acess as much	Acess to market than rural	Acess to market
Feed source	Mainly pusture from pasture land	From pasture land and purchased feed	Purchased feed
Feeding system	Mainly grazing by own self	Semi-grazing	Zero grazing
Herd type	Local and crossbred of lower exotic blood leve	Local and crossbred of low-high exotic blood level	Crossbred of higher exotic blood level
Herd size	Larger herd size	Medium herd size	Lower herd size
Land size	Larger land size	Medium land size	Lower-neglageble land size
Objective of keeping animal	For mult purpose	For mult purpose and specific objective	For specific objective
Milk production	To process and home consumption	To home consumption and selling	To sell

Characterization of the production system is taken from Tsehay, Redda et al., (2000)

3.4. Sampling method and data collection for survey study

To get information on reproduction and production of crossbred with different exotic blood level and indigenous dairy cow's Primary data and secondary data have been used.

Secondary data like Certificate given for crossbred animal from ranch or research center

Exotic blood level of sire/ bull from AI center were used

Primary data have been collected using by questioner on age at puberty, age at first calving, days open, calving interval, lactation length and, daily milk yield and for socio economic analysis, all house hold character data and input deliver data also have been collected during survey questioner.

3.4.1. Sampling Method for Survey Study

From West Shoa Zone two Districts (*Adaberga* and *Ejere*) and three peasants association /PA were selected. From each district totally six PA namely *(Damotu, Chiri, Ejere Twon) from Ejere and, (Maru chobot, Kitto and Inchini Town)* from Adaberga were purposively selected based on their crossbred dairy cattle population, ease of access and other characteristics of herd management. In addition, selection of PA also depend on dairy production system which was from rural *(Damotu* and *Kitto),* from peri-Urban *(Chiri and Maru chobot)* and from Urban *(Ejere and Hinchini* Town*)* were purposively selected.

Hence, a total of crossbred beneficiary sample sizes included in the study are determined according to the formula given by Arsham (2002) who state that to have some notion of the sample size, for example for SE to be 0.01 (i.e. 1%), a sample size of 2500 will be needed; 2%, 625; 3%, 278; 4%, 156, 5%, 100. Note, incidentally, that as long as the sample is a small fraction of the total population, the actual size of the population is entirely irrelevant for the purposes of this calculation.

$\mathbf{N=0.25/SE^2}$ Where, N= Sample size, SE= Standard error

Therefore, using the standard error of 0.0373% with 95% confidence level, the total number of household sampled were 180; crossbred and indigenous dairy cow owners under smallholder condition were selected by purposive selection procedure and addressed. The numbers of respondents (farmers) per single selected *kebele* are determined by proportionate sampling technique as follow

$$W= [A/B] \times N_o,$$

Where W= Sample of farmers determined per single selected kebele

A=Total number of households (farmers) living per a single selected *kebele*

B= Total sum of households living in all selected sample *kebeles* and

N_o = the total required calculated sample size (https://books.google.com.et/booksisbn)

According to *kebele's* livestock development agent (DA) documentation, the total number of households having dairy cattle living in each selected *kebele of (Damotu, Chiri, Ejere Twon, Maru chobot, Kitto and Inchini Town)* are 1156, 789, 761, 930, 507 and 930 respectively and a total sum of households living in all selected sampled *kebeles* are 5073 out of that about 3861 have crossbred animals. Accordingly 41, 28, 27, 33, 18, 33 are selected respectively from each *kebeles*. Total of 180 households about 59 household from rural, 61 from Peri-Urban and 60 from Urban production systems were selected. In this sampling technique one farmers represent one dairy cow and from the total in proportion to total population about 43 house hold for local animal, 137 for crossbred of different exotic blood level were 42, 44 and 51 for < 50%, 50-75% and >75% respectively selected.

3.4.2. Data Collection Method from Survey Study

From both districts the study was based on smallholder farms mainly found in rural, peri-urban and urban areas. Surveyed farmers had to have dairy cattle before they started crossbreeding and a minimum of five to ten years experience with crossbreeding to be included in sample. The establishment of these criteria was necessary to receive information on differences in management and pereferiance of both local and crossbred cattle. A simple random sampling formal survey technique was used to obtain data on the productive and reproductive performance of locals and crossbred dairy cows and constraints associated to dairy cattle performance from respondents. It allowed gathering of information about farmers' perceptions of their farming practices, livelihoods and their real opinion about the production and reproduction performances of indigenous and crossbred cows (low and high grade crosses) where they have been beneficiaries in their own production system. Data was collected during interviews with household heads using a detailed, pre-tested questionnaire, which was previously developed and checked for clarity of the questions prior the interview and respondents were briefed to the objective of the study. For this study the questionnaire was adapted according to prevailing circumstances before data collection.

The survey included closed and open questions allowing multiple responses in some cases. Data was collected on farming system characteristics, sources and availability of crossbred and exotic blood level of crossbred animal handled by farmers, impacts of crossbreeding and management strategies in dairy cattle husbandry (feeding, watering, housing, AI and health care), breeding practices, market access and breeds performance and also performance and reproductive and production performance of different exotic blood level of crossbred),(age at first service , age at first calving, days open, calving interval, Number of services per conception, Daily Milk production, Milk production per lactation, Lactation length, Longevity and milk to be churn to get one kg of butter from local and crossbred of different exotic blood level). Those data carefully taken from the dairy cow owners by motivating them to recall the age at which his heifers or cows become show the listed parameters. In addition to that households' family size, level of education, land use pattern, herd size, blood level preference of dam or sire which used for breeding, availability of crossbred heifer, sire, kind of exotic breed used, area coverage of the breeding services (artificial insemination /AI or bull service) and extension service and parity of the dam was collected. The interviews data were collected by 6 (six) enumerators who are irtificial insemination/AI technician and developmental agents/DA from *Worede's* Livestock and Fishery Resource Office; which was conducted in regional language (*Afaan Oromo*) and translated into English. Field work was conducted from mid February 2015 to mid September 2015

3.5. Sampling Method and Data Collection for Monitoring Study

For follow-up study, from the total 180 household, first 40 households that have lactating crossbred or indigenous cows were identified and 30 for crossbred (with different exotic blood level ((1-3)<50%, 50-75% and >75% of crossbred) and 10 for local dairy cows. Whenever the exotic blood level of crossbred animal was identified by looking its certificate that given from the source of crossbred cows/heifers (ranch or agricultural research center and also in some case it can obtained from ear tag of an animal) and asking the bull and dam type it born from.

Table 2 Mechanisms used to identify exotic blood level of crossbred cows/heifers

Probability of Dam exotic blood level certified from source and supplied for farmers	Probability of Sir/bull exotic blood level at AI /natural service				
	50%	62.5%	75%	87.5%	100%
	Estimated Offspring exotic blood level				
0%(Local)	25%	31.25%	37.5%	43.75%	50%
25%	37.5%	43.75%	50%	56.25%	62.5%
50%	50%	56.25%	62.5%	68.75%	75%
62.5%	56.25%	62.25%	68.75%	75%	81.25%
75%	62.5%	68.75%	75%	81.25%	87.5%
87.5%	68.75%	75%	81.25%	87.5%	93.75%
100%	75%	81.25%	87.5%	93.75%	100%

To identify the exotic blood level of cow or heifers that do not have certificate and for the cow/heifers born in herd of farmers, first awareness have been given to farmers as listed in table above; how to determine probability of exotic inheritance of the dam and bull line that gave birth and service respectively; after that determining exotic blood level of current cow/ heifers easily occurred.

Based on these data, lactating cows were stratified into early (1–2 months), mid (3–4 months), and late (> 5 months) stages of lactation, for both crossbred and indigenous dairy cattle. This is line with Kedija Husen, (2007) who stratified cows into early (1–2 months), mid (3–4 months), and late (5–6 months) stages of lactation. A follow-up study was conducted to obtain information on milk yield of cows based on lactation stages, exotic blood level and parity. During that the amount of milk production produced by sampled crossbred and local dairy cows (n = 40) was recorded. Daily cow milk yield (morning and evening) was measured by using calibrated plastic jog (capacity 1 liters) once a week (test day (thursday)) for a period of 6 (six) month from the total 40 dairy cows. In case of crossbred daily milk yield was measured from each exotic blood level of (< 50%, 50-75% and >75% crossbred). The objective of using these criteria was to receive information on differences in milk yield performance of both indigenes and crossbred of different exotic blood level cattle across the defined production systems for comparing

3.6. Data-Analysis for Survey Study

The data was subjected to statistical analysis using Statistical Package for Social Sciences (SPSS) software, version 16.0 (SPSS, 2003). Descriptive statistics such as means, frequency distribution and percentages were used. Furthermore, Turky was used to examine differences between levels of significance of milk yield between lactation stages, breed, and/or different exotic blood level of crossbred and production system. For quantitative data procedure means was used to compute minimum, maximum and means in the general linear model (GLM) used to compute least square means (LSM) were used. Statistical significance between variables was examined using P-values at critical probability of $P<0.05$ and for rank case Index calculation was used.

The following linear models have been used during analysis of quantitative survey data**:**

Model statement regarding the effect of different fixed effects on various performances parameters of crossbred and indigenous dairy cows

$Y_{ijk} = \mu + m_i + b_j + \varepsilon_{ijk}$ Where

Y_{ij} is the cows' performance parameters estimate for cow i in rural, peri-urban urban area of j and each exotic blood level of k

μ is the overall mean,

m_i is fixed effect of production system that affects performance of cows (i= rural, peri urban and Urban)and

b_j= is fixed effect of exotic blood levels that affects performance of cows (l= 0%, <50%, 50-75% and > 75% e) and

ε_{ijk} = is the residual error.

3.7. Data-analysis for monitoring study

Monitoring data was also subjected to statistical analysis using Statistical Package for Social Sciences (SPSS) software, version 16.0 (SPSS 2003). To analyze continuous monitoring data procedure means were used to compute minimum, maximum and means, and the general linear model (GLM) to compute least square means (LSM) were used. To examine Milk production significance differences between different stage of lactation, parity, Exotic blood level and production system at critical probability of P<0.05 was used.

To analyze monitoring data of cows' milk productivity, the following Model statement about the effect of different fixed factors on cow's milk production was used

$Y_{ijsc} = \mu + m_i + l_j + k_s + p_c + \varepsilon_{ijk}$ Where

Y_{ijsc}= the amount of cow's milk products by ith breed in the jth production system at sth lactation stage and cth parity

μ = the overall mean,

m_i = the fixed effect of exotic breed blood level (i=0%, <50%, 50-75% and >75%),

l_j = fixed effect of production system of the area (j= rural, peri-urban and urban)

k_s = fixed effect of lactation stage (s= early, mid and late)

P_c = parity of the cows (c= parity 1-5)

ε_{ijk} = the residual error.

4. RESULTSAND DISCUSSION

4.1. Result of Households survey study

4.1.1. Household Description

In this study there was a significant ($p<0.05$) difference in family size among production system (Table 3**).** The mean family size in the studied household was 6.21±.16, which is higher than the mean house hold size of 4.9 person in rural Ethiopia (CSA, 2011). Family size was significantly ($p<0.001$) higher in rural and peri-urban than in urban production system. Female headed household (24.4%) was lower than male headed household (75.6%).

Table: 3. Mean values of total household size, sex of household head and educational status across the production system

Production system	Household size			Household head sex		Educational status of household head			
	N	Mean ± SE	P-value	Male (N)	Female (N)	Illiterate (N) (%)	Primary school (N) (%)	High school (N) (%)	College/ University (N) (%)
Rural	59	7.00±.28		55	4	(17)(19.4)	(37)(20.6)	(4) (2.2)	(1)(0.6)
Peri-urban	61	6.50±.28		38	23	(27) (15)	(26)(14.4)	(7) (3.9)	(1)(.6)
Urban	60	5.15±.28		43	44	(10)(5.6)	(37)(20.6)	(10) (5.6)	(3)(1.7)
Total	180	6.21±.16	0.000	136 75.6%	44 24.4%	(54) (30)	(100) (55)	(21)(11.7)	(5)(2.8)

N= number of farmers, SE= standard error

Educational levels of total household heads was about 55% can read and write and 11.7% and 2.8% have been educated high school and higher institute education respectively, were as only about 30%m were illiterate. This would indicate that the crossbreed cattle owners are having high correlation to adopting new technologies of dairy animal management. The mean age of household heads 42.5 years; range from 25 to 62 years. This show as most farmers at the productive age and can actively manage their own dairy cows.

4.1.2. Farm Size across The Production System

Table 4. Respondents farm size in hectares (ha) across production system of the study area.

Land use type	Production system			P-Value
	Rural(n=59)	Peri-Urban(n=61)	Urban(n=60)	
Crop own land	1.908 ±.127	1.914±.125	.153±.126	.000
Crop land rented in	.943±.111	.676±.109	.485±.110	.014
Grazing/ forage land owned	.913±.072	.776±.070	.092±.071	.000
Grazing/forage land rented in	.436±.066	.305±.065	.150±.066	.010
Irrigated own land	.111±.032	.212±.032	.017±.032	.000
Total farm size	4.363±.210	3.865±.207	.89±.208	.000

Average total farm size across production system of the study area is 3.038±.208 ha. Which were larger than the Ethiopian average of farm size 1.18 ha (CSA, 2011). Mean values for farm sizes in each production systems listed in (Table 4). The average mean farm size in rural (4.363 ha.) and peri-urban (3.865 ha.) area was significantly ($p<0.05$) higher than in urban (0.89) area as expected. As the result in urban area most dairy farmers buying animal feed from other areas and used zero grazing system rather than free grazing on garden but in rural and peri-urban production systems farmers release their local and lower exotic inheritance cows to free grazing also they practice stall feeding for higher exotic inheritance.

4.1.3. Participation of Household Members in Dairy Activities

Household participation in dairy management is important in improving dairy animal handling.

Table 5. Participation of household members in dairying activities

Household members	Milk processing		Transporting milk to market		Milking		Processing on Farm		Breeding decision	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Head	0	0	26	14.4	12	6.7	75	41.7	171	95
Spouse	134	74.4	14	7.8	140	78	27	15.0	7	3.5
Children	26	14.4	92	52.1	12	6.7	31	17.2	2	1.1
Workers	20	11.1	48	26.7	16	8.9	47	26.1	0	0
Total	180	100	180	100	180	100	180	100	180	100

Freq.= frequency

From the result, milking is almost the responsibility of female or male spouse (77.8%) and involved by other household members when there is large number of lactating cows. Processing on farm (fodder harvest, feeding) is mainly done by all family members. Children are in charge of transport of milk to cooperative or nearest market (52.1%), but it also done by other family members when the children are at school. In some cases in urban area dairy products (most of) were picked up by customers from the producer’s gate. Processing of milk is often considered as woman’s work that is why female spouses and daughters (88.8%) of respondents are mainly responsible for processing activities. Breeding decisions are mainly made by male heads (95%), in some occasions in consultation with spouse, seldom with children. Generally the distribution of dairy cattle management activities among household members and hired laborers is in agreement with findings by Anteneh *et al.,* (2010). However transport of milk to milk cooperatives or nearest markets was usually the responsibility of children which disagree with results reported by Aneteneh *et al.* (2010) who found that mainly adult males and females were responsible for this activity. The difference may be due to nearness of milk collection cooperative to house of dairy farmers.

4.1.4. Cattle Herd size and Composition

In this study the predominant breed of cattle owned by farmers in all production systems farmers owned high land zebu population which are non- descriptive local cattle.

Table 6. Cattle herd size and composition across production system

	Rural		Peri-Urban		Urban	
Cattle breed and type	Mean	%	Mean	%	Mean	%
Total herd size	**11.67**	**34**	**12.72**	**36.2**	**9.88**	**30.4**
No. Local cattle	**7.2**	**32.2**	**7.33**	**37.9**	**4**	**24.8**
Male calves	0.55	31.7	0.77	44.2	0.42	24
Female calves	0.23	23.0	0.42	41	0.37	36.1
Heifers	0.72	48.3	0.55	37.1	0.22	14.6
Bulls	0.78	42.7	0.67	36.4	0.38	20.9
Oxen	3	39.4	2.6	34.1	2.02	26.5
Cows	1.82	35.7	2.02	39.7	1.25	24.6
No. of crossbred	**4.47**	**29.7**	**5.15**	**34.4**	**5.4**	**36.0**
Male calves	0.45	24.1	0.85	45.5	0.57	30.4
Female calves	0.65	28.3	0.67	29	0.98	42.8
Heifers	0.9	28.7	1.13	36.2	1.1	35.5
Bulls	0.45	45.8	0.13	13.6	0.4	40.7
Oxen	0.13	44.4	0.03	11.1	0.13	44.4
Cows	1.73	29.8	2	35.8	2	30.4

As shown in Table 6 across the production system large number of total cattle comprise 36.2%, and 34% of the herd in peri-urban and rural production system respectively than in urban 30%. Higher number of cattle in peri-urban and rural were from the higher proportion of local cattle in the herds. This result could be connected to the larger farm sizes occurring within this region and considerable number of oxen present compared to the urban area. These results are comparable with Ayenew *et al*. (2008) who reported a larger number of cattle kept by crop-livestock farmers, like in peri-urban and rural area, than by livestock farmers in urban area.

Total number (%) of crossbred cattle was lower in rural than urban and peri-urban production system. This is in harmony with fiding in rural Bure by Azage *et al.* (2013) who stated that the proportion of crossbred cattle is very low in rural dairy production system, better in peri-urban and higher in urban dairy production system.

4.1.5. Crossbred Genotype Composition

The majority of crossbred cows in production system had 50% to 75% of exotic blood. Across the production system crossbred genotypes of cattle owned by respondents are described in table 7 blow.

Table 7. Genotype composition of crossbred cattle across the production system

Exotic blood level %		Rural		Peri-Urban		Urban		Total	
		Mean	%	Mean	%	Mean	%	Mean	%
Cow	<50	.33	55.6	.13	22.2	.13	22.2	.19	100
	50-75	.58	20.8	1.23	44	.98	35.2	.93	100
	>75	.77	27.7	.78	28.3	1.22	44	.92	100
Heifer	<50	.22	86.7	0	0	0	0	.07	100
	50-75	.25	20	.63	50.7	.37	29.3	.42	100
	>75	.6	30.8	.48	24.8	.87	44.4	.65	100
Bull	<50	.03	50	.03	50	0	0	.02	100
	50-75	.15	36	.2	48	.07	16	.14	100
	>75	.12	50	.08	35.7	.03	14.3	.08	100
Oxen	<50	.02	50	0	0	.02	50	.01	100
	50-75	.03	22.2	.1	66.7	0.2	11.1	.05	100
	>75	0	0	.03	100	0	0	.01	100
Calve	<50	.02	25	.05	57	0	0	.2	100
	50-75	.32	31.7	.38	38.3	.3	30	.33	100
	>75	.65	21.3	1.12	36.6	1.28	42.1	1.02	100

The proportion of blood from exotic breed of crossbred cattle is increasing up from rural to urban production system, that means in most cases in rural exotic blood level of crossbred was < 50%, in peri-Urban 50-75% and in urban> 75% exotic blood level. In rural and peri-Urban the highest proportion of bulls with exotic blood levels of less than 50% were found which used for traction in rural and per-urban area. In Peri-Urban the majority of crossbred oxen had an exotic inheritance of >75%. They use them for crossbreeding by natural mating. Higher number of crossbred with < 50% exotic blood level found in rural production system than other systems. It may be due to that un controlled breeding system without determine Cleary defined breeding strategy is doing in area, specially AI by estrous synchronization give many calve at one.

4.1.6. Farmers Exotic Blood Level Preferences

In this study as presenedt in Table 8 exotic blood level had a significant effect on both productive and reproductive performance. Farmers experienced running of high graded of crossbreds to have higher daily milk yield, earlier age at first calving and short calving interval.

Table 8. Exotic blood level preference of cow/heifers across production systems of study site

Exotic blood level	Production systems															Total indx
	Rural					Peri-Urban					Urban					
	R1	R2	R3	R4	indx	R1	R2	R3	R4	indx	R1	R2	R3	R4	index	
1ocal	4	1	1	25	0.14	4	0	0	24	0.13	5	0	0	20	0.12	0.15
< 50%	6	48	10	36	0.46	4	0	0	32	0.16	3	0	0	29	0.14	0.25
50-75%	37	11	0	0	0.21	5	39	20	0	0.46	4	47	23	36	0.5	0.39
>75	4	0	0	36	0.2	38	16	1	0	0.25	39	16	2	1	0.26	0.22

Indx = index

Index = [(4 for rank 1) + (3 for rank 2) +(2 for rank 3) (1for rank 4)] divided by sum of all weighed reasons mentioned by respondent

In rural production system cow/heifers with an exotic blood level of <50% are preferred by the majority of respondents and ranked at first preference with an index result were 0.46 and they prefer 50-75% exotic blood level of crossbred as 2nd with an index result 0.21 as well as the 3rd and 4th rank > 75% and local (0 %) with an index result 0.2, and 0.14 respectively. In peri-urban production system, farmers prefer crossbred of 50-75% exotic blood levels as 1st rank with an index result of 0.46 and > 75% exotic blood level as second preference with an index result of 0.25. Moreover they prefer < 50% and local as 3rd and 4th rank with an index of 0.16 and 0.13 respectively. In urban production system farmers prefer crossbred of exotic blood level of 50-75% as first rank with an index result 0.5 and > 75% as second with an index of 0.26 . They also prefer <50% and local as 3rd and 4th rank with an index of 0.14 and 0.12 respectively. As a whole across the production systems, farmers prefers 50-75% exotic blood level crossbred as first rank with an index result of 0.39 and as 2nd, 3rd and 4th rank < 50%, > 75% and local with an index result of 0.25, 0.22 and 0.15 respectively. This is in agreement with previous reports from Ethiopia by Kiwuwa *et al.* (1983) ; Abdinasir, (2000); Desta, (2002); Demeke *et al.* (2004); Bitew *et al.* (2011) and other developing countries such as Galukande, (2010). They state that high graded crossbred animal were more preferred by the majority of dairy farmers to get the advantage of exotic inheritance.

4.1.7. Breed Preferences of Dairy Farmers across Production Systems

The rural setting farmers had shown an interest in Jersey (84%) breed compared to Holstein Friesian (13%) breed. The majority of respondents stated in all production systems (95%), have commitment to continue crossbreeding with high exotic blood levels in crossbred offspring (Genotype composition). That means they did not keep the initial proportion of exotic genes in their herd constant but they need to improve by increase exotic blood level and also need to use different exotic blood breed types.

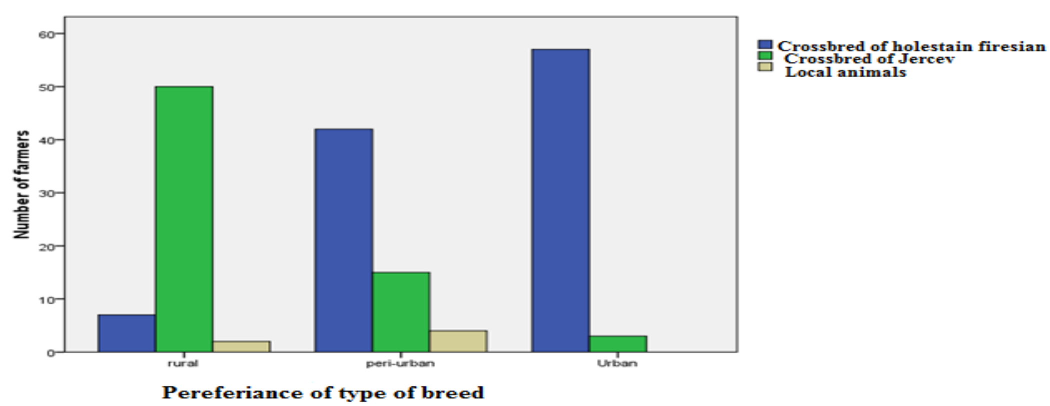

Figure 2: Preference of Exotic breeds for cross breeding across Production system of study site

In this study the shift of preferences for Jersey breed was observed in rural where as the urban and peri urban still prefer the Holstein Frisian. As shown on Figure 2 crossbreeding local animal with Holstein Frisian of exotic breed by using AI to improve blood level was the most practiced strategy in all urban and most of peri-urban area. In rural area cross breeding local animal with Jersey of exotic breed were more preferred. Those farmers who want to cross Jersey with local breed did so because of due to long distance of their home from milk collection cooperatives, and they need to sell butter than milk and the ablity of Jersey breed with standing low quality and quantity feed, poor housing and heat staress. The current result was similar with the finding of Kahi (2002), who repored that utilization and improvement of the desired crossbred population can only be efficient in situations where breeding programmers' with well-defined breeding objectives are developed; which is often lacking at smallholder level in the tropics.

4.1.8. Production and Reproduction Performance of Crossbred of Different Exotic Blood Levels and Local Dairy Cows.

4.1.8.1 Age at First Service and Age at First Calving

The mean of total farmer's response on age at first service (AFS) and age at first Calving (AFC) of all indigenous and their crossbred with different exotic blood is presented in table 9 across the production systems of study site

Table 9. Age at first service (AFS) and age at first Calving (AFC) of all indigenous and their crossbred with different exotic blood levels across the production systems of study area.

		Breed type and Exotic Blood level			
Parameters	Production System	Pure local	<50%	50-75%	>75%
		Mean ±SE	**Mean ±SE**	**Mean ±SE**	**Mean ±SE**
Age at First Service (month)	Rural	46.35±.062[a]	42.68±.091[a]	23.04±.037[a]	22.80[a]
	Peri-Urban	45.84±.088[a]	40.45±.129[a]	23.1±.052[a]	20.75[b]
	Urban	38.1±.098[c]	30.83±.144[c]	19.5±.058[c]	18.37[c]
	Over all	**43.44±.08**	**37.98±.12**	**21.88±.04**	**20.64±.64**
			Average for Crossbred	**26.83±.54**	
	p-Value	.002	.001	.0001	.000
Age at first Calving(month)	Rural	54.22±.068[a]	51.02±.106[a]	31.92±.068[a]	30.52±.06[a]
	Peri-Urban	53.34±.096[a]	48.78±.150[a]	31.53±.096[b]	30.04±.08[a]
	Urban	49.50±.108[c]	40.57±.168[c]	30.37±.107[c]	28.13±.09[c]
	Over all	**52.35±.09**	**46.79±.14**	**31.27±.09**	**29.56±.08**
			Average for Crossbred	**35.87±.10**	
	p-value	.005	.007	.004	.006

Least-squares mean with same superscript in the same column for same variable indicate non-significance across the production system

Current result of AFS and AFC of local cow was 43.44 and 52.35 month respectively, which was longer than the findings of Dinka (2012) who reported that AFS and AFC 34.8 and 41.3 months, respectively. The difference is might be due to widely use of crossbred animal that disregard the attention to local breed in study area.

In case of crossbred, the current result of AFS for < 50%, 50-75% and >75% exotic blood level has 37.98 , 21.88 and 20.64 months respectively. The average age at service was (26.83) is much higher than 9.58, 11.75, 13.5 and 13.75 months values reported for general crossbred by Tadesse *et al.* (2010), Shiferaw *et al.* (2003), Mureda and Mekuriaw (2007) and Ibrahim (2011), respectively. The difference may be due to that previous result was studied under control environment rather than under farmers' condition. The mean AFC of different exotic blood level crossbred cows of <50%, 50-75% and >75% exotic blood level is 46.8, 31.3 and 29.6 months respectively with the average value 35.87 for crossbred cows. The present result agrees with that of general crossbreds by Mureda and Mekuraiw (2007), Ibrahim *et al.* (2011), and Lemma and Kebede (2011) and Dinka, (2012) who reported 36.2, 34.7, 33.2, and 34.8 months, respectively, for crossbred cows in different parts of Ethiopia.

Age at first Service and AFC were significant ($p < 0.05$) between production of study area and among different exotic blood levels. The AFS and AFC decreased as production system is intensified from rural to urban and as exotic blood level was enhanced. The variation in AFS and AFC between different exotic blood level and between production systems is probably due to difference in genetic potential among different exotic blood levels and difference in management and feeding systems among production systems.

4.1.8.2. Calving interval, Day open and Lactation length of Crossbred of Different Exotic Blood level and Local Cows

The overall reported calving interval (day), day open (days) and lactation length (month) of local and theirs crossbred cows performance based upon the response of the farmers from the study area were presented in table 10 blow.

Table 10. Calving interval, day open and lactation length of local and theirs crossbred cows with different exotic blood level across the production system

Parameters	Production systems	Exotic Blood level			
		Local	<50%	50-75%	>75%
		Mean ±SE	Mean ±SE	Mean ±SE	Mean ±SE
Calving interval (day)	Rural	748.25±.05	557.7±.01	441.65 ±.05[a]	441.6±.05[a]
	Peri-Urban	743.50±.04	556.6±.02	435.41±.04[a]	419.8±.03[a]
	Urban	724.53±.03	547.6±.02	410.63±.03[c]	389.8 ± .02[c]
	Over all	**738.8±.03**	**466.8±.02**	**429.23±.06**	**417.07±.03**
			Average of all cross		**437.8±.04**
	P-value	0.37	.48	.007	.004
Day open (days)	Rural	235.8±23	205.9±10	90.8±.1	90.0±.85
	Peri-Urban	207.5±21	191.3±15	90.0±.93	90.0±.76
	Urban	207.3±15	164.4±17	88.1±.66	88.1±.53
	Over all	**216.9±2**	**187.2±1**	**90.82±.9**	**89.3±.7**
			Average of all cross		**122.4±5.2**
	p-Value	.536	.135	.110	.260
Lactation length (month)	Rural	7.7±.279	8.2±.196 [a]	9.0±.260 [a]	10.2±.260
	Peri-Urban	8.8±.395	8.8±.277 [a]	10.5±.367 [b]	10.6±.367
	Urban	8.2±.441	9.3±.309 [c]	10.5±.411 [b]	10.1±.411
	Over all	**8.23±.37**	**8.76±.09**	**10.0±.35**	**10.3±.35**
			Average of all cross		**9.69±.26**
	p-value	.110	.019	.002	.729

Least-squares mean with same superscript in the same column for same variable indicate non-significance amoung genotype across the production system.

4.1.8.2.1. Calving Interval (CI)

Calving interval is a time elapsed between two consecutive successive parturitions. As presented in (Table 10) the average mean of CI of indigenes zebu cattle and their crossbred of < 50% and 50-75% and >75% exotic blood level were, 738.8, 466.8, 429.23 and 417.07 days respectively and the mean average CI for all crossbred was 437.8 days. Current result of CI for local cows 738.8 day was comparable to that of Mulugeta Ayalew and Belayeneh Asefa, (2013) reported 748.2 days for indigenous animal in North Showa zone of Amhara Region .

Calving interval of crossbred cow with exotic blood level of 50- 75% and >75% significantly ($P \leq 0.05$) shorter in urban than those of peri-urban and rural. It may be due to intensified management of animal in urban area than in peri-urban and rural. In case of crossbred of different exotic blood level in this study, as exotic blood level was increased shorter calving interval was found. Calving interval of 466.8, 429.23 and 417.07 days was obtained for lower to high grade cows respectively (Table 10) and the mean average CI of crossbred was 437.8 days. Current result was different from finding of Gabriel et al., (1983) longer calving interval as exotic blood level increased as 50, 75 and 87.5% have CI of 458 ,475, 525 days respectively. In addition, the current result is disagree with report of Aynalem *et al.,* (2009), who reported that the level of management achievable in Ethiopia is unfavorable to higher exotic inheritance levels more than 50% exotic inheritance. This might be due to relatively good long run intervention of different Government and Non Government organization in dairy industry of the study area. For example Government Organization like Holleta research center, Adabera Dairy farm, District Livestock and fish resource office and Cooperative association office played a great role in adoption of dairy knowledge and Technology by giving training for framers on Crossbred management (feeding, housing, breeding, improved forage development and conservation, health care and Dairy product marketing and how to make Cooperative and Union to solve market problem), supplying dairy input (Crossbred heifers/bull, Feed, Liquid nitrogen, Semen, medicines, improved forage seed and Dairy equipments). In addition, NGOs like ILCA, Self help, Land Oleks, VOCA, World Vision and ILRI in different period made cooperation with the listed Government Organization doing huge task in adoption of Crossbred dairy technology in the area. As a result, most of farmers advance their knowledge on Crossbred management, and also they launch to make a decision on theirs crossbred exotic blood level and most of them have greater than 50% of exotic inheritance of crossbred animal and they also make Zero grassing/ stall feeding system for their crossbred animal. Consequently relatively, they can get high production and reproduction performance that expected from exotic inheritance.

The current finding was confirming the expectation of shorter calving interval in higher inheritance level. This might be indicative of relatively; excellence of crossbred management under smallholder farmers in handling, breeding management, accesses of artificial insemination service, relatively shorter days open, diseases control and relatively good experience of farmers on all management practices.

4.1.8.2.2. Days Open for Dairy cows

As presented in the previous Table 10 the average days open in indigenous dairy cows included in the current study was 216 days. From the analyzed collected survey data there was no significant difference (p>0.05) in day open of dairy cows among production system. But significant difference occurred among different exotic blood levels. The current result showed that days open for indigenous cows is exceptionally longer than previously reported by Belay *et al.* (2012), Tadele Alemayehu and Nibret Moges *(*2014) in North, Gondar Zone Amhara Regional State. They stated that the overall LSM of day open for indigenous cows was estimated to be 86.4 days and Study on Reproductive Performance of indigenous Dairy Cows at Small Holder Farm Conditions in and Around Maksegnit town stated that the LSM for day open in indigenous dairy cows was 86.5 days. The variation could be attributed to differences in management practices like lack of giving attention for local animal, feed shortage and lack of proper heat detection might be contributory factors for long day open in local dairy cows reported in this study.

Day open for different exotic blood level of crossbred with < 50% 50-75% and >75 was 187, 90.82 and 89.3 days, respectively with the average mean values of 122.4 day for exotic blood level crossbred. As analyzed survey result there is no significant difference ($p>0.05$) among production system on day open for crossbred animal, but decreasing day open was seen as exotic blood levels increased. The average mean day open for crossbred was 122.4 days was slightly lower than that 5.19 months reported by (Belay *et al.,* 2012) at Jimma Town Ethiopia. The differences might be indicative of relatively; perfection of crossbred management under smallholder farmers in breeding management, accesses artificial insemination service, diseases control and relatively superior experience of farmers on all management practices in the study area.

In other way current study results showed that the mean value for days open of higher exotic blood level of 50-75% and >75% crossbred was 90.82 and 89.3 days respectively which are similar with the findings of Hunduma (2012), who reported day open 85.6 days in Asella town, Oromia regional state, Ethiopia and 2.9 months reported in crossbred cattle in and around Gondar, North Western Ethiopia (Moges, 2012).

4.1.8.2.4. Lactation length

As indicated in the Table 10 the average mean lactation length of indigenous and their cross of 50%, 50-75%, and >75% exotic blood level was 8.23, 8.76, 10 and 10.3 months respectively. with the mean average of lactation length for all crossbred animal was 9.69 month. Current result lactation length for local cows was agrees with the report of Kurtu (2003) who reported that lactation length of local cows in private holdings 212 days in the Harari milk shed. In case of Crossbred the average mean lactation length was 9.69 months. This agrees with the lactation length of, 10.1 reported by Asaminew and Eyasu, (2009) in northwest and central Ethiopia. Lactation length of crossbred exotic blood level of < 50% and 50-75% dairy cow was significantly longer in urban (9.3 and 10.5) month than in rural (8.2 and 9.0) month respectively. The difference may be due to the reason of the farmers in urban area having more experience to control lactation length of their cows than in rural area. That means in study area lactation length of cows depends mostly on the management objective of the herder, the herder may prolong the lactation length for the sake of continues milk production or dry off the dam at early stage for the purpose of breeding the cows. There was an increment trend in lactation length revealed as exotic blood level increased, even if it could not reach generally accepted 305 days of lactation length for crossbred still 10.3 month was perceive for crossbred exotic blood level of >75% .

4.1.9. Longivity, Number of service per conception and Milk to be churned to get 1kg of butter for Crossbred of Different Exotic Blood level and Local Cows

Table 11. Longevity (years), number of service preconception numbers) and milk to be churned (Litter) to get one kilogram of butter from local and their crossbred across production system.

Parameters	Production system	Breed and Exotic blood level Mean ± SE			
		local	< 50%	50-75%	>75%
Longevity (year)	Rural	11.9±.32[a]	11.8±.28 [a]	10.3±.32	9.1±.20
	Peri-Urban	14.7±.46[c]	12.9±.39[a]	10.1±.45	9.3±.30
	Urban	13.4±.51[c]	12.2±.44 [c]	10.9±.50	9.1±.32
	Over all	13.33±.43	11.96±.37	10.43±.42	9.17±.27
			Average for all crossbreds		**10.52±.32**
	P-value	.000	.000	.085	.817
Number of service per conception	Rural	3.7±.07 [a]	3.5±.07 [a]	1.9±.07	1.6 ±.08
	Peri-Urban	3.0±.10 [c]	3.0±.10 [c]	1.8±.09	1.5±.11
	Urban	3.0±.11 [c]	2.9±.11 [c]	1.7 ±.10	1.3±.12
	Aver all	3.3±.09	3.13±.09	1.8±.08	1.5±.10
			Average for all crossbreds		**2.14±.09**
	p-value	.000	.000	.118	.179
Milk to be churned to get 1kg of butter	Rural	18.85±.7 [a]	20.36±.73 [a]	25.81±.80 [a]	26.64±.8 [a]
	Peri-Urban	18.66±1 [a]	20.33±.1 [c]	25.83±1 [c]	27.66±1 [c]
	Urban	19.14±.9 [b]	21.05±1 [c]	27.00±1 [c]	28.19±1 [c]
	Aver all	18.89±.87	20.53±.79	26.12±.55	27.27±.55
			Average for all crossbreds		**24.64±.63**
	p-value	.001	.000	.000	.000

Least-squares mean with same superscript in the same column for same variable indicate non-significance amoung genotype across the production system.

4.1.8.2.5. Longevity

The general goal of dairy farms is for cows to produce a maximum amount of milk per day of its life. As shown in Table 11 the mean productive age of indigenous and their cross of <50%, 50-75%, and >75% was 13.33, 11.96, 10.43 and 9.17 years respectively with the average mean for all crossbred was 10.52 years. The current result is in line with keffena *et al.* (2013) Which was statement that the overall least squares mean for the entire lifespan of various crossbred dairy cows was 4036 days, (about 11 years). But the result higher than the 5.3 years for grade Boran cattle in Tanzania reported by (Trail et al 1985), the 6.02 years for crossbred cows in Ethiopia reported by (Enyew *et al.,* 2000) and 7.9 years for dairy cows in Cheffa farm in Ethiopia reported by (Goshu, 2005).

There was a declining trend in total lifespan of dairy cows as the level of exotic blood inheritance increased from 50 to 75%. This is may be due to high exotic inheritances give high production in their live which was accelerate decline in performance of animal and the farmers sold their animal at early age. This is similar with Study of disposal causes for the some farms showed that 51.9% cows were sold at early age (Abebe ,2005) also it may be due to that as exotic blood level of crossbred is increased resistance of animal became decrease as a result they attack by disease and other discomfort which make shortness of their live span.

4.1.8.2.6. Number of service per conception

The mean number of services required per conception is a simple method of assessing fertility (Payne, 1970). The number of service per conception in the present study for local and theirs crossbred of<50%, 50-75% and >75% was 3.3, 3.13, 1.8 and 1.5 respectively, with the mean average for all crossbred was 2.14. The finding in the present study agree well with the 2.0 services per conception reported for cows at Asella (Negussie *et al.,* 1998). It is, however, slightly higher than 1.62 reported in central highlands of Ethiopia (Bekele *et al.,* 1991 and Shiferaw *et al.,* 2003). The variation may be due to the difference in householders' knowledge on proper heat detection and also time of insemination and perfection of AI technician of study area from previous study. The result is state that higher exotic blood level of crossbred have better performance conception rate than indigenous and with lower exotic blood level cross breed.

4.1.8.2.7. Amount of Milk to be churned (L) to get 1kg of butter

As shown in Table 11 indigenous animal andcrossbred with lower exotic blood has higher Butter fat content. For example to get 1kg of butter from indigenous animal averagely 18.89 liters of milk was to be churned. However to get 1kg of butter about 24.64 liter of milk shall be churned from all exotic blood level crossbred. As the exotic blood level increased butter fat content of milk was reduced. This maight be due to the nature of an animal that exotic breeds produce high amount of milk than indigenes animal but lower in butter fat content and vice versa. The current result well agree with report of Gabriel *et al.* (1983) who stated that in Arsi Region local Arsi, Zebu and F1Jersey cross with Arsi breed group have higher butter fat (5.1 to 5.5%) than higher graded Firesians (4.1 to 4.5%). This circumstance show that in remote rural area where the mattering of infrastructure to sell fresh milk the use of lower crossbred exotic inheritance for production of butter could be desirable.

4.1.9. Major Challenges on Input Delivery for Dairying across production systems

Concentrate feed and agro industrial by product is very crucial for dairy animal for their energy balance and giving production. Hoever a as presented on appendix table 5, shortage of inputs delivery and unbalance cost of dairy input like Feed (concentrate feed and mill byproduct, roughage and forage seeds), improved breed (Heifers or bulls), AI facilities (Liquid nitrogen, semen, AI technician) and health facilities (medicine) was reported in study area.

Table 12. Ranking reason on shortage of dairy inputs supply across the production systems of study area

Type of input	Percent of farmers give rank across Production System															Over all I
	Rural					Peri-urban					Urban					
	1st	2nd	3rd	4th	I	1st	2nd	3rd	4th	I	1st	2nd	3rd	4th	I	
Concentrat efeed and AIBP	35	31.3	27	6.1	0.3	20	37	29	13	0.29	25	31	37	6.2	0.26	0.28
Improved breed supply	30	26.1	36	7.2	0.3	21	37	31	11	0.26	34	37	23	10	0.31	0.28
AI facility	8.0	25.3	29	38	0.2	29	25	24	22	0.25	17	25	37	20	0.2	0.23
Health care facility	16	18.5	24	41	0.2	19	23	38	20	0.24	14	19	26	40	0.19	0.21

AIBP = agro industrial byproducts, I= Index

In the present study even if there was comparatively access of dairy input supply in the area but the farmers in all production systems had a difficulties to acquire concentrates feeds, agro industrial byproducts , medicine and semen as they want in quantity and quality. As listed in Table 12 in rural area shortage of supplying concentrate feed and agro industrial by product rank as 1st problem with index result 0.30. It may be due to that even if there is other feed available in rural area in terms of supplying concentrate feed and agro industrial by products that needed for dairy animals especially for crossbreds not satisfy the demand. Shortage of improved breed, AI facility and health facility are ranked as 2nd 3rd and 4th problems. The same problems in rank were reported in peri-urban production system. In urban area shortage of supplying improved bred is ranked as 1st with an index result 0.31 followed by concentrate and agro industrial byproduct feeds, AI and health facilities as 2nd , 3rd and 4th rank with an index result 0.26, 0.23 and 0.19 respectively.

As a whole a shortage on feed and improved breed supply which are the first rank problems with index result 0.28 that case hinder dairy development. Also shortage of AI and health care facility are the 2nd and 3rd problem in dairy production. These findings was similar to those of Bitew *et al*. (2011) and Mekonnen *et al.* (2010) in Amhara regional state that the seriousness of resource, service and input related problems were the main problems on dairy production.

4.1.10. Dairy Product Processing and Marketing System across Production System

In the current study area, before adoption of crossbreeding only few farmers (10%) were participated in selling of milk and about (90%) of them practiced butter churning. After interfering of different NGO like Self help, Land Olaks and Rural Capacity building projects and Government Organization through adoption of crossbreeding, milk consumption and processing at home decreased after long process of awareness creation and implementation of milk marketing, the majority of farmers acquired new market access. This agree with Yigrem *et al.* (2008) who reported that before few years sales of milk on open market were formerly not common practice; on the contrary in some regions selling was restricted by traditional taboos The mean milk/litter/day produced and sold is presented in (Table 12).

Table:13. Milk production and use categories across production system

Production system	Milk production and use categories			
	Milk production of herd (l/d)	Milk for sale (l/d)	Milk processed at home (l/d)	Home consumption (l/d)
	Mean± SE	Mean ±SE	Mean ±SE	Mean ±SE
Rural	13.5±1.15^{a}	11.949±1.171^{a}	1.186±.155^{a}	.453±.064^{a}
Peri-Urban	17.5±1.14^{b}	15.492±1.152^{c}	1.066±.153^{a}	.918±.063^{c}
Urban	18.6±1.14^{c}	17.083±1.162^{c}	.567±.154^{c}	.992±.064^{c}
P-Value	.000	.007	.012	.000

SE = standard error l= litter d= day

Least-squares mean with same superscript in the same column for same variable indicate non-significance amoung genotype across the production system.

There were a significant differences ($p < 0.05$) in herd milk production, amount of milk sold, milk processed and amount of milk used for home consumption across production systems. In all production systems, higher amounts of whole milk were sold than used for home consumption or processed at home. Out of all milk produced on farm for sell, process and consume at home were 83.8%, 8.98% and 6.58% respectively Demonstrating how adoption of dairy technologies (crossbred cows, improved feed and management practices) enhanced market participation and raised per capita income, expenditure on food and non-food items and nutrient consumption. These results show that smallholders moved from subsistence to market-oriented dairy production (Ahmed et al., 2004). These findings are in line with the present study results.

4.1.11. Constraint and Opportunities on marketing in the study area

Table 14. Milk price and selling place across the production systems of study area

Milk price and selling to whom	Number and percent of farmers across the production systems							
	Rural		Peri-Urban		Urban		Total	
	Frq.	%	Frq.	%	Frq.	%	Frq.	%
Milk Union	57	31.7	58	32.2	56	31.1	171	95
Rented person	2	1.1	2	1.1	3	1.7	7	3.8
Hotels	0	0	0	0	2	1.2	2	1.2

	Price of milk across the production systems											
	Rural			Peri-Urban			Urban			Total		
Price of Milk/Litter in ETB	birr	Frq.	%	birr	Frq.	%	birr	Frq.	%	birr	Frq.	%
	11.50	52	28.9	11.50	52	28.9	11.50	47	26.1	11.50	151	83.9
	12.00	2	1.1	12.00	6	3.3	12.00	11	5.6	12.00	19	10.6
	13.00	2	1.1	13.00	3	1.7	13.00	5	5.6	13.00	10	5.6

Level of satisfaction	Rural		Peri-Urban		Urban		Total	
	Frq.	%	Frq.	%	Frq.	%	Frq.	%
Satisfied	1	0.6	2	1.1	3	1.7	6	3.3
Unsatisfied	58	32.2	59	32.8	57	31.7	174	96.7

ETB = Ethiopian birr Frq. = frequency

Of the total, 83.8% of respondent sell milk with price of 11.5 ETB/L and used it as source of income generation and only 3% of them are used milk for other purpose like baby consumption, process it and use butter and cheese. An increase in marketing of dairy products could be observed. Of total interviewed farmers (n=180), 95%, 3.8%, 1.2% sell their milk for milk union, rented person and Hotel, respectively. The current result is greater than amount milk sold to milk sell group reported in Mieso District by Kedija Husen (2007) who stated that from the total (n=94) households who sell milk, only 22 (23 %) were involved in the milk seller groups. The difference of current result is maybe due to actively participation of the farmers in organizing dairy cooperative and union and also contribution non Governmental/ NGO organization to empower milk cooperative /Union to solve milk market problem in the area also; due to nearness of study area to central market and access of infrastructure.

As shown in Table 14 in present study even if there is a little slight of market problem the results show unlike of report from different source. Off total interviewed farmers 95% stated that lack of market is do not affect as much their milk production. Every moment they have three option to whom they sell their milk namely; Milk Union, Private Milk collector enterprise and Central market, Farmers who have crossbred must be member of Dairy Cooperative /Union and he/she provide his/her daily produced milk to Cooperative. If he/she not satisfied to cooperative he/she supply to Private dairy product collectors enterprise /Mama or Shola which collect milk from Urban, peri urban in somewhat rural by moving home to. In the current study, production system was comparatively supported by enhanced access to input supply like feed, breed, improved husbandry practices, better health, good market infrastructure and information in which both public and private sectors play a role. Dairy cooperatives and unions will be strengthened/created for increased efficiency in input supply, production and marketing services.

This study have shown that intervention of Governmental and different nongovernmental organization and other milk processor partners and also vicinity to central market led to a substantial increase in marketing of milk and milk products. In other way there was a computation between farmers milk Union and other milk processer enterprise like Shola and Mama on milk collection and market. In such condition they play a significant role in ensuring sustainable supply of raw milk to the dairy industry by coordinating the flow of milk from their members and assisting them by supplying the required dairy farm inputs and dairy owners sell their milk to whom they are satisfied. The result is in agreement with ffinging of Emana, (2009) who reported that there are 180 cooperatives engaged in milk production and marketing operating in different parts of the country.

The great antagonistic bold problem seen in current study was that, the price of milk not fair when compared to price of dairy input specially feed. About 96.7% stated that the price of milk/L is not reasonable with cost of animal diet; they buy 1kg of concentrate feed by 15.00 ETB birr and sell 1L of milk by 11.50 ETB/Ethiopian birr, thus the price of milk was not fair. This finding disagrees with finding of Gitu *et al*. (2007) who reported in Kenya the Utilization and cost of concentrates and milling by-products affected the cost of milk production.

4.1.12. Daily Milk Yield Across The Production System From Survey Study

Table 15. Daily milk yield (litter/cow) of local animal and their crossbred with different exotic blood level across the production system from result of survey data

Genotypes	Mean± SD of Daily milk yield in litter across the Production systems				P-value
	Rural (59)	Peri-Urban (61)	Urban (60)	Total (N=180)	
0% (local)	2.59±1.5 (N=23)[a]	2.27± .41(N=11)[a]	2.72±.33(N=9)[c]	2.53±1.10 (N=43)	.0001
< 50%	5.01±.68(N=15)[a]	8.00±.88 (N=13)[a]	8.59±.45 (N=14)[c]	7.11±1.74(N=42)	.0001
50-75%	11.76±.34(N=10)[a]	14.46±.74(N=18)[b]	16.07±3.7(N=16)[b]	16.07±3.73(N=44)	.0001
>75%	13.47±.65(N=11)[a]	15.18 ±1.6 (N=19)[c]	26.07±1.4(N=21)[c]	19.29±6.09(N=51)	.0001

Least-squares mean with same superscript in the same row for same variable indicate non-significance amoung genotype across the production system.

N= number of respondent

As listed in Table 15 the respective average, daily milk yield of local animal across the production system was 2.59, 2.27 and 2.72 in rural, peri-urban and urban of study area with an average milk yield of 2.53. Daily milk yield of different exotic blood level of crossbred of < 50% was 5.0, 8.00 and 8.59 in rural, peri-urban and urban respectively with average daily milk yield of 7.11. For crossbred exotic blood level of 50-75% 11.76, 14.46 and 16.07 in rural, peri-urban and urban respectively with an average daily milk yield was 16.07 litters and for crossbred exotic blood level of > 75% was 13.47, 15.18 and 26.07 in rural, peri-urban and urban respectively with an average daily milk yield was 19.29 litters . The average daily milk yield of crossbreds with different exotic blood level was significantly (P<0.001) difference in all production systems. The result is difference from that of Staal and Shaprio (1996), who stated that rural production system was the predominant milk production system for national milk production. Which was higher in urban production system than peri-urban and in rural as well as exotic blood level was increase milk production also increase. The difference in daily milk production of the same exotic blood level of crossbred under different production system also indicate that to receive expected production from exotic inheritance properly designing breeding policy and dissemination method of exotic blood levels for each production system was needed

4.2. Result of Monitoring Study

4.2.1. Daily Milk yield across the Production System

Table 16. Daily milk yield (litter/day/cow) of local animal and their crossbred with different exotic blood level cows across production system

Genotype	Mean ± SD of Daily milk yield in littes from monitoring data				P-Value
	Rural	Peri-Urban	Urban	Total	
Local	2.02 ±.19 (n=2) [a]	2.27±1.0(n=2)[ab]	2.28±.16(n=3)[c]	2.30± .56(n=7)	.000
<50%	4.95±.26(n=6) [a]	8.77±2.43(n=2) [b]	8.83± 2.0(n=2) [c]	7.51± 2.6(n=10)	.000
50-75%	11.86± 3.5(n=3)[a]	14.59±5.62(n=3)[ab]	20.78±8.29(n=4)[c]	15.74± 7.7(n=10)	.002
>75%	13.70±.50(n=3)[a]	15.30±6.98(n=4)[ab]	26.76±5.87(n=6) [c]	18.59± 8.4(n=13)	.000
Total	8.13±3.40(n=14)	10.34±5.37(n=11)	14.70±9.33(n=15)	11.05±09(n=40)	.029

Least-squares mean with same superscript in the same row for same variable indicate non-significance amoung genotype across the production system.

As peresented in Table 16 from the monitoring data result the average daily milk yield of local animal across the production system was 2.02, 2.27 and 2.28 in rural, peri-urban and urban, respectively. The daily milk yield of different exotic blood level of crossbred of < 50% was 4.95, 8.77 and 8.83 in rural, peri-urban and urban, respectively with over all average 7.51 for crossbred exotic blood level of 50-75% of 11.86, 14.59 and 20.78 in rural, peri-urban and urban respectively with an average daily milk yield was 15.74 litters and for crossbred exotic blood level of > 75% was 13.70, 15.3 and 26.67 in rural, peri-urban and urban respectively with an average daily milk yield was 18.6 litters . The average daily milk yield of crossbreds with different exotic blood level and local cow was also showed significant ($P<0.05$) difference in all production systems. The result of monitoring study on milk production per day of dairy cows in study area was similar to the survey study. In both studies productivity of crossbred animal was increase as exotic blood level was increase. The same exotic blood level having different productive performance in different production systems. In all case milk production of cows was higher in urban production system than peri-urban and in rural. The difference may be due to different management practice among production systems and it may be indicate that to receive expected production from exotic inheritance properly designing breeding policy and dissemination method of exotic blood levels for each production system was needed

4.2.2. Estimated Milk Production against Stage of Lactation

Table 17. Milk yield (litter/day/stage of lactation) of crossbred level and local cows

Exotic blood level	Mean ± SD of Daily Milk yield in Litters compare with Stage of lactation				
	Early stage	Mid stage	Late stage	mean average	P-value
Local	2.82±.22 (N=3)[a]	2.57±.41 (N=2)[a]	1.55±.34 (N=2)[c]	2.31±.27 (N=7)	0.0012
<50%	8.16±0 (N=2) [a]	7.50±.21 (N= 6)[a]	6.86±.10 (N=2)[c]	7.51±.10 (N=10)	0.0011
50-75%	22.48±0 (N=2)[a]	14.81±2.9 (N=3)[b]	7.55±1.6 (N= 2)[c]	15.74±3 (N=10)	0.0001
>75%	22.43±6.9 (N= 6)[a]	18.30±5.5 (N=5)[b]	15.0±6.1 (N=5)[c]	18.57±6.0 (N=13)	0.0001
Total	17.69±2.3 (N=9)	13.54±2.61(N=15)	9.8±2.6 (9)	13.94±3.0(40)	0.0001
	Average for all crossbred was 13.93±3.03				

Least-squares mean with same superscript in the same row for same variable indicate non-significance amoung genotype across the production system.

The milk production performance at different stage of lactation and lactation dairy cows across the production system were revealed in (Table 17). The average daily milk yield at early, mid, and late lactation stages for local of 2.82, 2.57 and 1.55 respectively with mean average daily milk yield was 2.31 liters. 8.16, 7.50, and 6.86 litters in early, mid and late lactation stage respectively for <50%, with mean average daily milk yield was 7.51 litters and 22.48, 14.81 and 7.55 litters in early, mid and late lactation stage respectively for 50-75% and with mean average daily milk yield of 15.74 litters and 22.43, 18.30 and 15.0 respectively for > 75% with the mean average daily milk yield was 18.57 litters.

The milk production was significantly (P<0.001) reduced in late lactation than in mid and early stage of lactations for both local and crossbred cows. Current result average milk production for all crossbred with different exotic blood level in compare with lactation stage was 17.69L, 13.54L and 9.8L at early, mid and late lactations which was higher than previously reported by Adebabay Kebede (2009), who stated that daily milk production from unknown exotic blood level of crossbred cows was; 10.96, 9.12 and 5.04 liters for first, second and third lactations stages. The average daily milk yield 13.93L for all different exotic blood level observed in this study was higher than the average values reported by Asaminew and Eyasu (2009), Yitaye et al. (2007) which was 7.8, 7.8 liters respectively from unknown exotic blood level crossbred cows. The main reasons for high daily milk yield of crossbred cows in current study may be due, improvement knowledge of small holder farmers on general management such as (feeding, watering, housing, health care and breeding management of crossbred animal in study area.

In case of local dairy animal, from the monitoring study, the mean daily milk yield of local cows in the study area was 2.31liters, which was better than the national average 1.09 L, and those reported by (Degena Aredo and Adugna Lemi, 1999), and by Kedija Hussen (2007) in Mieso District. The reason for higher daily milk production of local cows may be due to the season of in which the monitoring study was conducted during which more feed was available for local cows in current study.

4.2.3. Milk Production Performance Against Parity

Table18. Daily milk yield of cow/day/parity crossbred with different exotic blood level and local in compare with Parities

Genotpe	Parities					P-value
	1st parity	2nd parity	3rd parity	4th parity	5th parity	
Local N=7	1.5±.23(N=2)[a]	2.1±.42 (N=1)[b]	2.5±.37 (1)[b]	3.5±.27 (N=2)[d]	1.5±.25 (N=1)[a]	.0001
<50% N=10	6.70±.0 (N=3)[a]	-	10.54±.21 (N=3)[c]	6.9±.10 (N=2)[a]	5.73±.14 (N=2)[a]	.0003
50-75% N=10	9.07±.10 (N=2)[a]	14.18±2 (N=2)[b]	26.15± 2.9(N=2)[c]	19.5±.30 (N=2)[d]	9.46±.45 (N=2)[a]	.000
>75% N=13	15.4± 2.1 (N=2)[a]	20.4±2 (N=3)[b]	21.6±1.5 (N=3)[b]	19.23±.5 (N=3)[bcd]	16.57±.25 (N=2)[a]	.000

Least-squares mean with same superscript in the same row for same variable indicate non-significance amoung genotype across the production system.

As presented in Table 18, the effect of parity was highly significant (P<0.001) for daily milk yield for both local, and their cross of <50%, 50-75% and >75%. Milk production increased as parity increased until three then decreased with the advance of parity. This result agrees with the finding of Mohamed (2004) who demonstrated that milk yield increased with advancing lactation up to 4th parity in the Sudan.

4.2.4. Milk production per Lactation

Table19. Milk production per lactation of crossbred with different exotic blood level and local cows across the production systems

	Milk production per lactation across Production systems									Aveg. MPPL (L)
	Rural			Peri-Urban			Urban			
Genotype	LL (month)	DMY (L)	MPPL (L)	LL (month)	DMY (L)	MPPL (L)	LL (month)	DMY (L)	MPPL (L)	
Local	7.7	2.02	466.62	8.8	2.27	599.3	8.2	2.28	560.9	542.3
>50%	8.2	4.95	1217.7	8.8	8.77	2315	9.3	8.83	2463	1999
50-75%	9.0	11.86	3202.	10.5	14.5	4595.8	10.5	20.78	6545.7	4781
>75%	10.2	13.70	4192.2	10.6	15.30	4865.4	10.1	26.76	8108.3	5722
Total					**Average for all crossbreds 4167.33±.87**					

Mean average milk production per lactation for indigenous 542.27 Liters in 246 days, which was higher than the overall average lactation, 271.4 litters reported in Mieso district by Kedija Hussen, (2007) and 488 liters within 249 days found in Somali region of pastoral areas by (IPS, 2000). The high daily and lactation milk yield of local cows found in the current study may be due to period of monitoring of milk was during availability of feed resource for local cows and relatively longer lactation length shown than the previous study. Milk production per lactation for crossbred of < 50%, 50-75%, and>75% was 1998.76, 4781.25 and 5722 respectively of 4167.33litters. The average milk yield per lactation for all crossbred cows was 4167.33 liters, which was higher than milk production per lactation of 233.63 Liters reported for unknown exotic blood level crossbred cows (Belay *et al.,* 2012) in Jimma town.

Generally, the same exotic blood level of crossbred animal have different reproductive and productive performance under different production systems. Accordingly the AFS, AFC, CI, DO and lactation length were best in crossbred of >75% in urban production system, than peri-urban and in rural production system. This result urgue to establish a well-known breeding strategy for each production system in case of placing rights exotic blood level at rights place for dairy improvement. Depending on the nature of production systems, feeding arrangement, milk marketing operation to get expected profit from exotic inheritance and to avoided adaptation problems it more best assigning high exotic blood level(>75%) to urban production system, medium exotic blood level(50-75%) to peri-urban and lower exotic blood level to rural production system.

5. SUMMARY AND CONCLUSIONS

The current study was conducted to evaluate the productive and reproductive performance of crossbred and indigenous dairy cows at farm level under small scale farmer's management conditions. Accordingly the productive performance traits like daily milk yield and its projected lactation milk yield and lactation length; and reproductive performances traits like (age at puberty and at first calving, calving interval, number of service pre conception) of indigenous and their crossbred with different exotic blood level cows and breed preference of the farmers was studied by analyzing survey and monitoring data captured from 180 household. It was observed that significance difference on production and reproduction performances existed among different blood grade categories (< 50%, 50-75% and above >75%) within three production systems being defined as rural, perri-urban and urban setting.

The survey result in this study confirmed that the performance of crossbred cows for production traits had increased as exotic blood level increase cows with exotic blood level <50%, 50-75% and >75% have 7.11 L/day, 16.07 and 19.29 L/day, respectively. This is indicative of iproved of crossbred management under smallholder farmers in handling, breeding management, and better accesses of inputs in the study area. The breed preference of dairy farmers under this study had shown that the farmers under rural setting preferred the Jersey sire lines where as the peri-urban and urban setting prefered the Holstein Friesian. The reason for prefering Holstein Friesian by urban farmers was selling milk than processing it to butter and in rural area selling butter is more advantages than selling milk due to shortage of infrastructure and long distance from milk collection centers and and the ablity of Jersey breed with standing low quality and quantity feed, poor housing and heat staress. From the result of monitoring study, productive performances (Daily milk yield and milk production per lactation) for crossbred of different exotic blood level of < 50%, 50-75% and >75% dairy cows was 7.51 L/day, 15.74 L/day and 18.59 L/day, respectively. It was observed that daily milk yield of cows was affected by different factors like parity, stage of lactation and production systems. Monitoring study had shown similar trend of performance improvement in crossbred animals to that of the survey study in terms daily milk yield and total projected lactation yield.

The study had also shown that productive and reproductive performance traits of the same exotic blood level crossbred dairy cows showed different performance under rural, peri urban and urban production systems. Each exotic blood level crossbred dairy cows had best production and reproduction performance in urban setting than rural and peri-urban. The variation in performance of the same exotic blood level animal in different production system was due to difference in management of animal like such as feeding, housing, health care and breeding management of the farmers in each production systems.

A shortage of inputs delivery and unbalanced cost of dairy inputs like feed (concentrate feed and mill byproduct, roughage and forage seeds), improved breeds (heifers or bulls), AI facilities (liquid nitrogen, semen, AI technician) and health facilities (medicine) and lower price of milk compared to price of dairy input were the major problems that hindering dairy production in the study area.

Generally, from the summury it conclude that reproductive and productive performance of crossbred with different exotic blood levels and indigenous dairy cows was affected by different factors like exotic blood level, production systems and management practices also shortage of dairy inputs and unbalance price of milk is the major problem in dairy production in the study area.

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6. RECOMMENDATION

Reproduction and production performance of crossbred and indigenous dairy cattle are mostly affected by management (feeding, housing, health care and breeding), genetic, and production system. Based on the present study, the following areas need we attention to support dairy production to be developing into a market-oriented business operation in study area.

- To receive expectation profit from exotic inheritance, it calls for creating strategic breeding systems independently under each production system to allocate right exotic blood level at right place with consideration of adaptation problem, market access and management practice of farmers in each production systems.
- Dairy union and cooperatives can solve shortage of concentrate feed and seed of improved forage through regularly supplying it, additionally Union can planting feed mixer mill and recycle the budget as revolved fund.

- Non Governmental Organizations, feed supplying companies be supposed to initiating dairy industries by doing on forage development, genetic improvement, solving market by acting in value chain of milk production.

- Governmental organization should be performing to solving problems on price of milk by creating foreign chain to realize profitability of dairy producers and supplying crossbred heifers/bulls and other dairy inputs with subside price

- As exotic blood level of crossbred animal was increased the reproduction and production performance is increase and it reach obtimum condition so; it’s a best making backcross after reaching high production and reproduction of crossbred exotic blood level of greater than 87.5% to re enhance heterosis effect.

Future Research Direction

As a scope for future research work in the study areas, the following points can be considered:

- The result of the present study on reproductive and productive performance of crossbred of different exotic blood level was collected from the recalling method of the farmers; to realize current result, long term recorded based study will be require to compare the productive and reproductive performance of crossbred with different exotic blood levels.

- To underline profitability of the dairy farmers from crossbred animals need to study on cost benefit analysis and future study should have to work on cost profit analysis regarding crossbred with different exotic blood level.

7. REFERENCES

Abebe Berihun, 2005. Herd life and lactation performance of Holstein Friesian cows at Stella dairy farm, Ethiopia. DVM thesis. Faculty of Veterinary Medicine, Debre Zeit, Ethiopia

Abdinasir, I. B. ,2000. Smallholder dairy production and dairy technology adoption in the mixed farming system in Arsi highland, Ethiopia. PhD thesis. Humboldt University of Berlin, Department of Animal Breeding in the Tropics and Subtropics. Germany.

Adebabay Kebede, 2009. Characterization of Milk Production Systems, Marketing and On-farm Evaluation of the Effect of Feed Supplementation on Milk Yield and Milk Composition of Cows at Bure District, Ethiopia. M. S thesis submitted to Bahir Dar University, pp: 14.

Alemayehu Mengstu, 2005. Feed resource base of Ethiopia: limitation and opportunities for integrated development. pp 250-259. In: Participatory Innovation and Research: Lesson for Livestock Development. Proceeding of the 12th Annual Conference of Ethiopian Society of Animal Production (ESAP), Volume II Technical papers. 12-14 August, Addis Ababa, Ethiopia

Abaye, T., G.M. Tefera, G.W. Alemu, Y. Beruk, and C. Philip, 1991. Status of dairying in Ethiopia and strategies for future development. pp 91-104. In the proceeding of the 3rd Annual Livestock improvement Conference, 24-26 May 1989, IAR (Institute of Agricultural Research), Addis Ababa, Ethiopia

Ahmed, M. M., BezabihEmana, M.A. Jabbar, F. Tangka and S. Ehui, 2004. Economic and nutritional endometritis in repeat breeder dairy cows. Theriogenology74(7): 1271-1278.

Ahmed, M.M., S.Ehui and Yemsrach Assefa, 2003. Dairy development in Ethiopia. Socioeconomicsand Policy Research Working paper 58. ILRI (International Livestock ResearchInstitute), Nairobi, Kenya, 47p.

Alberro M, 1983. Comparative Performance of F_1 Friesian x Zebu Heifers in Ethiopia. Animal Production 37: 247-252

Alemayehu Mengstu, 1998. Feed resource in Ethiopia. pp. 35-43. In: Kategile J.A., Said A.N. and Dzowela B. H. (eds), Animal feed resource for small-scale livestock producers. Proceeding of the second PANESA workshop. IDRC (International Development Research Institute), Ottawa, Canada.

Anteneh, B, Azage T., Beyene, F., Gebremedhin, B. 2010. Cattle milk and meat production and marketing systems and opportunities for market orientation in Fogera woreda, Amhara region, Ethiopia. IPMS (Improving Productivity and Market Success) of Ethiopian Farmers Project Working Paper 19. ILRI (International Livestock Research Institute), Nairobi, Kenya. pp 65.

Arsham, H., 2002. Descriptive Sampling Data Analysis. Statistical Thinking for Managerial Decision.

Arthur P F, Makarechian M, Beng RJ Weingardt R.,1992. Longevity and lifetime productivity of cows in a purebred Hereford and two multibred systematic groups under range conditions. J. Dairy Sci. 71:1142-1147.

Asaminew and Eyasu, 2009. Smallholder dairy system and emergency of dairy Woredas, northern, Ethiopia. World J. Dairy and Food Sci., 4(2): 185-192p.

Ayenew, A. Y., Zollitsch, W., Wurzinger, M., Tegegne, A.,2008.Characterization and analysis of the urban and peri-urban dairy production systems in the North western Ethiopian highlands. PhD thesis. University of Natural Resources and Applied Life Sciences, Vienna, Austria.

Aynalem, H., Workneh, A., Noah K., Tadelle D. and Azage T., 2011. Breeding strategy to improveEthiopian Boran cattle for meat and milk production. IPMS (Improving Productivity and Market Success) of Ethiopian Farmers Project Working Paper 26. Nairobi, Kenya, ILRI.

Aynalem Haile, Joshi, B K, Workneh Ayalew, Azage Tegegne and Singh A., 2009. Genetic evaluation of Boran cattle and their crosses with Holstein Friesian in central Ethiopia: milk production traits. Animal3 (4):486-493

Azage Tegegne and Alemu Gebre Wold, 1997. Prospect for per-urban dairy development in Ethiopia. pp 28-39. In: ESAP (Ethiopian Society of Animal Production), fifth national conference of Ethiopian Society of Animal Production, Addis Ababa, Ethiopia, 15-17 may 1997.E SAP, Addis Ababa, Ethiopia.

Azage, T., Lahlou-Kassi, A. and Mukassa-Mugrwa, E., 1995. Biotechnology in animal production. Development Opportunities in Livestock Agriculture. Proceedings of the Second Annual Conference of the Ethiopian Society of Animal Production,26-27 May, 1993, Addis Ababa, Ethiopia. pp. 49-80.

Azage, T., Berhanu, G. and Hoekstra, D., 2010. Livestock input supply and service provision in Ethiopia: challenges and opportunities for market oriented development. IPMS (improving productivity and market success) of Ethiopian farmers project working paper 20. ILRI (international livestock research institute), Nairobi, Kenya.

Azage T et, al, 2013. Smallholder dairy production and marketing systems in Ethiopia: IPMS experiences and opportunities for market-oriented development

Bekele T, Kasali OB and Alemu T., 1991. Reproductive problems in crossbred cattle in central Ethiopia. Animal Reproduction Science 26: 41-49

Belay, D., Yisehak, K. And Janssens, G., 2012. Productive and reproductive performance of zebu x holstein-friesian crossbred dairy cows in Jimma town, Oromia, Ethiopia. Global veterinarian 8 (1): 67-72, 2012.

Behnke R (2010) The Contribution of Livestock to the Economies of IGAD Member States: Study Findings, Application of the Methodology in Ethiopia and Recommendations for

Further Work, IGAD LPI Working Paper 02-10. Odessa Centre, IGAD Livestock Policy Initiative, Great Wolford, UK

Bitew, A., Bahata, M., Mekonnen, K., Duncan, A.,2011. Dairy intensification and milk market quality in Amhara region, Ethiopia. ILRI (International Livestock Research Institute), Addis Ababa, Ethiopia.

Beruk Yemane, 2000. Livestock feed resource statuse of Afare region. In: Pastoralism and agropastoralism, *which way for ward?* Proceeding of the 8th Annual conference of ESAP(Ethiopian Society of Animal Production).24-26 August 2000, Addis Ababa Ethiopia. P 35-43

CSA (Central Statistical Authority), 1996. Livestock resource and production statistics in Ethiopia. In:

CSA 2012/13. Agricultural sample survey. Report on livestock and livestock characteristics.

The Federal Democratic republic of Ethiopia, Central Statistical Agency (CSA). Private

Peasant Holdings. Statistical Bulletin 570, Addis Ababa, Ethiopia, April, 2013.

CSA, 2011. Agricultural sample survey. Report on livestock and livestock characteristics. The Federal Democratic republic of Ethiopia, Central Statistical Agency (CSA). Private Peasant Holdings.Statistical Bulletin 570, Addis Ababa, Ethiopia, April, 2013.

Coppock, D.L.,1994. The Boran Pleatue of Southern Ethiopia: Synthesis of Pastoral Research, Development and Change, 1980-91. ILCA systems study. No.5. ILCA, Addis Ababa, Ethiopia. P 393.

Cunningham, E.P. and Syrstad, O.,1987. Crossbreeding bos indicus and bos Taurusfor milk production in the tropics. FAO animal production. Health paper no. 68, food agric. organ.UnitedNations, Rome, Italy.

Danesh, P. and Jean, C., 2011. Opportunities of poultry breeding programmes for family production in developing countries: the bird for the poor.Background document for an e-conference of the international network for family poultry development in collaboration with Effects in a Multibreed Evaluation for Nordic Red Dairy Cattle. 8th WCGALP, Belo Horizonte, Brazil.

Degena Aredo and Adugna Lemi., 1999. The crop livestock systems and contributions to the economy: A review of empirical evidence. Economics of integrated crop and livestock system in Ethiopia. In: Proc. of the 3rd conference of the AESE (Agricultural economic society of Ethiopia). pp. 1-34.

Demeke, S., Neser, F.W.C., Schoeman, S.J.,2004. Estimates of Genetic Parameters for Boran, Friesian and Crosses of Friesian and Jersey with Boran cattle in the Tropical Highlands of Ethiopia: Reproduction Traits. J. Anim. Breed. Genet. 121, pp 57–65.

Desalegn G/Medhin, 2011. Performance of artificial insemination: challenges and opportunities presented by Desalegn G/medhin Ethiopian meat and dairy technology institute workshop on “alternatives for improving field AI delivery system”ilri/ipms, august 2011.

Desta, K. B., 2002.Analyses of Dairy Cattle Breeding Practices in Selected Areas of Ethiopia. PhD thesis. Humboldt-Universität zu Berlin, Germany.

Dinka H 2012 Reproductive performance of crossbred dairy cows under smallholder condition in Ethiopia International *Journal of Livestock Production* 3 (3): pp. 25-28, http://www.academicjournals.org/IJLP.

Emana, B,. 2009. Cooperatives: a path to economic and social empowerment in Ethiopia. Coop Africa Working Paper No. 9. Internatio
nal Labour Office (ILO), Dar es Salaam, Tanzania. pp. 44.

Enyew N, Brannang E, Rottmann OJ.,1999. Reproductive perfor-mances and herd life of crossbred dairy cattle with different level of European inheritance in Ethiopia. *In*: Proceedings of 7th Annual conference of Ethiopian Soc. Anim. Prod. (ESAP) held at Addis Ababa, Ethiopia, pp. 65-74.

Enyew Nigussie, Bränäng E and Rottmann O J, 2000. Reproductive performance and herd life of crossbred dairy cattle with different levels of European inheritance in Ethiopia. Livestock production and the environment: implication for livelihoods. Proceedings of the 7th annual conference of the Ethiopian Society of Animal Production (ESAP). 26-27 May 1999, Addis Ababa, Ethiopia.

Ethiopian Agricultural Research Organization EARO, 2001., 1. Back ground paper on developing animl breeding policy working paper. January, 2001, 21pp.

Ethiopian Agricultural Research Organization EARO., 2001., 2. Livestock breeding policy. A working paper. January 2001. 14pp

FAO, 2009. Selection and breeding of cattle in Asia: strategies and criteria for improved breeding. Animal production and health section international atomic energy agency Vienna international center, 1400 Vienna, Austria.

FAO. 2000. The appropriateness, significance and application of biotechnology options in the animal agriculture of the developing countries. Electronics Forum on Biotechnology in Food and Agriculture. http://www.fao.org/biotech/C3doc.htm ,June 12 - August 25, 2000.

Falvey L, Chantalakhana C (1999). Smallholder Dairying in the Tropics. (ed). ILRI (International Livestock Research Institute) Nairobi. Kenya pp. 462

Gabriel HK, John CM, Trail MY, Kurtu GW, Frank MA, Jeffrey D., 1983. Crossbred dairy cattle productivity in Arsi Region, Ethiopia. ILCA Research Report No. 11.

Galukande, G. E., 2010. Comparison of production systems with purebred Ankole vs. crossbred Ankole-Friesian animals on-farm using a combined cross-sectional and 102 longitudinal approach (Kiruhura District of Uganda). PhD Thesis. University of Natural Resources and Applied Life Sciences, Vienna, Austria.

Getachew, F. and Gashaw, G., 2001. The Ethiopian dairy development policy. In: a draft policy document. AddisAbaba, Ethiopia: ministry of agriculture/ AFRDRD/AFRDT food and agriculture organization/ssf. gricultural sciences vol. 1(1): 008-017.

Getinet., 2001. serial crop is the main Agricultural product Focus on Seed Programs the Ethiopian Seed,)

Gebeyehu Goshu., 1999. Reproduction and production Performance of Friesian Boran cross bredcattle at Chafa state farm,Wollo, Ethiopia. MSc Thesis Alemaya University, Alamaya, Ethiopia.

Getachew Eshete, 2003. Assessment of feed resource their management and impact on livestock productivity in the Ginchi watershed. M. Sc. Thesis, Alemaya University, Dire Dawa, Ethiopia. IAR (1991). (Institute of Agricultural Research).In: Proc. of 4th National Livestock Improvement Conference. 13-15 Nov., 1991, Addis Ababa, Ethiopia.

Gillah K A, Kifaro G C and Madsen J., 2012. Urban and peri urban dairy farming in East Africa: A review on production levels, constraints and opportunities. *Livestock Research for Rural Development. Volume 24, Article No.198.*

Gitu K W, Mburu L M and Wakhungu J W, 2007. A cost-benefit analysis of smallholder dairy cattle enterprises in different agro-ecological zones in Kenya highlands. *Livestock Research for Rural Development. Volume 19, Article #95.* Retrieved December 24, 2015, from http://www.lrrd.org/lrrd19/7/mbur19095.htm

Goshu G., 2005. Breeding efficiency, lifetime lactation and calving performance of Friesian-Boran crossbred cows at Cheffa farm, Ethiopia. Livestock Research for Rural Development. Volume 17, Article #73.

Hailemariam, M. and Kassamersha, H. 1994. Genetic and environmental effects on age at first calving and calving interval of naturally bred Boran (zebu) cows in Ethiopia.Animal Production*, 58*: 329-334.

Haile-mariam M., Banjaw K, Gebre-Meskel J and Ketema T., 1993. Productivity of Boran Cattle and Their Friesian Crosses at Abernossa Ranch, Rift Valley of Ethiopia. I. Reproductive Performance andPreweaning Mortality. Tropical Animal Health and Production 25: 239-248

Heins B J, L B Hansen and A J Seykora, 2006b. Calving difficulty and stillbirths of pure Holsteins versus crossbreds of Holstein with Normande, Montbeliarde, and Scandinavian Red. Journal of Dairy Science 89:2805 2810.

Hunduma Dinka., 2012. Reproductive performance of. crossbred dairy cows under smallholder condition in Ethiopia. International Journal of Livestock Production, 3(3): 25-28.

Ibrahim M N M and Zemmelink G., 2000. A comparative evaluation of integrated farm models with the village situation in the Forest-Garden area of Kandy, Sri Lanka. Asian-Australian Journal Animal Science 13(1): 53-59.

Ibrahim N, Abraha A and Mulugeta S., 2011. Assessemnet of reproductive performance of crossbred dairy cattle (Holstein-Friesian X zebu) in Gondar town. Global Veterinaria 6(6):561-566.

ILCA (International Livestock Center for Africa), 1990. Livestock systems research manual. No. 12, section 1. Working document. ILCA. Addis Ababa, Ethiopia, pp: 8.

ILRI (International Livestock Research Institute),1999. Economic Valuation of Animal Genetic Resources. Proceedings of a FAO/ILRI workshop held at FAO Headquarters, Rome, Italy: 80p. impacts of market-oriented dairy production in the

IPS, 2000. (International Project Service). Resource potential assessment and projectidentification study of the Somalia Region: Socio-economics assessment. Investment office ofthe Somalia regional state. Research Report. Vol.III. Somalia, Ethiopia. 351p.

Kahi, A., 2002. Crossbreeding systems and appropriate levels of exotic blood: examples from kilifi plantations.

Kedija husen, 2007. Ccharacterization of milk production system and opportunity for market orientation: a case study of mieso district, oromia region, ethiopia in partial fulfillment of the requirements for the degree of master of science in agriculture (animal production)

Keffena et al., 2013. Analysis of longevity traits and lifetime productivity of crossbred dairy cows in the Tropical Highlands of Ethiopia, ISSN 1996-0867 Academic Journals, Vol. 7(11), pp. 138-143, November 2013

Kelay Belihu, 2002. Analyses of Dairy Cattle Breeding Practices in Selected Areas of Ethiopia. Ph.D.thesis, Humboldt University of Berlin, Germany.

Ketema, H., Tsehay, Redda, 1995. Dairy production system in Ethiopia. In: Strategies for marketorientation of small scale milk producers and their organizations. FAO (Food and AgriculturalOrganization of the United Nation. Proceeding of the workshop held at 20-24th march,Morogoro, Tanzania. p125.

Kiwuwa, H. Trail, M. Kurtu, Y. Getachew, W. Anderson, F. Durkin J., 1983. Crossbred dairy productivity in arsi region, Ethiopia. ILCA research report no. 11, ILCA, Addis Ababa, p. 58.

Kragelund, K., J. Hill and D. Kallay, 1989, Genetic and phenotypic relationships between reproduction and milk production. J. Dairy Sc., 62: 468.

Kurtu MY., 2003. Certain aspects of the dairy system in the Harar milkshed, eastern Ethiopia. PhD thesis, University of the Free State, Bloemfontein, Faculty of Natural and Agricultural Sciences, Department of Animal, Wildlife and Grassland Sciences, South Africa. 195 pp.

Larroque H, Ducrocq V., 2001. Relationship between type and longevity in the Holstein breed. Genet. Sel. Evo. 33:39-59.

Lemma A and Kebede S., 2011. The effect of mating system and herd size on reproductive performance of dairy cows in market oriented urban dairy farms in and around Addis Ababa. Revue de Médecine Vétérinaire 162(11): 526-530.

Lemma Fita, Fekadu Beyene and P.B. Hegde, 2005a. Rural smallholder milk and dairy productsreproductive performance in dairy cows. Journal of Dairy Science 76:3257-3268 http://jds.fass.org/cgi/reprint/76/10/3257

LIVES, 2012. Livestock and irrigation value chain for Ethiopian small holders (international livestock research institution), Zonal diagnosis and intervention plan west shoa, Oromia

Lobago, F., Bekana, M., Gustafsson, H. and Kindahl, H., 2007. Longitudinal observation on reproductive and lactation performances of smallholder crossbred dairy cattle in Fitche, Oromia region, central Ethiopia, *Tropical Animal Health and Production*, *39*: 395-403.

López Villalobos N., 1998. Effects of crossbreeding and selection on the productivity and profitability of the New Zealand dairy industry. PhD Thesis, Massey University, Palmerston North, New Zealand.

Mekonnen T, Bekana M, Abayneh T.,2010. Reproductive performance and efficiency of artificial insemination smallholder dairy cows/heifers in and around Arsi-Negelle, Ethiopia. Livestock Research for Rural Development, 22(3).

Metaferia F, Cherenet T, Gelan A, Abnet F, Tesfay A, Ali JA, Gulilat W (2011) A Review to Improve Estimation of Livestock Contribution to the National GDP. Ministry of Finance and Economic Development and Ministry of Agriculture. Addia Ababa, Ethiopia

Million Tadesse and Tadelle Dessie,2003. Milk production performance of zebu, HolsteinFriesian and their crosses in Ethiopia. Livestock research for rural development. (15)3 2003.

MOA (Ministry of Agriculture), 1996. National ruminant livestock development strategy of Ethiopia. AddisAbaba, Ethiopia.

MoARD (Ministry of Agriculture and Rural Development), 2007.Livestock Development Master PlanStudy. Phase I. Volume I.Dairy. Addis Ababa, Ethiopia.

Moges, N., 2012. Study on Reproductive Performance of Crossbred Dairy Cows under Small Holder Conditions in and Around Gondar, North Western Ethiopia. Journal of Reproduction and Infertility, 3(3): 38-41.

Mpofu, N. And Rege J.,2002. Monitoring of sahiwal and Friesian cattle genetic improvement programs in kenya. in: Ojango J M, Malmfors B, Okeyo a (eds.) animal genetics training resource, version 2, 2006. Nairobi, Kenya: international livestock research institute; Uppsala, Sweden: Swedish university of agricultural sciences, pp. 35-44.

Mohamed A M 2004 Studies of some performance traits of Butana cattle in Atbara live-stock research station. MSc thesis University of Khartoum, Sudan

Mukasa-Mugerwa, E, 1989. A review of reproductive performance of the Female *Bos-indicus* (zebu) cattle. ILCA. Monograph 6. ILCA (International Livestock Research Institute) AddisAbaba, Ethiopia. p134.

Mulugeta Ayalew and Belayeneh Asefa, 2013..Reproductive and lactation performances of dairy cows in Chacha Town and nearby selected kebeles, North Shoa Zone, Amhara Region, EthiopiaISSN 2329-9312 ©2013 World Science Research Journals World Journal of Agricultural Sciences Vol. 1(1), pp. 008-017, February 2013

Mulugeta Assefa, 1990. Borena cattle herds: Productivity, constraints, and possible interventions. MSc Thesis, Department of Range Science, Colorado State University, Fort Collins, Colorado, USA. p154.

Mulugeta Ayalew, 2005. Characterization of dairy production systems of Yerer watershed Adalibeb woreda, Oromia region, Ethiopia. MSc Thesis. DraDawa, Ethiopia.

Mureda E, Mekuriaw Z.,2007. Reproductive performance of crossbred dairy cows in Eastern Lowlands of Ethiopia. Livestock Research forRural Development 19 (161).

NAIC (National ArtificialInsemination Center) Annual Report, 1999. Kality. Ethiopia.

National Meteorological Agency (NMA) 2007 Climate change national adaptation program of action of Ethiopia, edited by Abebe, T. Addis Ababa, Ethiopia.

Negussie E, Brannang,E, Banjaw K and Rottmann O U., 1998, Reproductive performance of dairy cattle at Assella livestock farm. Arsi. Ethiopia. I: Indigenous cows versus their F1 crosses. Journal of Animal Breeding and Genetics 115: 267-280October 8 to 10, 2008. Part ii technical session.ESAP, AddisAbaba 329 pp.

Perera, O., 1999. Management of reproduction. 241-264pp. In: small holder dairying in the tropics. ILRI (International Livestock Research Institute), Nairobi, Kenya. p 462

Philipsson, J, Eriksson, J.Å. and Stålhammar, H.,2005. Know-how transfer in animal breeding the power of integrated cow databases for farmer's selection of bulls to improve functional traits in dairy cows. In: knowledge transfer in cattle husbandry. EAAP publication 117:85–.

Siegefreid Debrah and Berhanu Anteneh, 1991. Dairy marketing in Ethiopia: Markets of first sale and producers' marketing patterns. ILCA Research Report No.19. ILCA (International Livestock Centre for Africa). ILCA. Addis Ababa, Ethiopia

SNV [Netherlands Development Organization], 2008. Study on Dairy Investment Opportunities in Ethiopia. Addis Ababa.

Shiferaw Y, Tenhagn BA, Bekana M and Kassa T., 2003. Reproductive performance of crossbred Dairy cows in different production systems in the central Highlands of Ethiopia. Tropical Animal Health and Production 25: 551-561

SPSS (Statistical Procedures for Social Sciences). 2003. SPSS Version 12. Illinois, Chicago, USA.

Stall S J and B I Shapiro,1996. The Economic impact of Public Policy in Smallholder Peri-urban Dairy Producers in Addis Ababa. ESAP Publication No. 2.

Shiferaw Y, Tenhagn BA, Bekana M and Kassa T., 2003. Reproductive performance of crossbred Dairy cows in different production systems in the central Highlands of Ethiopia. Tropical Animal Health and Production 25: 551-561

Syrstad, O. 1987. Dairy cattle crossbreeding in the tropics: choice ofcrossbreeding ctrategy. Trop. Anim. Health and Prod. 28: 223–229.

Syrstad O., 1989. Dairy cattle crossbreeding in the tropics: performance of secondary crossbred populations. Livest. Production sci. 23:97-106.

Tadele Alemayehu and Nibret Moges, 2014. Study on Reproductive Performance of Indigenous Dairy Cows at Small Holder Farm Conditions in and Around Maksegnit Town© IDOSI Publications, 2014 Global Veterinaria 13 (4): 450-454, 2014

Tadesse, B., 2002. Reproductive performances of zebu (Fogera) breed in the central highlands of Ethiopia. DVM thesis, Addis Ababa University, Faculty of Veterinary Medicine, DebreZeit, Ethiopia.

Tadesse, M., J. Thiengtham, A. Pinyopummin and S. Prasanpanich, 2010. Productive and reproductive performance of Holstein Friesian dairy cows in Ethiopia, 21.

Tafesse Mesfin, 2001. What should a pastoralist development strategy continue towards povertyreduction among pastoral communities in Ethiopia. In: Proceeding of 2nd Annual Conference onPastoral development in Ethiopia. Pastoral Forum in Ethiopia, May 22-23, Addis Ababa,Ethiopia. 136 p.

Tegegne A, Galal E S E and Beyene K, 1981. A study on the production of local Zebu and F_1 crossbred (European ´ Zebu) cows: Number of services per conception, gestation length and days open till conception. Ethiopian Journal of Agricultural Science 3: 1-14.

Tesfaye A., Yirga, C., Alemayehu, M., Zerfu, E.,Yohannes, 2001. Smallholder livestock production systems and constraints in the Highlands of North and West Shewa 110 zones. In Livestock in Food Security – Roles and Contributions. Proceedings of the 9th annual conference of the Ethiopian Society of Animal Production (ESAP) held in Addis Ababa, Ethiopia.

Trial, J.C.M., 1985. Productivity of respective breeds of imported cattle groups in Africa.
In: Evaluation of Large Ruminants for the Tropics. ACIAR Proceedings Series.*No. 5*. pp. 101-106.

Tsehay Redda, 2002. Small-scale milk marketing and processing in Ethiopia. 352-367 pp. In:Smallholder dairy production and market opportunity and constraints. Proceeding of a southsouth workshop held at NDDB, Anand, India, 13-16 march 2001. NDDB (National DairyDevelopment Board), Anand, India, and ILRI (International Livestock Research Institute),Nairobi, Kenya.

Weigel, K A, and K ABarlass, 2003. Results of a producer survey regarding crossbreeding on US dairy farms. J. Dairy Sci. 86:4148-4154.

Workneh Ayalew and J. Rowlands, (ed), 2005. Design and execution and analysis of livestock production, utilization and marketing systems in East Showa zone of Oromia. 17-28 pp.

Workneh Ayalew, Zewdu Wuletaw and Haileyesus Abate, 2002. Highlights of the rapid field survey on cattle genetic resources in North and South Gondr zones. Submitted to Integrated livestock development project- Gondar, Ethiopia.World's Animal Genetic Resources for Food and Agriculture. FAO, Rome, Italy

Yifat, D., Bahilibi, W. and Desie, S., 2012. Reproductive performance of Boran cows at Tatesa cattle breeding center. Advances in Biol. Res. 6 (3): 101-105.

Yigrem, S., Beyene, F., Tegegne, A., Gebremedhin, B.,2008. Dairy production, processing and marketing systems of Shashemene–Dilla area, South Ethiopia. IPMS (Improving Productivity and Market Success) of Ethiopian Farmers Project Working Paper 9. ILRI (International Livestock Research Institute), Nairobi, Kenya. 62 pp.

Yitaye, A., M. Wurziger, Azage. T and W. Zollitsch, 2007. Urban and peri-urban farming system and utilization of the natural resources in the north Ethiopian highlands: In proceedings of Conference on International Agricultural Research for Development, 9-11 October 2007, University of . Gottingen, Germany, pp: 13.

Zavadilova L, Nemcova E, Stipkova M, Bouska J.,2009. Relationships between longevity and conformation traits in Czech Fleckvieh cows. Czech J. Anim. Sci. 54 (9):387-394

Zegeye Yigezu, 2003. Challenges and opportunities of livestock marketing in Ethiopia. In: Proceedings of The 10 annual conference of Ethiopian Society of Animal Production (ESAP), 22-24 August 2002 held in Addis Ababa, Ethiopia, 7: 47-54.

Zewdu, W., 2004. Indigenous cattle genetic resources, their husbandry practices, and breeding objectives in northwestern Ethiopia. M.Sc. thesis. Alemaya University, Alemaya, Ethiopia

7. APPENDIX

7.1. Appendix Tables

Appendix: Table1 Total family size and family member's working on field

	Across all PA of production systems																	
	Inchini Town (n=23)			M/chobot (n=33)			Kitto (n=24)			Ejere Town (n=20)			Chiri (n=27)			Damotu (n=53)		
	mean	Min	mx	mean	min	mx	mean	min	max	mean	min	mx	mean	min	mx	mean	min	mx
House hold size	5.47	2	10	8.2	4	12	7.17	3	12	4.83	2	9	5.5	3	13	5.9	1	11
Family members working on farm	3.33	1	6	4.2	2	8	3.83	2	8	3.30	1	6	3.53	2	7	3	1	6

n= number of farmers, min= minimum, mx= maximum

Appendix: Table: 2 mechanisms how to get first Crossbred Animal

Way to gate first Crossbred	Frequency	Percent
Supplied by LFRO and ARC	76	42.2
Crossing local cow/heifer with exotic breed by AI	56	31.1
Natural Mating local cow/heifer with exotic breed Bull	16	8.9
Bought from market	12	6.7
Supplied by NGO	20	11.1
Total	180	100

LFRO = livestock and fish resource Office, ARC= Agricultural research center, NGO = nongovernmental organization, AI=Artificial insemination

Appendix Table: 3. Participation of household members in dairying activities

Household members	Milk and milk product processing		Transporting milk and milk product to market		Milking		Processing on Farm		Breeding decision	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Head	0	0	26	14.4	12	6.7	75	41.7	171	95
Spouse	134	74.4	14	7.8	140	77.8	27	15.0	7	3.5
Children	26	14.4	92	52.1	12	6.7	31	17.2	2	1.1
Workers	20	11.1	48	26.7	16	8.9	47	26.1	0	0
Total	180	100	180	100	180	100	180	100	180	100

Appendix Table: 4. Exotic blood level preference of Cow/heifers across study site

Preferred exotic blood level	percent of house hold give ranking					Index
	1st	2nd	3rd	4th	5th	
Local (0%)	6.1	0	0	0	45.6	0.05
< 50%	8.3	0	0	32.2	0	0.08
50-75%	56.1	23.9	1.7	.6	0	0.29
> 75%	7.2	68.9	29.4	.6	0	0.3
100%	7.2	.6	65.6	59.4	1.1	0.27
Total	84.9	93.4	96.7	92.8	46.7	

Index = [(6 for rank 1)+(5 for rank 2)+(4 for rank 3)+(3 for rank 4)+(2 for rank 5) (1for rank 6)] divided by sum of all weighed reasons mentioned by respondent

The cow/heifers with an exotic blood level of > 75% are preferred by the majority of respondents

Appendix Table: 5 Major Constraint in Dairy production in study area

Type of input	Percent of farmers give rank				Index
	1st	2nd	3rd	4th	
Feed	36.1	43.3	31.1	11.1	0.33
Improved breed	31.7	41.7	33.9	18.3	0.32
AI	25	15	18.9	27.8	0.24
Medicine	7.2	0	16.1	42.8	0.10
Main problem on feed supply	Percent of farmers give rank				
	1st	2nd	3rd		Index
Price and shortage of concentrate feed	48.9	37.2	48.9		0.51
Price and shortage of mill byproduct feed	42.2	4.2	42.2		0.34
Shortage supply improved forage seed	8.9	21.1	8.9		0.15
Main problem on improved heifer/bulls supply	Percent of farmers give rank				Index
	1st	2nd	3rd		

Shortage of supply	37.2	48.9	48.9	0.43
Type of breed to be supply	41.7	41.2	42.2	0.41
Exotic blood level to be supply	21.1	8.9	8.9	0.15

Appendix Table: 6. Constraint on supply and price of Concentrate feed for animal

Status of feed	Union		Cooperatives		Traders		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Supplied by	130	72.2	31	17.2	19	10.6	180	100
Cost of Concentrate feed in Birr/kg. from different source	15birr/kg		15birr/kg		20birr/kg		--	-
Major problem	Very cost		Shortage of Supply					
	Frequency	Percent	Frequency	Percent	-	-	-	-
	161	89.4	19	10.6	-	-	180	100

Appendix: Table: 7. Ranking reason for adoption levels and feeding system of crossbred animal

Type and Source of feed	Number of house hold ranking					Index
	1st	2nd	3rd	4th	5th	
Hay &Crop residue	148	87	65	33	26	0.5
Industrial byproduct and concentrate feed	28	68	67	3	9	0.23
Improved Developed forage	0	1	26	116	26	0.13
Silage	0	24	22	24	107	0.12
Grassing/natural Grass	4	0	0	3	11	0.01
Total	180	180	180	180	179	

Index = [(5 for rank 1) + (4 for rank 2) + (3 for rank 3) +(2 for rank 4)+(1for rank 5)] divided by sum of all weighed reasons mentioned by respondent

Appendix: Table: 8 Ranking reason for adoption levels and feeding system of local animal.

Type and Source of feed	Number of house hold ranking					Index
	1st	2nd	3rd	4th	5th	
Grassing/natural Grass	148	87	65	33	26	0.5
Hay &Crop residue	28	68	67	3	9	0.23
Improved Developed forage	0	1	26	116	26	0.13
Silage	0	24	22	24	107	0.12
Industrial byproduct and concentrate feed	4	0	0	3	11	0.01
Total	180	180	180	180	179	

Index = [(5 for rank 1) + (4 for rank 2)+(3 for rank 3)+(2 for rank 4)+(1for rank 5)] divided by sum of all weighed reasons mentioned by respondent

Appendix: Table 9. Cattle breeding objective and rank of parameters from farmer's prospection on study area

Main objective of keeping animal	Number of respondents							
	First Frequency	Second Frequency	Third Frequency	Forth Frequency	Fifth Frequency	Sixth Frequency	seventh Frequency	Index
Milk	101	33	38	7	1	0	0	0.22
Meat	2	2	16	33	99	25	3	0.11
Drought power	15	49	15	55	29	4	1	0.15
Source of income	51	72	42	9	3	1	1	0.21
Asset accumulation	10	24	55	47	27	16	1	0.15
Social culture	1	1	2	2	4	0	170	0.04
Manure	0	0	0	26	20	130	4	0.08

Index =[(7 for rank 1)+(6 for rank 2)+(5 for rank 3)+(4 for rank 4)+(3 for rank 5)+(2 for rank 6) (1for rank 7)] divided by sum of all weighed reasons mentioned by responden

7.2. Appendix. Questionnaire Used to collect information from dairy farmers

I. House hold characteristics

A. Socio economic information of respondent

Enumerator's name ____

1. Woreda ________________________ kebele _______________________
2. Name of interviewee ________________________ Sex ______ age _______
3. Sex of Household head ___________ 1= Male 2= female
4. Age of the house hold head ____1= below 25 yrs 2= 25 yrs to 35 yrs 3= 36yrs to 45 yrs 4= 46 yrs to 65yrs 5= above 66 years
5. Occupation of the household head__ 1= off- farm self- employment 2= Formal employment 3= Farming
6. Household size ______ 1. 2 2. 3-5 3. 6-9 4. Above 9
7. Marital status of the farmer _________ 1 = Single 2= Married 3= Separated/divorced 4= widowed
8. Production system of the area _______ 1= Rural; 2 = Peri- Urban 3 = Urban
9. Total Number of House hold Member

	Age group					
	<2	2-10	11-15	16-30	31-50	>60
Male						
Female						
Total						

10. Educational status

Category	Educational level			
	Illiterate	1-7	7-12	>12
Male				
Female				
Total				

11. Land holding (hectares)___________

	Purpose	Own	Rented	Communal
1	Crop (including fallow land)			
2	Grazing & Forage production			
3	Irrigated land			
4	Other/______________________/			
5	Total			

12. What was the trend of land holding for the last ten years? 1= increasing 2= No change 3= Decreasing

13. Number of Livestock resources& Utility by type, sex & age

	Livestock type		Breed type			Total	Most important species
			local	Cross/exotic			
1	Claves (<1 year)	Male					
		Female					
2	Heifer	Age(<1yr)					
		age(1-2yr)					
3	Bulls						
4	Oxen						
5	Dry cows						
9	Lactating cows						
7	Sheep						
8	Goats						
9	Equines						
10	Poultry						
11	Beehives		Tradition	Transition	Modern		

14. Herd structure

15. Please specify the composition of your cattle herd: Tell me how many animals per category you own

Type	Breed					
	1:crossbred (n=)1 with blood level			2: Boran (n =)2	3: other local breed (n =)3	3: exotic (n =)4
	1. <50%	2. <75%	3. >75%			
1:cows						
2: heifers						
3: bulls						
4: oxen						
5: calves						
Total						

16. What is your major farming activity? 1= Livestock production2= Crop production 3= Mixed production

17. What is the source of feed provided to your livestock? Rank them according to the order of their use

1. Communal grazing _____2. Crop residue_____ 3. Developed forage____ 4. Agro-industrial by product ___

(give 1, 2, 3,4 rank)

18. What is the source of water for dairy cattle? 1. Pond/dam 2. River 3. Pipe water 4. Rain water

19. Do you clean the house of the dairy cattle? 1. Yes 2. No

20. If your answer is yes, what the frequency of cleaning? 1. Daily 2. Weekly 3. Monthly

21. Do you have veterinary service in your area? 1. Yes 2. No

22. If yes, how far from your home? 1. >1 km 2. 1 km 3. 1-5km

B. Labor Distribution

23. Who is responsible for following dairy management activities?

A. Herding, Fodder harvesting & feeding:

1. Head 2. Spouse 3. Children 4. Workers

D. Milking:

1. Head 2. Spouse 3. Children 4. Workers

E. Transport of milk and milk products to market/cooperative

1. Head 2. Spouse 3. Children 4. Workers

F. Processing on farm:

1. Head 2. Spouse 3. Children 4. Workers

2. Characterization of Reproduction and production of indigenous and crossbred with different exotic blood level

24. How much did you earn from crops last year? In Money ______________________

25. How much did you earn from dairy last year? In Money ______________

26. How much milk did you sell on a usual day? L/day ____________

27. How much milk is processed into butter and cheese on your farm on a usual day? L/day____________

27. How much milk is consumed at home on a usual day? L/day____________

28. What is the most important use of milk on your farm? Rank them

1. Baby consumption____ 2. Used as watt_____3. Used as drink water____ 4. Used as economics source (sale)______

29. Histories/ Origin and Exotic blood level of Current your Crossbred cows now you have (interviewed for)

No.	Exotic Blood level(%) of mother of your current cow	Exotic Blood level(%)father/ AI bull /of your current cow	How many Cycle of crossing to get your current cow? (Number of cross)	Judgment for Exotic blood level of current cow (%)
Cow 1				

Cow 2				
Cow 3				
Cow4				
Cow5				
Cow6				
_____				

30. Which exotic blood level do you prefer in cattle you use for Reproduction and production? /Give sign of √ /

Breeding animal	preferred exotic blood level					
	1: Local	2: <50%	3: 50%	4: 62.5%	5: 75%	6: 100%
1: heifers and cows						
2: bulls/AI						

31. Why do you prefer these levels of exotic blood level for heifers/cows and bulls? Rank them.
1. Adaptation and resistance ability____ 2.Reproduction and production capacity_____ 3. Management and handling availability______

32. What the Reproduction and production performance of indigenous and crossbred different exotic blood level of your dairy cattle?

No.	Reproduction & production trait performance	Indigenous and exotic blood level							
		Local	<50%	50%	62.5 %	75%	87.5%	100%	
								HF	Jersey
1	Age at puberty (year)								
2	Age at 1st calving (year)								
3	Calving interval (year)								
4	Day open (days)								
5	Lactation length (month)								
6	Daily milk yield (litter)								
7	Milk production per lactation(L)								

8	How much milk/Litter needs to be churned to get 1 kg of butter?								
9	Milking frequency/day(No.)								
10	No. of service per conception (No.)								
11	Longevity/Replacement (year)								
12	Fertility rate (%)								

33. How much milk production of your crossbred cows (L/day) Highest______lowes_______ Average of all cows______

33. How much milk production of your local cows (L/day) Highest_________lowes_______Average of all cows______________

I. Factors that affect Efficiency of Crossbred and Indigenous cows

34. What are the most difficult challenges of dairy cows production? rank the constraints (1-5)
1. Feed resource___ 2. Disease____ 3. Watering___ 4. Housing____ 5. Poor genetic poetical___

35. Is there any reproduction health problem in your Crossbred/local cattle you have? 1. Yes 2. No

36. If yes what the of reproduction health problem? rank them 1. Reproductive disorders___ 2. Mastitis___ 3. Abortion____ 4. Dystocia___ 5.Uterine prolapsed___ 6. Repeat breeder___ 7. Anoestrus____ 8. Mixed problems ______

37. How do you treat your diseased Crossbred/local cattle?
1: vaccinations 2: treating sick animals 3: prophylaxes against parasites 4: other specify________________

38. Are there diseases that only crossbred cattle get? 1. Yes 2. No

39. If yes what type of Diseases? 1. Tuberculosis 2. Brucellosis 3. Malnutrition/Calcemia 4. all the above

40. Is it worth all the trouble and expense of crossbred dairy animal? 1: yes 2: no

41. If yes what the type of worth?
1. Burden of work 2. UN availability of input delivery 3. Faller of milk price during festival

42. Have you faced failure of any cross breeding program (AI/Bull service)? 1. Yes 2. No

43. If yes what do think the reason for the failure?

No	Variable	Priority/Rank with(1-5)
1	Heat detection problem	
2	AI technician efficiency problem	
3	Distance of AI/bull service centre	
4	Shortage of AI technician	

5	Shortage of input delivery	
6	Disease problem	
7	Other specify_______________	

II. Management of Dairy Animal

44. What did/do you feed local cows? (rank them 1-6)

1. Grazing/ Foraging __ 2. Hay___ 3. Green feed (legumes, grass, legume trees)____

4. Crop residue (Sorghum and maize Stover, wheat straw)____

5. Concentrate (Grains, oil seed cakes, wheat bran, commercial mix, brewery spent grain and molasses) ___

6. Mineral supplement (Common salt)______

45. What do you feed crossbred cows? (rank them 1-6)

1. Grazing/ Foraging___ 2. Hay____ 3. Green feed (legumes, grass, legume trees)____

4. Crop residue (Sorghum and maize stover, wheat straw)____

5. Concentrate (Grains, oil seed cakes, wheat bran, commercial mix, brewery spent grain and molasses)___

6. Mineral supplement (Common salt)____

46. Do you use new feedstuffs since you started with crossbreeding? 1: yes 2: no

47. If yes which new feedstuffs have you introduced?

1. Improved forage 2. Industrial by product 3. Concentrate feeds 4. All the above

48. How did you learn about these new feedstuffs? Through Training by?

1. Government through extension program 2. By NGO 3. By Cooperative 4. From neighbor

49. How do you feed local cattle? 1. Grazing cows by its ownself 2 sub grazing 3. Cut and carry system

50. How do you feed crossbred cattle?

1. Grazing cows by awn self 2 sub grazing 3. Cut and carry system 4. All of the above

51. How did you learn about new feeding and housing system of your dairy cows?

Who told you? 1. Government through extension program 2. By NGO 3.By Cooperative 4. From neighbor

53. Did you house your cattle before crossbreeding? 1. Yes 2. No

54.Do you need the veterinarian more often now or before crossbreeding? 1: yes2: no

55. For what do you need the veterinarian more often? 1: vaccinations 2: treatment of sick animals 3: prophylaxes against parasites 4: help for calving difficulties 5: other specify_____________________________

56. Do you face to any adaptation problem in case of crossbred dairy cattle? 1. Yes 2. No

57. If yes in case of what adaptation problem you face? 1. Feed 2. Environment 3. Housing 4. all

58. What the opportunity for you to continue your dairying with crossbred animal?

1. Availability of input delivery 2.Increase demand of milk 3. My area is milk shed area 4. All of them

III. Input delivery for dairying

59. Have you accessed and breeding services in the last ten year? 1. Yes 2. No

No	Year	Type of breeding system used in the farm 1. Bull scheme 2. AI services 3. Others, specify	Organization that is offering the scheme 1. Govt 2. NGOs 3. Private practitioner	You have to pay for the service 0. No 1. Yes	If yes, how much did you pay per animal(Birr)	The service was administered by 1. Government AI technician 2. Government Vet Assistant 3.Private AI technician 4.Private vet assistant	Were you satisfied with the performance of the person? Code 1-4	Have to pay for the person's transport costs? If no, write no if yes, fill amount
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

59.1. If yes, specify the service below

60. How do you get the first information about Crossbreeding program _______? 1= Extension agent 2. AI technician 3. Project agent farmers 4. Neighbors 5. From other area (specify______________________)

61. Did you ask also other people for more information about crossbreeding? 1: yes 2: no

62. If yes which other people did you ask for information on crossbreeding? 1: farmer 2: extension staff 3: NGO staff 4: Researcher 5: cooperative member

63. As a user of dairy animal for milk and milk products do you get the service (AI/Bull) regularly and without interruptions? 1. Yes 2. No. If your answer for question No. 63 is no, what is the reason for this?

1. The service is not available on weekends & holidays 2. There is shortage of AI technicians (AITs)

3. There is shortage of bull service 4. Shortage of input 5. All of the above 6. Others: Specify __________

64. If you do not get the service what do you do? 1. Pass the date without breeding the cow 2. Use Natural mating (NM)

65. How do you communicate with AI technicians for breeding purpose?

1. AITs visit us daily 2. We call AITs when we need them 3. We take our cows to the AI station

66. Do you let male animals go a long with the herd? 1. Yes 2. No

67. Do you have any say in the selection of the type of semen you use? 1. Yes 2. No

68. In relation to the above question, what factors would you use to choose the type of semen given, the chance?

1. Milk production 2. Beef type 3. 1&2 4. Others ______________

69. Have willing use if sexed semen is supply for you? 1. Yes 2. No

70. If yes what type sex you want to use 1. Male 2. Female

71. What you think breed improvement speed with sexed semen compared to unsexed semen? 1. It is very accelerating 2. It is the same 3. It is less than the normal AI or no change

72. Which breed do you consider suitable for cross breeding with zebu? 1. Holstein 2. Jersey 3. Graded Crossbred

73. Have you dairy cattle before you attend crossbreeding? 1 yes 2 no

74. How did you get your first crossbred cow? 1: own local cow X AI with exotic semen 2: own local cow X crossbred exotic bull 3: bought crossbred animal 4. It supplied for me by BoA 5. It supplied to me by ARI 6.Supplied to me by NGOs 7. Supplied to me by Cooperatives

75. If you buy how much cost of it?________________________

76. How many crossbred heifers did you receive in total? _____________

77. Did you get support with crossbreeding (full package from elsewhere; heifers or AI)? 1: yes 2: no

78.If yes specifies Organization: 1. Government org. 2. NGO 3. Cooperatives 4. Private sector 5. Other__

79. How did the organization which implemented crossbreeding support your breeding activities?

1: Give training 2: Give crossbred heifers/ calves3: Give AI service 4: Give veterinary services

80 Have you participated in synchronization program? 1.Yes.. 2. No…

81 What is your opinion on the regular AI service versus the synchronization program? Is synchronization more efficient than regular AI? 1. Yes 2. No

Questionnaire on feed delivery

81 what do you feed your crossbred animals? 1. Wheat bran 2. Fagulo 3. Mixed feeds 4. Home-grown improved forages like napier,grass 5. Atella 6. Natural grass

82. How much per day you feed your Crossbred Dairy cows /kg? ________

83. Does feeding differ during early, mid and late lactation period? 1.Yes 2. no.

81 what do you feed local cows? 1. Wheat bran 2. fagullo 3. mixed 4. home-grown improved forages like napier,grass 5. atella 6. Natural grass

82. How much per day you feed your local dairy cows/Kg? ______

83. Does feeding differ during early, mid and late lactation? 1.Yes 2. no.

84. Do you get concentrate feed for your animal? 1. Yes 2. No
85. If yes, who are the suppliers? 1. BoA supplies concentrate feeds, 2. traders 3.Uniens 4. Cooperatives
86. What are the constraints on feeding? 1. Not available, 2. Very cost 3. Seasonality of feed availability . 4. Lack of knowledge on feeding
87. Is there forage development practice in your area? 1. Yes 2. No
88. If yes who precede forage development with you? 1. Government 2. Cooperatives 3. Union 4. NGO
89. Who supply improved forage seed for you? 1. Government 2. Cooperatives 3. Union 4. NGO
90. Are you practice forage conservation? 1. Yes 2. No
91. If yes what the type of forage conservation? 1. Hay making 2. Silage making 3. By feed processing

IV. Dairy product Marketing system

92. Did you sell milk? 1: yes 2: no
93. Where did you sell milk?
1. Local market 2. Milk union 3. Rented person 4. Hotels 5. Processors
94. Do you learn about the markets? 1. Yes 2. No
95. If yes who give Training for you? 1. Government through extension program 2. NGO 3. Cooperative 4. All of the above
96. Which dairy product you produce mainly?
1. Milk 2. Butter 3. Cream 4. All of them
97. Where do you sell your dairy products?
1. Local market 2. Milk union 3. Rented person 4. Hotels 5. Processors
98. Do you face any challenges in milk marketing? 1. Yes 2. No
99. If yes what type of challenge? Rank them
1. Price fall during festival____ 2. Price fluctuation ____ 3. Problem of infrastructure to supply milk____ 4. Unbalance price of milk with feed of dairy_____
100. What the impact of crossbred on your household income
1. It increase income/year
2. Increase food security

I. Cattle breeding objective

101. What is the main objective of keeping/Breeding cattle?

	Breeding objectives (S)	Rank 1. Most important) 2. Important; 3. Least important; 4. Not important;
1	Milk	
2	Meat	
3	Draught power	
4	Income	
5	Asset Accumulation	
6	Social cultural	

7	Manure	
8		
	Other	Specify ________________________

II. Current breeding practices

101. Do you have own one (or more) bull(s)? 1: yes2: no

102. If yes specify number of bull(s) ________: breed of bull(s):______________

103. If you do not own a bull, in which other way do you mate your cows?

1: bull from other farmer 2: research/bull station bull 3:AI 4: other (specify) ___________

104. Are you face any problems of inbreeding? 1. Yes 2. No

105. If your answer is yes, give examples ______________________

106. Is there now an artificial insemination service/bull available for you? 1: yes2: no

If yes (*specify*: AI service or bull service)____

107. How much does the artificial insemination/bull service cost per service?________________________

108. Is this an acceptable price for you? 1. Yes 2. No

109. What is the maximum price you would be ready to pay for artificial insemination/bull service?

AI______________________ Bull service_____________________________

110. How many services are necessary on average for a successful insemination? for Local and crossbred cow________ and_________

111. Have you continued with crossbreeding? 1: yes 2: no

112. What the use of crossbreeding?

1. Good efficiency of program 2. Best production and reproduction of crossbred animal 3. Availability of input for program 4. Due to increase of milk demand 5. Other specify____________________

III. Questioner for Crossbred Animal beneficiary

113. Have you used a different exotic breed for crossbreeding with local cattle? 1: yes 2: no

114. Which breed have you used for crossbreeding?

1. Holstein-Friesian 2. Jersey 3. Locally crossbred animal

115. Would you be continued using a different exotic breed for future crossbreeding? 1: yes : 2: no

116. If yes which breed(s)? 1. Holstein-Friesian 2. Jersey 3. Locally crossbreds

117. How did you learn about exotic breed(s)? 1. From agricultural extinction 2. From research center3. Cooperatives

4. from Neighbor

118. Why would you like this exotic breed? 1. Milk production 2. Butter fat content 3. Ability to resistance 4. Simple Management

119. Did your herd size changed after you started with crossbreeding? 1: yes 2: no

120. How big was your herd before crossbreeding? In number_______________

121. How big is your herd after crossbreeding? In number____________________

3. Questionnaire used to collect information from researcher / ranch for input delivery

1. Have your institution provide different exotic breed/ cross of dairy cattle for farmers for genetic improvement strategy?
1: yes 2: no
2. If yes What type of breed it distributes for users?
1. Holstein-Friesian 2. Jersey 3. Locally crossbred animal
3. Where the institution is getting those exotic breeds/ cross?
1. Reproduce by own self 2. Import from other country 3. Select best performed from farmers and redistribute it
4. Which exotic breed is more acceptable by users/ farmers?
1. Holstein-Friesian 2. Jersey 3. Locally crossbreds
5. Why it is more acceptable by users? 1. Due to milk yield 2. Due to resistance of disease 3. Due to butter fat content
6. Have this institution was distribute other inputs for dairy development in the area?
1. Yes 2. No
7. If yes what type of input it supply for beneficiary?
1. Concentrate feed 2. Industrial by products 3. Improved forage seed 4. Milk processing materials
8. What other technical's the institution provide for users? 1. Extensional support 2. Training 3. Other specify______
9. What the status/ Ideology of farmer /beneficiary on the Dairy development in the last ten years?
1. Positively changed 2. Negatively changed 3. No change
10. Is there satisfaction of farmers/ beneficiary on the technology the institution was provided?
1. Yes 3. No
4. Questioner for Milk and Milk product Collectors, Processers and retailers

1. Is there a problem on the quality and quantity of milk on market? 1. Yes 2. No
2. What the major problems on milk and milk product marketing?
1. Quantity problems 3. Hygiene problem 3. Unbalance of Demand and supply
3. Is there problem on milk marketing? 1. Yes 2. No
4. If yes what the type of market problem?
1. Seasonal price fluctuation 2. Price unfair 3. Demined is seasonally different
5. What the maximum price of milk/Litter during high price of milk in birr?______
6. What the maximum price of milk/Litter during low price of milk in birr?______
7. As you think what the fair price of milk/Litter in birr in every season?_________

5. Questionnaire used to collect information from Animal Experts & researchers

1. As you think which genetic improvement strategy is best to accelerate genetic improvement local animal and rank them

   1. Conventional AI__________
   2. Synchronization & AI___________
   3. Natural Cross breeding with exotic bull 4._______

2. As your opinion why it is best?____

3. Who is owner of your first rank program? 1. Government 2. NGO 3. Private Person 4. Unions

4. What about input supply for genetic improvement in your area/District
 1. Available 2. Somewhat available 3. Not available

5. What you think about conventional dairy cattle breed improvement program by cross indigenous cattle with exotic breeds in last ten years?
1. Succeed over faller 2. Faller greeter than success 3. No change

6. Do you think that conventional breed improvement program/Normal AI is satisfies the users/beneficiary in your work area? 1. Yes 2. No

7. If No what the problem that case dissatisfaction of the users?/rank them as severity
1. Shortage of crossbred animal __________
2. Shortage of input supply ____________
3. Shortage of AI technician ____________
4. Seasonal problem _______________
5. Lack of appropriate heat identification of farmers ________

8. In your work area is there cross breed female animal are preferred than Male by farmers?
1. Yes 2. No

9. If yes what the reason you think for that 1. Milk production is common in area 2. Demand of milk is increase 3. Crossbred female heifer has high price to sell 4. All of the above

10. Do you think that if female sexed semen is provide for users productivity of milk is increase 1. Yes 2. No

11. Are you face for any fail of breed improvement program 1. Yes 2. No

12. If yes what you think the major that case faller?/ Rank them

No	Variable	Priority
1	Heat detection problem	
2	AI technician efficiency	
3	Distance of AI centre	
4	Absence of AI technician	
5	Disease problem	

6	Shortage of input supply	
7	Program doing during mismatch with season/Environment	
8	Cattle/ cow management problem	
9	Other_____________	

13. As expert/ Researcher of an Animal what you think to success the breed improvement program?/Rank them(1-4)

1. Running the program at proper season /matching with feed resource ____
2. Supplying adequate input ______
3. Training AI technician_______
4. Training farmers to manage their cow/heifer and heat detection______

14. As a researcher are you satisfied with the overall breed improvement program in your area? 1. Yes 2. No

15. If it is provided with reliable and regular service for breed improvement, would you mind raising the service change? 1. Yes 2. No

16. How do you evaluate the service of breed improvement in your area? 1. Cooperative 2. Non – cooperative

6. Questioner for Milk monitoring study

1. What the about your cows which you used for milk production now (Indigenous, crossbred or Exotic) cows?

Sheet of Milk yield Monitoring:- Production system of the area _____________

Name of House hold __________________Woreda ________kebele________

No.	Anima l Code	Breed 1-3 1=local 2=cross 3=exotic	Blood level(%) (1-4) 0=0% 1 <50% 2<50-75% 3>75%	Duration of lactation (1-3) 1=early 2=mid 3=late	Days of milk yield in Litter(L)Monitoring Morning and afternoon lactation												
					Month 1- Month 6												
					Week1			Week2			Week3			Week4			Remark
					Thursday			Thursday			Thursday			Thursday			
					AM	PM	Tot	AM	PM	Tot	AM	PM	Tot	AM	PM	Tot	
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	

9																	
10																	

Note. Thursday was test day AM= Morning PM = Evening Tot = Total daily milk yield

1.Type of Breed (1-3) 1. Local 2. Crossbred 3. Exotic animal

2. ExoticBlood level(%) (1-4) 0=0%, 1=<50%, 2=50-75%% 3= >75%

3. Stage of lactation(1-3)1. Early (1–2 months), 2. Mid (3–4 months), 3. late (5–6 month)

6. Questioner for Milk monitoring study