SCHOOL OF GRADUATE STUDIES

ASSESSMENTS OF THE PRODUCTIVE AND REPRODUCTIVE PERFORMANCES OF LOCAL AND CROSS BRED DAIRY CATTLE IN SELECTED DISTRICTS OF GURAGHE ZONE, CENTRAL ETHIOPIA

M.Sc. THESIS

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Assessments of the Productive and Reproductive Performances of Local and Cross Bred Dairy Cattle in Selected Districts of Guraghe Zone, Central Ethiopia

A Thesis Submitted to, School of Graduate Studies, in Partial Fulfillment of the Requirements for the Degree of Master of Science (M.Sc) in Animal Production

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APPROVAL SHEET

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We hereby certify that we have read and evaluated this Thesis entitled "**Assessments of the Productive and Reproductive Performances of Local and Cross Bred Dairy Cattle in Selected Districts of Gurahge Zone, Central Ethiopia**" prepared under our guidance by Abebe Hailemariam Abdela. We recommend that the Thesis shall be submitted as fulfilling the requirements for the award of a M.Sc. degree in Animal Production.

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As members of the Board of Examiners of the Master of Science Thesis open defense examination, we have read and evaluated this thesis prepared by Abebe Hailemariam Abdela and examined the candidate. We hereby certify that the thesis is accepted for fulfilling the requirements for the award of the degree of Master of Science (M.Sc.) in Animal Production.

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Final approval and acceptance of the thesis is contingent upon the submission of its final copy to the Council of Postgraduate Program (CPGS) through the candidate's department or school graduate committee (DGC or SGC).

DEDICATION

This work is dedicated to my lovely wife, W/ro Tesfanesh Jamal, my kids, Meklit Abebe, and to the poor farmers who keep the local cattle for the wealth.

DECLARATION

I therefore declare that this thesis is my original work and that I have gratefully recognized all of the sources of the materials utilized in it. I prepared, gathered, analyzed, and finished this thesis in accordance with all academic ethical standards. This thesis was prepared with a great care to ensure that no plagiarism existed.

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BIOGRAPHICAL SKETCH

The author was born at Yetbon Kebele, Meskan woreda, East Guraghe zone, Central Ethiopian Regional State, on August 20, 1995, G.C. When he reached school age, he attended his elementary school at Project mercy Medhanialm Elementary School from 2002 to 2009 G.C. He then attended at project mercy medhanialem school and high school at Project mercy medhanialm secondary school from 2010 to 2013G.C.He enrolled at Assosa University in 2014G.C and earned a B.Sc in Animal Science in July 2016 G.C. Immediately after graduation, he was employed by the Gurage Zone Agricultural Bureau and started his work in Endrgnagn woreda as Kebele Enterprise expert From 2017 to 2018G.C Welacho kebele

He was deputy to the head office of the Agriculture and Natural Resources Becha Kebele from 2019 to 2020 G.C. He was the animal disaster risk management officer for the Agriculture and Natural Resources office in the Guraghe zone Endegagn district deputy. In conclusion, starting in 2021, G.C. In October 2022, G.C. began his MSc studies at Wolkite University's Department of Animal Science, College of Agriculture and Natural Resources, for the 2022–2025 academic year.

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LIST OFABBREVIATION AND ACRONYMS

ADY	Average daily milk yield
AFC	Age at First Calving
AFS	Age at Frist Service
AI	Artificial Insemination
CI	Calving interval
CSA	Central Statistical Agency
DONRD	Department of Natural Resources Development of Guraghe Zone
DAWs	Development Agent Workers
DOFED	Department of Finance and Economic Development
DO	Day open
GNRH	Gonadotropin Releasing Hormone
GZADO	Gurage Zon Agricultural Development office
GZLFRO	Guraghe Zone Livestock Fishery Resource Office
IOI	Insemination ovulation interval
LL	Lactation length
MOFED	A Ministry of Finance and Economic Development
NSC	Number of Service Per Conception
PAS	Peasant Associations
PARI	Program of Accompanying Research for Agricultural Innovation
PGF2α	Prostaglandin F2alpha
PPS	Probability Proportion to size
SNNP	Southern Nations Nationalities and Peoples
SSWARDO	Southern Sodo Wereda Agricaltural Rural Development Office
SPSS	Statistical Package for Social Sciences

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ABSTRACT

The study was conducted at Meskan, S/sodo and Endegagn in Gurage Zone, Central Ethiopia, aimed to assess the Productive and Reproductive Performance of Local and Cross Bred Dairy cattle .Three districts namely Meskan, Endegagn and S/Sodo were purposively selected based on AI services. A total of 379 respondents (155 from Meskan, 102 from Endegagn and 122 from S/Sodo) systematic sampling selected. All the collected data were analyzed using SPSS version of 20. Average daily milk yield of local and Crosse bred dairy cows in Meskan, S/sodo and Endegagn district daily milk yiled of were found1.33±0.05, 1.31±0.13, and 1.3±0.05 liters, respectively. Whereas crossbred cows produced 6.42±0.44, 4.67±0.34, and 2.9±0.24 liters, respectively.—Total lactation length Local and crossbred cows in 4.16±0.13, 3.27±0.21and1.54±0.221liters, respectively Meskan, S/sodo and Endegagn whereas crossbred cows. 4.9±0.1, 3.23±0.2and2.61±0.22 liters, respectively.AFC Local and Cross bredcows39.35±2.06, 37.2±2.0 and36.23±1.4 months respectively. Whereas crossbred cows 28.5±2.1, 26.02±1.7 and25.04±1.3 months, respectively.(CI) Local and Cross bredcows19.14±1.6,17.5±1.4and15.5±1.5liters,respectively. Whereas crossbred cows17.5.±1.01, 15.02±0.97and10.51±1.02 liters, respectively The estimated daily milk yield of local and crossbred cow were found to be 1.31±0.12 and 4.61±0.34 liters, respectively. The estimated lactation yield of local and crossbred dairy cow in the study area were 350.2±1.74and 1489.31±11.89liters, respectively. The average age at first service of local and crossbred dairy heifers in the study areas were37.6±1.82 and 26.52±1.70 months, respectively. The ages at first calving (AFC) of the indigenous and crossbred were 48.24±2.24and 37.65±2.10 months, respectively. The average calving intervals of local and crossbred dairy cows in the study area were 17.38±1.2 and 14.34±1.0 months, respectively. In parametrs we have studied crossbred animals are showing better performancs, than the local animals, even though both are showing low performances Generally, concluding the production and reproductive performances of dairy cattle the study area will be difficult without, coordinated interventions from all the stakeholders. Specially With focuses on feed helth, environment etc. With proper management.

Keywords: *days open (DO),* estrus cycle. *calving interval (CI),* heat periods.

1. INTRODUCTION

1.1. General Background

Dairy production is essential to economic development, particularly in underdeveloped nations where it leads to both economic growth and profit. It is utilized as a business, is financially viable, and makes a substantial contribution to the alleviation of poverty, food security, family nutrition, income, and employment opportunities (Kumar *et al*., 2014).The portion of animal products in total food budget increases faster than that of cereals due to relatively high-income elasticity of demand for animal products (Dayanandan, 2011).

Ethiopia is one of the countries with the largest livestock wealth in Africa, and the estimated number of cattle in the national herd in Ethiopia is about 70 million cattle. Out of this, 56% of female's cattle, 97.4% of the country's indigenous cattle, and the remaining 2.3% and 0.31% are hybrid and exotic breeds, respectively. There are 10 million dairy cows in Ethiopia, producing approximately 3.2 billion liters on average per cow per day over a lactation period of 180 days (CSA, 2021). Although the largest cattle population in Ethiopia productive and reproductive performances are very poor (Yosefe *et al.*, 2003; Belay *et al.*, 2012 and Melku *et al.*, 2016). Similarly (Niraj *et al.,* 2014b) and (Nibret *et al*., 2014) reported that reproductive performance of dairy cows will found to be less than the optimum values desirable for profitable milk production in different parts of Ethiopia.

According to (Belay *et al*., 2012) the cause for low performances of dairy cattle might be genetic and environmental factors like feed shortage, low level of management, lack of access to land, disease, lack of proper breeding management such as lack of accurate heat detection and timely insemination might have contributed considerably to long days open (postpartum anestrous), late age at first calving, long calving interval, short lactation length and low milk production. These factors reduce reproductive efficiency, shortening the projected duration of productive life and lowering milk production (Hossein-Zadeh, 2013), which widens the demand-supply gap for milk and milk products. Although cattle production in general, and dairy production in particular, is the primary driver of agricultural growth in the country, the overall cost of keeping dairy cattle,

including health care, nutrition, and reproduction management, has not kept pace with their contribution to people's livelihoods and economies.

1.2. Statement of the Problem

In addition to inadequate infrastructure, managerial, and financial constraints, Ethiopia has one of the lowest AI service efficiency rates among developing nations. This could be attributed to poor heat detection, improper insemination timing, and embryonic mortalities (Shiferaw *et al*., 2003). This makes artificial insemination more feasible and can have a positive impact on the reproductive efficiency and productivity of dairy cattle (Murugavel *et al*., 2010).

According to the information obtained from the Meskan, S/sod and Endegagn District Livestock and Fisheries Office, dairy cattle production and reproduction performance is one of the major sub-sectors in the livestock sector and is a means of survival for smallholder farmers, especially for women and children. It is also mentioned as a source of income, a source of economic potential and a way to ensuring food security. Among the districts in Gurge zone, Meskan ,S/sod and Endegagn district is having potential in dairy farming and having about 309,131 cattle population, out of which 304,453 (98.5%) are indigenous and (46780) 1.5% are cross breed cattle GZLFRO (2014) (Unpublished data).

There are also issues with animal selection. Poor nutritional condition has a direct impact on fertility in cattle, particularly those that graze in subtropical/tropical environments (Bo *et al*., 2003). Several factors influence dairy cow reproductive efficiency, including genetics, season, age, production method, diet, housing and management, environment, and disease (Shiferaw *et al*., 2003).due to the above reasons, dairy cattle in guraghe zone were inseminated just to increase their production and reproduction performances of dairy cattle. However, there has been no detailed information about assessment of the productive and reproductive performance artificially inseminated dairy cattle.

In the study area, most of the dairy farmers not use artificial insemination to improve productive and reproductive performance. But in Meskan and S/sodo distrct, they are using artificial insemination betrethan Endegagn. Artificial insemination service was started in the district in 1989 by GZADO (Gurage Zon Agricultural Development office) through the Agricultural Institute.

In the current study area, there is need to be an awareness about dairy breeds how they are giving higher milk yield get, Asses productive performance and Reproductive performance of AI dairy cattle as well as if the related factors such as genetics, season, age, nutrition, housing and management, environment and disease & are affecting in the study districts so, knowing the problem will enable to look for solutions so that technology will be used efficiently in Guraghe zone, central Ethiopia.

1.3. Significance of the Study

Few studies have been conducted in other Guraghe Zone on subjects, but none have been conducted in the three districts. The findings of this research will benefit farmers, governments, and non-governmental organizations which plan to work on future dairy development work.

Additionally, this study assists policymakers and development planners in creating suitable policies and strategies to increase the productivity of Synchronized cattle in the animal production sub-sector, facilitate the benefit of farmers and other participants. Additionally, important information will be supplied for small and medium-sized businesses and possible investors interested in this sub-sector. Lastly, heifer and bull reproductive and productive performance in dairy cattle must be taken into account and addressed because it will spread across the entire population.

1.4. Objectives of the Study

1.4.1. General Objective

- To assess the Productive and Reproductive Performances of Local and Cross Bred Dairy cattle in selected district Guraghe zone, Central Ethiopia.

1.4.2. Specific Objectives

- To assess the Productive and Reproductive Performances of Local and Cross Bred and Local Dairy Cattle in Selected district Guraghe zone.
- To know assess the current Reproductive and Productive Performances of Local and Cross Bred and local Dairy Cattle in Selected district Guraghe zone which gives baseline data that helps as references for future developmental work regarding dairy cattle in mentioned areas.

2. LITERATURE REVIEW

2.1. Reproductive Performance of Dairy Cattle

2.1.1. Age at First Service

It is the time taken from birth until the animal is serviced for the first time (Sisay, 2015). It influences both the productive and reproductive life of the female through its effect on her lifetime calf crop and also influenced by genotype, nutrition and other environmental factors (Zewdie, 2010).

Operating costs for replacement heifers expenses 15-20% of all costs related to cow milk production at farms. In order to overcome this problem, early breeding of heifers even at first estrus is often practiced after the body weight attains 340 kg in Holstein's dairy cows (Penev *et al*., 2014). The age at which heifers should be first mated depends upon the economics of management input against returns. Genetically, well grown HF heifers can be mated as early as 15 months to calve at 24 months, but require extra managerial effort if good genetic results are to be obtained (Croker *et al*., 2015). approximately 53 months (Zewdie Wandatir, 2010), 53.9 months for artificially inseminated Boran cattle (Ababu, 2002), and 34.4 months for Ogaden cattle (Getinet, 2005).AFS crossbreed cow will reported by (Nibret, 2012) 15.3±0.23 and 15.5±0.24 urban and periurban respectively in Gondar and higher will recorded 24.9±3.8 Asella Towen (Hunduma, 2013).

2.1.2. Age at First Calving

Age at first calving is the start of the heifer's productive life. The average age at first calving will be 40.9 ± 6.6 months, which is higher than what is anticipated (Mulugeta and Belayeneh, 2013). This includes 47.16 ± 8.7 months for native cows and 37.95 ± 9.4 months for crossbreed cows. AFC is the period between birth and first calving and influences both the productive and reproductive life of the female, directly through its effect on her lifetime calf crop and milk production and indirectly through its influence on the cost invested for up-bringing (Gebrekidan *et al*., 2012).For local breeds, the ideal age at first calving is three years, but for crossbred cattle, it is two years. A longer age at first calving will result in higher production during the first lactation, but fewer calvings will reduce lifetime productivity. The calves are weak, have trouble

calving, and provide less milk during the first lactation if the age at first calving is below ideal (Nerja and Kbrom, 2014).

Under controlled breeding program, heifers are mated when they are attaining sexual maturity and withstand the stress of parturition and lactation. This increases the likelihood of early conception after parturition. However, in traditional production systems breeding is often uncontrolled and heifers are bred at the first opportunity and it results in longer subsequent CI (Demissu *et al*., 2013).

2.1.3. Calving Interval (CI)

It is the period between successive parturitions and is a function of postpartum anestrous period (from calving to first estrus), service period (first estrus to conception) and GL (Tewodros, 2008). The effectiveness of estrus detection and conception rate has a great impact on the CI. CI is probably the best indicator of cattle reproductive efficiency. Fertility traits that can be used in selection programs are to minimize the negative effects of production (Mostert *et al*., 2010; Dayyani *et al*., 2013). CI varies slightly due to breed, calf sex, calf size, dam age, year, and month of calving and it was significantly affected by genotype, year, season, nutrition and other factors like placenta expulsion time and uterine pathology. CI has been extensively analyzed and reported and it is probably the best index of a cattle herd's reproductive efficiency. Lower conception rates, longer CI and an increased incidence of silent heat have been considered to be the results of energy deficiency (Zewdie, 2010).

2.1.4. Lactation length

Lactation length is the average days the cow milked for a single lactation and the lactation performance of dairy cattle is usually measured by determining total milk yield per lactation or per year that is the lactation length (Zewdu *et al.*, 2013). The performance of dairy animal is mainly estimated from the milk it produces during a specified period of lactation (Alewya, 2014). Lactation milk yield and lactation length variation was observed from lactation to lactation even in the same animal, which resulted from variation attributed to the physiology of lactation in the given set of genes and their reaction with non-genetic factors. Management, nutrition, age, year and season in which lactation started are the leading environmental factors affecting lactation and lactation length performance in cattle (M'hamdi *et al*., 2011). Many researchers in tropical countries have reported 322 days as the mean of LL (Rahman and

Alemam, 2008).Little can be done to dramatically alter the gestation time, which is more or less constant and varies somewhat depending on breed, calf sex, litter size, dam age, year, and month of calving (Fikre *et al*., 2007).A lactation duration of 305 days is generally regarded as the norm in the majority of dairy farms.

However, smallholder dairy cows, whose lactation length is often much longer, may not be able to meet such a conventional lactation length (Msangi *et al*. 2005).The length of an animal's lactation is primarily determined by the herder's management goals; for example, the herder may dry off the cow early in lactation for breeding purposes or extend the lactation period to provide a steady supply of milk for the home (Msangi *et al*., 2005).

2.2. Productive Performance of Dairy Cattle

2.2.1. Milk yield

Numerous environmental and genetic factors affect milk production. The amount and quality of accessible feed resources are the most important environmental elements (Zewdie, 2010). Lactation performance in cattle is highly influenced by management, nutrition, age, year and season in which lactation is started (M'hamdi *et al*., 2011).Inadequate feed bases, expensive imported feeds, and a lack of funds to purchase concentrate feeds are some of the factors impeding milk production (Anteneh, 2006). Farmers report that cows' milk yield performance varies across various dairy production systems, primarily as a result of breed and management variations (Azage *et al*., 2013).

2.2.2. Daily Milk Yield

According to, 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).

2.3 .Reproductive Efficiency

In dairy cattle operations, reproductive performance is a quality of utmost importance. Reproductive activity plays a major role in milk production, and the amount of the calf crop is crucial for herd replacement. Reproductive rate is directly related to potential genetic improvement in almost all economically significant qualities. Rapid advancement in a number of the sector's disciplines has combined to increase livestock output in industrialized nations. The most significant of these developments include increased feed output, greater animal health, better husbandry, and the breeding of animals with the genetic potential needed for enhanced performance. It is too expensive to import superior breeding stock for widespread adoption.

2.3.1. Conception Rate

Conception rates (CR) are calculated by dividing the total number of cows or heifers artificially inseminated with frozen semen within a given time period by the percentage of pregnancies confirmed by rectal examination of the genital tract at day 60 and beyond of post-insemination. Conception rates to initial inseminations were generally low at the national level, ranging from 7.14 to 40.23 percent (Desalegn, 2008).

2.3.2. Number of Services per Conception

Number of services per conception, which is defined as the number of services (natural or artificial) required for a successful conception, depends largely on the breeding system used, the reproductive health status of the animal, the management and feeding practices in a farm and the semen quality of AI or natural service bulls, skill of the inseminator, proper time of insemination and cows related factors (Tewodros and Alemam, 2008). According to Rahman and Alemam (2008) the term NSC is the total number of services given to a group of cows over a defined period divided by number of services which results in a diagnosed pregnancy not less than 42 days after service, with services to culled cows included. NSC is influenced by season and that is related to availability of feed, placenta expulsion time, LL and milk yield and parity (Gebeyehu *et al*., 2005; Gebrekidan *et al*., 2012 and Demissu *et al*., 2013). Management, nutrition and climate conditions may also affect the success of insemination (Million *et al*., 2010).

2.3.3. Days open (DO)

It is also termed as calving-to-conception interval which is the period between calving and conception in cows (Tewodros, 2008). The "days open" period should not be exceeding 80-85 days in order to achieve the ideal calving interval of 12 months (Dayyani, 2013). Days open is influenced by the length of time for the uterus to completely involutes, resumption of normal ovarian cycle, occurrence of silent ovulation, accuracy of heat detection, management, semen quality and skill of inseminator or efficiency of bull (Yosef, 2006; Melaku *et al*., 2011). Days open affect lifetime production and generation intervals, and hence the annual genetic gain Yosef (2006) and it is one of the fertility traits explained in days (Dayyani *et al*., 2013). The consistency of DO at the optimum level indicates regularity and stability of the reproductive status of the animal, especially the estrus cycle (Rahman and Alemam, 2008).

2.4. Factors affecting Reproductive and Productive performance of Dairy cattle

2.4.1. Feed Shortage

The main obstacle to the dairy production system is a lack of both quality and quantity of feed. In order to increase dairy output, roughage, and concentrate feeds are either too expensive or not available in enough quantity and quality (Guadu and Abebaw,2016). According to Sinishaw. (2005), the most significant barrier to improving dairying is the lack of financing for feed, which is likely to have the greatest impact on the prospective milk output of cows with good milk production ability. In both mixed and urban production systems, a sizable portion of dairy producers cited shortages and high feed prices as their top issues (Yilma *et al.*,2011). A seasonal variety in availability and the high cost of feeds are problems that are strongly stressed by about 55 and 73% of farmers in mixed crop-livestock and urban systems, respectively. Better feeding is essential to maintaining an environment that is conducive to animal growth, and feed supplements encourage increased milk output. Because of the unpredictable weather, feed, which is often made of hay and grass, is either not available in sufficient amounts or, when it is, it is of poor nutritional quality (Yilma *et al*.,2011).

2.4.2. Environmental Stress

Concomitant with the improvement in the quality of livestock through crossbreeding, there has been an increase in the susceptibility of these animals to various diseases, including exotic ones. Simultaneously, a number of disease control programs have been initiated with the aim of

reducing morbidity and mortality Akeberegn *et al* . (2019).Efforts have been made to control diseases like rinderpest, foot and mouth disease, and anthrax. Financial constraints generally inhibit the farmers' access to organized veterinary services, and they still rely on conventional treatment methods Gatwech . (2012).the Ethiopian government faces budgetary constraints to carry out the extension at the farmer level. Some international donors and NGOs engage in rural development programs that include extension activities Riese *et al*. (2010).

2.4.3. Animal Health Problem

The existence of such poor performance by the veterinary service indicated that the regional government gave less attention to the livestock sector in general. The poor performance of veterinary services in the lowlands is the result of the government's monopolized service Disease Yoseph *et al*. (2013) .in dairy animals also affects reproduction, milk production, milk quality, mortality, and morbidity.

Dairy production is also influenced at varied levels due to the prevalence of various diseases and parasites, like external parasites, internal parasites, and infectious diseases (Yibrah and Tsega ,2017). The prevalence of such diseases and parasites is highly dependent on ecology and management. Besides this fact, the health extension service provided is insufficient, with a high cost of drugs and poor diagnostic services. According to (Beredu and Biruk ,2019), dystocia, retained fetal membrane, and the poor reproductive efficiency of dairy cows are primarily caused by abortion, metritis, anestrous, and uterine and vaginal prolapse.Since the animal health care system mainly relies on veterinary interventions, many of these issues are caused by the interaction of the restrictions themselves. For instance, poorly fed animals develop low disease resistance and reproduction issues. The dairy commercial business is likewise constrained by money. As a result, creating credit service facilities is crucial for the dairy industry Yilma *et al*. (2011). The shortage of diagnostic testing tools and the significant staff and talent turnover are both effects of inadequate budgets.

The problem of diseases is becoming very important with the importation of exotic breeds into the country for improved genetics and milk production. Among the diseases, mastitis is known to be prevalent in different dairy production systems in the country, incurring high economic losses. It can be presented with visible or invisible inflammatory responses of the udder. Mastitis with visible symptoms is called clinical mastitis, whereas mastitis without visible symptoms is called

sub clinical mastitis FAO. (2014). Clinical mastitis is characterized by sudden onset, alterations of milk composition and appearance, decreased milk production, and the presence of the cardinal signs of inflammation in infected mammary quarters. It is readily apparent and easily detected. In contrast, no visible signs are seen either on the udder or in the milk in case of sub-clinical mastitis, but the milk production decreases and the somatic cell count increases. It is more common and has serious impact in older lactating animals than in first lactation heifers Khan and Khan . (2006).Because of the lack of any overt manifestation, the diagnosis of sub-clinical mastitis is a challenge in dairy animal management and in veterinary practice FAO. (2014).

2.4.4. Dairy cows welfare and housing system

The level of animal welfare varies considerably among dairy herds. Producers have always been concerned about the condition of animals in their care and have tried to ensure that they are healthy and well nourished. Tradition of animal care, good welfare is seen largely as the absence of illness or injury. More recent concerns about animal welfare have focused on the pain or distress that the animals might experience as a result of widely accepted management practices, and the possibility that animals suffer as a result of being kept under apparently "unnatural" conditions (Fraser,2008). People caring for the animals are naturally concerned about the addressing issues such as disease, injury, poor growth rates, and reproductive problems that are bad for the animal and also for the viability of the farm. However, many people are also concerned with the affective (emotional) state of the animal and focus on whether the animals are suffering from unpleasant feelings, such as pain, fear, or hunger, or whether they are experiencing positive states, such as pleasure associated with play. The World Organization for Animal Health defines an animal as being in good animal welfare if it is "healthy, comfortable, well nourished, safe, able to express innate behavior, and is not suffering from unpleasant states such as pain, fear, and distress" (WHOAH,2008).the good health is central to good welfare is relatively uncontroversial. Measures of biological health used by veterinarians and producers generally focus on disease, injury, and reproductive problems. For example, high rates of mortality are almost always associated with a poor quality of life for the animals. Surveys continue to report high levels of mortality in milk-fed calves USDA. . (2007). clearly both the calves and the producers would benefit from reduced mortality rates.

Lameness is widely regarded as a major welfare problem for dairy cows. Management factors, such as the use of concrete floors, zero grazing, and uncomfortable stalls, are important risk factors underlying the large differences between farms in the incidence of lameness (Cook and Nordlund , 2009). Management factors, such as the use of concrete floors, zero grazing, and uncomfortable stalls, are important risk factors underlying the large differences between farms in the incidence of lameness (Cook and Nordlund, 2009).Transition diseases result in an important economic loss for producers and are one of the most serious welfare issues affecting dairy cows. The high prevalence of infectious disease may be linked to inadequate nutrition which may also contribute to a depression of the immune system during transition Walters *et al*. (2006).

The development of different housing systems in previous decades has been driven primarily by technical innovations required by changes in cow requirements, farmer demands, and societal and environmental impact (national and local). These requirements and demands differ among countries, resulting in a wide variety of dairy housing systems. Technical innovations in feeding and milking made the transition to cubicle barn possible. However, studies by Taraba ,*et al*. (2020) have shown that the prevalence of lameness and hock lesions can be high in cubicle barn on concrete flooring, including both slatted and solid floors. Therefore, farmers are searching for solutions to prevent lameness and further improve animal welfare.

2.4.5. Artificial Insemination in Bovine

Artificial insemination (AI), or the use of devices to introduce sperm into the female genital tract, was the first generation of reproductive biotechnologies that could be used on cattle. It is the collection, processing, storage, and artificial introduction of male sperm into the female reproductive tract for the purpose of pregnancy Temesgen *et al*. (2017).It is the most widely utilized technology on dairy farms and is used for the production of herd replacements. It plays an important role in increasing the yielding capacity of cows and is the appropriate and cheapest way of genetic improvement Mohammed. (2018). the dairy industry's goal has always been to produce quality milk for the consumer market. In many countries, yield per cow has more than doubled in the last 40 years. This dramatic increase in yield per cow is due to rapid progress in genetics and management. Daughters of AI sires produce significantly more milk than those of herd bull sires, and the income from this extra milk may cover the extra costs resulting from extended calving intervals because of low heat detection. A study indicated that daughters of AI

sires were producing almost 900 kg more milk per lactation than daughters of natural service bulls Valergakis *et al*. (2017).three main assumptions underpin the successful use of artificial insemination (AI) as a method of animal breeding and the use of AI as a tool to increase cattle production efficiency (Holm *et al.*, 2008): first, that spermatozoa can survive outside the body; second, that they can be reintroduced into the female genital tract in a way that yields an acceptable conception rate; and third, that the female's fertile period can be identified(Holm *et al*., 2008) and (Manafi, 2011).

2.4.6. Factors Affecting Success of AI

Numerous internal and external factors influence the success of AI in cattle. Establishing corrective procedures requires an understanding of how these elements affect the likelihood that AI will succeed (Haugan *et al*., 2005). The extension service must make sure that farmers receive sufficient information on the input needed to benefit from crossbreed dairy cows and from those of higher genetic merit because reproductive efficiency is low in most cattle production systems. Specifically, cows do not conceive for a variety of reasons, including management, nutrition, reproductive diseases, semen quality, and other factors (Mekonnen *et al*., 2010).

2.4.7. The Role of the AI Delivery System

Ethiopia's AI delivery system is ineffective due to a number of problems. these factors include ineffective management, a failure to integrate AI services with livestock health and feed packages, a lack of suitable stakeholder collaboration, low inseminator motivation and skill, a lack of readily available inputs like liquid nitrogen, and an absence of adequate recording systems In order to find AI services, some farmers must relocate their cows over great distances. The reason for this is that AI technicians are unable to access transportation resources like motorbikes, fuel, etc., which is occurring in many places. AI is recognized to be a time-dependent activity, and before the service is provided, a lengthy journey or waiting period occurs (Lemma, 2010).

2.4.8. Factors Related to Heat Detection and Time of Insemination

Estimating the optimal time to artificially inseminate cattle requires knowledge of estrus behavior and the estrus to ovulation interval, but this has not been thoroughly described for zebu breeds (Barros *et al*., 2006; and Reolofs *et al*., 2010).ovulation takes place about 25 hours

following the onset of estrous in Bos indicus, which has a shorter duration of 10 to 15 hours (Reolofs *et al*., 2010). According to other research, inseminating cows within six hours after the first observation of estrus will not significantly lower the conception rate (John, 2012).AI carried out around 12 hours after the start of standing heat may result in a reduced incidence of fertilization and more embryo deterioration (Roelofs *et al*., 2010, and Dalton, 2011).Several writers have found that zebu cattle have shorter standing estrus duration than taurine cattle. In comparison to the estrogen stimulus, zebu cows experience a later, less intense, and shorter estrus (10.7–11.6 hours).

According to studies, up to 15% of cattle presented for insemination are actually not in heat (Chaundhari and Sabo, 2006). On the other hand, researchers have found that between 5-25% of cows are not in heat when inseminated, and a 90% heat detection accuracy rate—two out of every twenty inseminated cows are not in heat—has been deemed an acceptable target.

When compared to other factors, one of the main determinants of an AI program's efficiency is the accuracy of heat (estrus detection). In order to detect heat in cows, skilled ranchers and inseminators must be able to recognize the animals that have standing heat .A careful observation is necessary since it is the shortest time between two consecutive estrus cycles (Iftikhar *et al*., 2009).

According to Table 1, in addition to various outwardly noticeable changes like vulvular edema and the lack of wrinkles on vulvular lips, vaginal hyperemia, wetness, and mucus discharge, animals in standing heat also exhibit other behavioral symptoms like asking another cow to mount, standing to be mounted, chin resting, frequent urination, bellowing, raised tail, restlessness, and standing to be mounted (Ball and Petters, 2004).

According to Morrell (2011), over 86% of females that ride other females under the estrogen's domain are in estrous or proestrous. According to Roelofs *et al*. (2006), a variety of factors, including lactation, the number of days after giving birth, and heredity, might affect how estrus is expressed, quantity, milk output, and well-being environmental elements. Estrus manifestation is also influenced by factors like herd size, housing, season, and diet.

Table 1. **Timing of estrus detection in cattle**

Time line for Heat Signs in cattle		
Coming in to heat (6hours)	**Standing heat (12hours)**	**Going out of heat (14+hours)**
Heat signs stands and bellow Smells other cows Head buttes other cows Attempts to rid other cows but will Stand to be mounted Red, moist Slightly swollen valve cline mucus dishrags from vulva	Standingtobe mounted Rides other cow Bowell frequency Nervous and exactable	Attempts to rid other cows but will Stand to be mounted Smells other cows cline mucus dishrags from vulva

Changes and adaptations from Jane *et al*. (2009).

Standing heat can happen at any time of the day, according to Jane *et al*. (2009). Although a cow or heifer is most likely to display heat signs at night, the time of year can affect this, with more cows displaying heat during the day in cold weather and more at night in hot weather. Mounting activity may be decreased by hot weather, excessive productivity, crowded surroundings, and stressful environments. Cattle entering heat, remaining in heat, and exiting heat must be distinguished by observers. The most probable herd mates to mount other cows or heifers in heat are females who are in standing heat, were in standing heat yesterday, or will be in standing heat tomorrow (Jane *et al*., 2009).

The insemination–ovulation interval, or IOI, is the ideal period for insemination in relation to ovulation. It is primarily determined by the viable lifespan of the oocyte in the female genital canal and the fertile lifespan of spermatozoa (Roelofs *et al*., 2006).

The time between insemination and ovulation is crucial to successful fertilization; if insemination occurs too early, the sperm will be too old to fertilize the ovum by the time ovulation occurs, and if insemination occurs too late, the egg will be too old to fertilize and form a viable embryo. There are indications that the time of insemination in relation to ovulation varies greatly in practice (Roelofs *et al*., 2005).

Numerous research studies suggest that issues with estrus identification are the primary cause of the poor incidence of AI service in cattle. There are no issues with natural service because a cow will only stand for the bull during her estrus, and in a free-range setting, a cow may be served multiple times throughout each estrus. Numerous studies (Jane *et al*., 2009and Morrell, 2011)Describe how the proper timing of AI depends on the accurate, timely, and true detection of estrus, the precise identification of each individual animal, and notifying the inseminator at the appropriate moment.

According to Arthur (2009), a cow who is initially observed in estrus in the morning is typically inseminated the same day in the afternoon, but a cow that is first observed in estrus in the afternoon is inseminated early the following day. Similar to am/pm breeding, a procedure has been established that uses GnRH and PGF2α to synchronize the time of ovulation with PR/Am within an 8-hour interval (24 to 32 hours following the second injection of GnRH). An efficient test to ascertain the ideal AI timing in connection to ovulation is made possible by this exact synchronization of ovulation (Roelofs *et al.*, 2006).

2.4.9. Intrinsic Actors Related to the Cow

According to reports, endometritis and other postpartum issues have a detrimental impact on fertility; for example, primiparous cows have greater conception rates than older cows when using a two-timed breeding procedure, and the first-service conception rate is low (Asghar, 2007).For AI to be successful, the cow's reproductive health especially the uterine environment is crucial. According to James (2006), achieving normal uterine involution, early ovulation resumption, high estrous detection efficiency, and high conception rates per service are all necessary for excellent reproductive efficiency. Uterine involution and ovulation resumption are prolonged when an infection is present. According to research by Rahim and Asghar (2007), the rate of conception is significantly impacted by health and reproductive issues that arise after calving. Conception rates are significantly impacted by reproductive diseases related to calving and post-calving. Therefore, preventing diseases rather than treating them after they have already occurred must be the key to increasing conception rates. According to certain research, cows with metabolic diseases, such as milk fever, may be more likely to experience reproductive problems and have a reduced rate of conception (Arthur, 2001; Rahim and Asghar, 2007).

2.5. Early embryonic loses

Although the precise causes of early embryonic loss in dairy cows are unknown, pregnancy loss in nursing dairy cows is higher than in dairy heifers. According to several research studies, it is challenging to investigate early embryonic loss in cattle because there is currently no sensitive test comparable to that used for women and mares (Romano *et al*., 2007).the rate of embryo/fetal death between days 30 and 60 is 14.0%, according to Romano *et al*. (2007), which could lead to repeat breeding (Singh *et al*., 2005).

In contrast, the fertilization rate in beef cows following AI is 90%, while the embryonic survival rate is 93% by Day 8 and only 56% by Day 12 post AI. On the seventh day following AI, just 48% of the embryos in dairy cattle were deemed normal. Early pregnancy loss can also be treated by rectal probing performed by a nonprofessional during the early stages of conception (Romano *et al*., 2007).

Therefore, trans rectal ultrasonography reduces the number of false positive and false negative diagnoses when palpation per rectum is used, allows for an earlier pregnancy diagnosis than palpation per rectum, and provides instant information to confirm pregnancy and assess embryo/fetal viability (Romano *et al*., 2007).However, each of these stages in establishing pregnancy may have an impact on the conception rate to first service, which is the cumulative result of fertilization, early embryonic, late embryonic, and fetal development. Fertilization failure, early embryonic loss, late embryonic/fetal loss, and late abortion account for 20–45%, 8–17.5%, and 1–4% of pregnancy failure, respectively, according to Grimard *et al*. (2006).

2.6. Factors related to management

A number of management-related aspects contribute to a good pregnancy, with nutritional management accounting for the highest share. Seasonal variations that impact feed availability, high temperatures, and other environmental conditions (Haugan *et al*., 2005 It's crucial to distinguish between the ideal circumstances for follicle growth and embryo survival because overall dietary consumption can also impact fertility at the oocyte and embryo levels.Gene transcripts involved in early embryonic development can have their expression changed by dietary type and intake.

The nutrients needed for optimal embryonic development and follicular growth may differ significantly. Therefore, it becomes clear how important food is around mating time and, in particular, how important severe underfeeding is after mating in controlling the rate of pregnancy. According to Xu *et al*. (2010), the first month of pregnancy is when embryo mortality peaks, and reducing embryo mortality requires careful feed intake management. He has shown that a pig's diet prior to mating significantly affects both embryo survival and litter uniformity in blastocyst size. Because of what Robinson *et al*. (2006) said.

Beyond the provision of necessary nutrients and the alteration of hormones and growth factors that affect embryo development, diet has an impact on ruminant embryo survival. The distribution of heat over a 24-hour period can also be impacted by housing characteristics. Any housing structure that permits cattle to interact during the day gives them more opportunities to exhibit standing and mounting behavior, which makes it easier to spot estrous cows.

The outcome demonstrated that when cows are on dirt as opposed to concrete, mounting behavior happens more frequently.

2.7. Factors related to semen quality

The first AI's pregnancy rate must be used to determine success, taking into account the financial outlay for semen and other inputs. Additionally, a positive reaction to the first service conception rate typically indicates favorable circumstances for the second service (Saacke, 2008). Semen quality, which is mostly influenced by the bulls chosen, is another important aspect that should be taken into account when analyzing the pregnancy rate to first service.

Whether or not estrous synchronization is used in most breeding procedures, the quality of the semen is one of the most important factors in a healthy pregnancy. Saacke (2008) highlighted the significance of semen handling and placement to achieve threshold or above threshold number of sperm to the ovum necessary to maximize both fertilization rate and embryo quality. The nature of male-induced subfertility is proving to be as complex as that caused by females.

Both in vitro and in vivo, spermatozoa become extremely sensitive to environmental stressors. Consequently, fresh semen yields higher fertility than frozen-thawed semen (Lemma, 2011). In order to learn more about the cryopreserved semen's ability to fertilize, the AI industry is very interested in properly evaluating the post-thaw quality of spermatozoa. Sperm motility, morphology, acrosomal status, faulty sperm organelles and DNA, and metabolism have all been linked to fertility in a number of studies (Lemma, 2011).

2.8. Factors related to insemination techniques

Among other things, the efficiency of cow insemination depends on the inseminator's ability to deliver the semen to the right place in the reproductive tract at the right stage of estrus. Nevertheless, there has been a tendency to adopt routine insemination techniques and to ignore inseminator-related factors that can significantly affect fertility. Most inseminators are not educated to inspect the uterus and ovaries, even though they palpate the reproductive system of many cows every day. This is a significant real-world obstacle to AI's development (López-Gatius, 2011).

According to Iftikhar *et al*. (2009), animals exhibiting symptoms of genuine heat should be inseminated using frozen semen that has been thawed at 37.0°C for 30 seconds. Professional technicians outperform novice ones in insemination, suggesting that choosing a qualified inseminator is crucial to the success of AI programs and that consistent insemination practice is necessary to sustain high conception rates.The success of AI in cattle has been significantly influenced by the location of semen deposition, as demonstrated by the citation in Gebre Medhin (2008). With regard to depth and time of insemination (Arthur, 2001, and Modell, 2011), very deep insemination can improve sperm delivery. However, the site of insemination was found to make only small increases in sperm per egg. Deep insemination should be used only when the sperm dose is below threshold or if sexed semen is being used. Also, hygiene, thawing methods,and temperature maintenance between thawing and insemination do play a factor in achieving pregnancy (Morrell, 2011).

3. MATERIALS AND METHODS

3.1. Description of Study Area

The study was conducted in the Meskan,S/sodo and Endegagn in Guraghe zone, which is located in Central Ethiopia's It occupies an area of roughly 5,932 km² and is situated between 37° 28' and 38° 38' longitude and 7° 28' and 8° 27' latitude. The Guraghe zone has 16 administrative woredas (districts), 412 peasant associations (PAs), and five town administrations, according to data from the Department of Finance and Economy Development (DOFED) .

Meskan is located 100 kilometers from Wolkite, the zonal capital, in the Gurage zone, which is located between 7° 500" N and 38° 200" E. There are 42 kebeles in the district; 40 of these are rurals, and the remaining two are urbans. The Woreda is home to 222,602 people in total (109,549 men and 113,060 women).The total household number is 46,570; of this, 29,398 are men-headed households, and 17,172 are women-headed households. The district is located at an altitude range of 1501-3500 masl. Which has an area of 447 square kilometers.

The South Sodo district is located 129 kilometers from Wolkite, the zonal capital, in the Gurage zone, which is located between 8'9'000N and 8'1'9'000S in the north and longitudes 38'20'000E and 38'36'000W in the east. Which has an area of 245 square kilometers. the district is located at an altitude range of 1800-3200 masl.

Endegn district is located 75 kilometers from Wolkite (the seat of the zone), 277 kilometers from Hawasa (the capital of the region), and 230 kilometers from Addis Ababa (the capital of Ethiopia), which has an area of 5932 square kilometers, at 127 square kilometers. The district is bounded to the north and west by Enemor and Ener district, to the northeast by Geta district, to the south by Hadiya Zone, and to the southeast by Silti Zone. The district is separated administratively into 17 rural kebeles. Altitude of the area1801-2850 masl.

Table 2. Description of the study area of Gurage Zone

No	Study District	Human population	No. of HHs	Average temperature(C)	Average rain fall (mm)	Animal population	Cattle
1	Endegagn	63635	13366	10.1-17.5	1001-1200	282,838	106,558
2	Meskan	222,602	46,570	7.5-17.5	1001-1200	525528	130712
3	S .sodo	54,367	10,378	12.6-20	820-1200	225385	71861

Source: Gurage Zone Statistical Abstract Document, 2020.

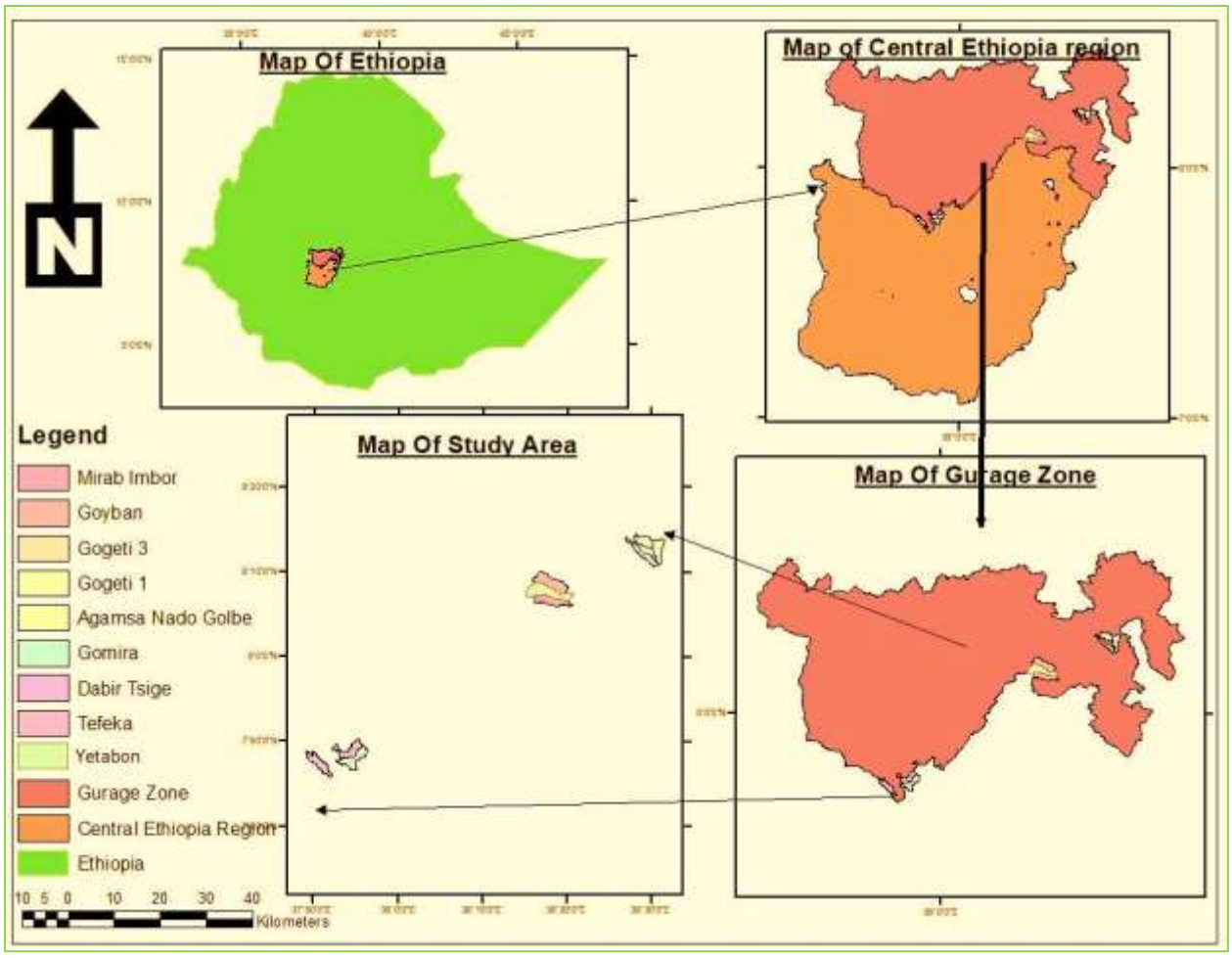

Figure 1. Map of the study area

3.2. Research Design

The productive and reproductive performances of dairy cattle in the Guraghe zone that were artificially inseminated and synchronized were examined using a cross-sectional survey research approach.

3.3. Sampling Technique and Sample Size

3.3.1. Sampling techniques/Procedure

From the guraghe zone, three districts (Meskan, South Sodo, and Endegagn) were selected purposively based on the adoption of estrus synchronization and AI services. Information was obtained from the Guraghe zone of livestock and fishery resources. From each district, three rural kebeles were selected purposively. The purposively selected households in the kebeles were identified through house-to-house visits by the data collectors with the guidance of Development Agent Workers (DAWs). By registering each kebele's determined eligible households, a sampling frame was created. The necessary number of households was then chosen using systematic sampling.

3.3.2. Sample size determination

The sample size can be calculated in a number of ways. The degree of variability, the desired level of confidence, and the amount of accuracy that users require are the fundamental elements to be taken into account when determining the optimal sample size. The formula provided by Yamane (1967) was used to calculate the total number of respondents included in the study based on the survey data. He states that the sample size at a 95% confidence level and p = 0.05 should be

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

Where,

n is the sample size,

N is the population size and

E is the level of precision (the acceptable sampling error)

Thus, this formula be used for the population, in which N =9475 with ±5% precision. Assuming 95% confidence level and p =0.05, we get the sample size as:

$$n = \frac{9475}{1+9475\,(0.05^2)} = 379$$

The number of HHs from dairy cow producers was calculated using the probability to sample size approach (Koch, 2004) formula.

The formula is. $pi = \frac{ni}{N}$

Pi=379÷9475=0.04

Where

Pi is the proportional of producer of HHs in the kebeles.

ni is sample size

N is the total number of house hold which has dairy caws

Therefore the size was calculated by total HHs owing above one cows/heifers times proportional of producer HHs in the kebeles

For example the sample size for Yetbon kebeles is 1921*0.04 =77

Table 3. Sample size in each kebeles of study areas

Wereda	**kebeles**	**Total HHS sample size owing above one cows/hivers**	
Meskan	Ytebono	1921	77
	W/embor	1111	44
	Goyban	850	34
S/sodo	Agam senado	1000	40
	Gogiti one	1200	48
	Gogiti three	853	34
Endegagn	Gomra	800	32
	Tefeka	840	34
	Debre tsgi	900	36

3.4. Sources and Methods of Data Collection

3.4.1. Sources of data

This study included data from both primary and secondary sources. In order to obtain thorough and trustworthy information, semi-structured questionnaires were used to gather primary data from a sample of respondents. Additionally, data from assess of the reproductive and productive

performances of Synchronized and artificially inseminated dairy cattle were also gathered. Secondary data were obtained from various sources such as reports from South Sodo, Meskan and Endegagn district and Guraghe Zone Agriculture and Natural Resources Office, Livestock and Fishery Resources Office, NGO_s, previous research finding, internet and others published and unpublished materials.

3.4.2. Methods of data collection

To gather data on the reproductive and productive performance of dairy cattle, a cross-sectional survey was conducted for every household. The main factors to be taken into account in the procedure were the productive performances in terms of the quantity of milk produced per cow per year, the length of lactation, the daily milk production, and the frequency of milking.

Farmers' estimates of milk production per cow per year were used to calculate the average milk yield. Furthermore, productive and reproductive performances were assessed through semi-structured questionnaire survey. In order to gather reproduction performances (AFS, CI, LL, DO, and NSPC) and document reproductive performances (birth date, calving date, mating date, and estrus date), closer visits to the chosen homes were conducted. This allowed for firsthand observation of every facet of the district's cattle production.

3.5. Data Analysis

The data were checked, coded, and entered into a Microsoft Excel worksheet and was analyzed using SPSS software version 20. Descriptive statistics like percentage and mean were used to present the analyzed data, while Chi-square ($\chi 2$) and use cross tape was used to compare the variation of the productive and reproductive performances of dairy cattle. In all the cases, a 95% confidence level and 0.05 absolute precision errors were considered. A p-value ≤ 0.05 was considered statistically significant.

The Model used for reproductive and productive Performance of dairy cows.

$$Yij=\mu+ai+bj+eij$$

Where yij=response variable (AFS, LL, DO, CI, NSPC)

μ=Overall mean

ai =fixed effect of ith Districts (i=3:Meskan, South sodo, Endegagn)

bi= fixed effect of jth breeds (j=2:Local, Crose)

eij= residual error

AFS=Age at first service

LL=Lactation length

DO=Day open

CI=Calving interval

NSPC=number of service per conception

.

4. RESULTS

4.1. Household Socio-economic Characteristics

Table 4 displays the respondents' primary household characteristics. On average, households headed by men made up 83.4% of all respondents, while households headed by women made upthe remaining 16.6%. Endegagn had a greater percentage of households headed by women than the other two districts. The overall average age of the respondents was 73 years and ranged from 46 to 65 years. There was a significant difference in average ages of the respondents and family size in the Endegagn district than in the two districts. The overall average family size of the responding households in all the study areas was 69 persons, and ranged from 3-5 persons. The results also indicate that most of the respondents were attained grade 1-8 in the studied Districts. However, households attained grade above12 was found in Meskan andS/sodo.

Table 4. Demographic structure of the study area

	Districts									
variable	**Meskan(N=155)**		**S/sodo(n=122)**		**Endegagn(N=102)**		**Over all**		**X^{2}_Test**	**P-Value**
sex	**frequency**	**(%)**	**frequency**	**(%)**	**frequency**	**(%)**	**frequency**	**(%)**		
male	**136**	**87.7**	**105**	**86**	**78***	**76.5***	**319**	**83.4**		
female	**19**	**12.3**	**17**	**14**	**24***	**23.5***	**60**	**16.6**		
Total	**155**	**100**	**122**	**100**	**102**	**100**	**379**	**100**	**15.5[a]**	**0.013**
Family size(0-2)	**0**	**0**	**3**	**2.5**	**3**	**2.9**	**6**	**1.8**		
3 up to5	**71**	**45.8**	**62**	**50.8**	**75***	**73.5***	**208**	**56.7**		
6 up to 9	**62**	**40.0**	**37**	**30.3**	**20***	**19.6***	**119**	**30**		
Above9	**22**	**14.2**	**20**	**16.4**	**4***	**4***	**46**	**11.5**		
Total	**155**	**100**	**122**	**100**	**102**	**100**	**379**	**100**	**20.4a**	**0.001**
Age of House										
Below 25yr	**6**	**3.9**	**0**	**0**	**3**	**2.9**	**9**	**2.3**	**7.65b**	**0.45**
25yr to 35yr	**24**	**15.5**	**20**	**16.4**	**29**	**28.4**	**73**	**19.3**		
36yr to45yr	**20**	**12.9**	**14**	**11.5**	**25**	**24.5**	**59**	**16.3**		
46yr to65yr	**92**	**59.4**	**81**	**66.4**	**45**	**44.1**	**218**	**57.5**		
Over66yr	**13**	**8.4**	**7**	**5.7**	**0**	**0**	**20**	**4.7**		
Total	**155**	**100**	**122**	**100**	**102**	**100**	**379**	**100**	**14.8b**	**0.29**
Illiterate	**23**	**14.8**	**18**	**14.8**	**7**	**6.9**	**48**	**12.7**		
1-8	**115**	**74.2**	**96**	**78.7**	**88**	**86.2**	**299**	**78.9**		
9-12	**13**	**8.4**	**6**	**4.9**	**7**	**6.9**	**26**	**6.9**		
Above12	**4**	**2.6**	**2**	**1.6**	**0**	**-**	**6**	**1.6**		
Total	**155**	**100**	**122**	**100**	**102**	**100**	**379**	**100**		

Where n= number of respondents in Meskan , S/sodo and Endegagn, N=number of respondents in study area. X^2 = chi-square,*Figures significant different in the district

4.2. Production Performance

4.2.1. Daily milk yield

As indicated Table 5, there was no significant difference in three districts for the daily milk yield for the local cows. However, there was significant difference in three districts for the daily milk yield for the for cross breed cows. Average daily milk yield of local cows was 1.33±0.05, 1.31±0.13and 1.3±0.05liters for Meskan, S/sodo and Endegagn, respectively, with an overall average of 1.31±0.12 liters. The average daily milk yields of crossebred cows were 6.42±0.44, 4.67±0.34and 2.9±0.24liters for Meskan S/sodo and Endegagn, respectively with an overall average of 4.61±0.34liters. There was significant difference (p-vale<0.05) both in breed type and between districts for crossed and the local breeds.

Table 5. Daily milk yield of dairy cows in three district based on farmer's response in liters

		Districts				
Breed type	Stage of lactation	Meskan Mean±SE	S/sodo Mean±SE	Endegagn Mean±SE	Over all Mean±SE	P- vale
Local cows	Beginning	1.76±0.05	1.74±0.046	1.71±0.044a	1.74±0.14	
	mid	1.27±0.046	1.24±0.044	1.23±0.04a	1.25±0.13	
	late	0.97±0.05	0.94±0.04	0.92±0.06a	0.94±0.09	
	Average DMY	1.33±0.05	1.31±0.13	1.3±0.05	1.31±0.12	0.07
Crosse bred Cows	Beginning	9.75±0.67a	6.75±0.54a	4.25±0.47a	6.79±0.56	
	Mid	5.5±0.36b	4.25±0.28b	3.03±0.14b	4.26±0.26	
	Late	4±0.3a	3±0.2a	1.34±0.1a	2.78±0.20	
	Average DMY	6.42±0.44	4.67±0.34	2.9±0.24	4.61±0.34	0.001
Average	Beginning	7±0.5	4±0.35	1.81±0.2	4.27±0.35	
	Mid	4±0.21	3±0.1	1.28±0.17	2.76±0.16	
	Late	2.58±0.15	1.75±0.1	1.25±0.2	1,86±0.15	
	Average DMY	4.53±0.29	2.92±0.18	1.45±0.19	2.96±0.22	0.01

SE-Standard Error, a-b means with different superscripts within Columns differ significantly, SE=Standard Error.

4.2.2. Lactation length

The lactation lengths of local and crossebred cows in the study area are shown in Table 6 Average lactation length of local cows was 4.16±0.13, 3.27±0.21 and 1.54±0.221 month for Meskan, S/sodo and Endegagn, respectively, with an overall average of 8.99±0.56 month. The average daily milk yields of crossbred cows were 4.9±0.1, 3.23±0.2 and 2.61±0.22 month for Meskan S/sodo and Endegagn, respectively with an overall average of 10.74±0.52month. There was significant difference (p-vale<0.05) both in breed type and between districts for crossed and the local breeds.

Table 6. Lactation lengths of local and crossbred dairy cows in three districts in months.

		Districts				
Bred type	Stageof lactation	Meskan Mean± SE	S/sodo Mean± SE	Endegagn Mean± SE	Over all Mean± SE	P-value
Local cows	Beginning	1.5±0.05	1.1±0.12	0.55±0.08	3.15±0.25	
	Mid	1.2±0.02	1±0.03	0.45±0.05	2.65±0.10	
	Late	1.46±0.059	1.19±0.06	0.54±0.091	3.19±0.21	
	Total Lactation length	4.16±0.13a	3.27±0.21a	1.54±0.221b	8.99±0.56	0.004
Crosse bred cows	Beginning	2.0±0.06	1.2±0.13	1.01±0.07	4.21±0.26	
	Mid	1.5±0.03	1.01±0.04	1±0.06	3.51±0.12	
	Late	1.4±0.4	1.02±0.6	0.6±0.04	3.02±0.14	
	Total lactation length	4.9±0.1a	3.23±0.2a	2.61±0.22b	10.74±0.52	0.042
Average	Beginning	1.75±0.055	1.15±0.13	0.78±0.08	3.02±0.14	
	Mid	1.35±0.025	1.005±0.04	0.73±0.06	3.09±0.26	
	Late	1.43±0.23	1.105±0.06	0.57±0.07	3.13±0.23	
	Total Lactation length	4.53±0.46	2.16±0.20	2.08±0.221	9.24±0.63	0.031

SE-Standard Error, a-b means with different superscripts within Columns differ significantly, SE=Standard Error.

4.2.3. Lactation yield

The lactation milk yield of local and crossbred cows in the study area are shown in Table 7. Average lactation yield of local cows was 141.52±0.64, 116.66±0.5 and 89.02±0.6 liters for Meskan, S/sodo and

Endegagn, respectively, with an overall average of 350.2±1.74liters. The average daily milk yields of crossbred cows were 682±4.42, 494±3.07 and 312.92±4.4 liters for Meskan S/sodo and Endegagn, respectively with an overall average of 1489.31±11.89liters. The result further indicated that lactation yield was higher (P<0.05) among the native cows reared in the Meskan. Similarly, Lactation yield of crossbred cattle was higher in meskan than S/sodo and Endegagn.

Table 7 Average lactation yield of cows based on farmer's estimation in litters in the three Districts.

		Distrcts				
		Meskan	S/Sodo	Endegagn	Over all	P-value
Breed type	Stage of lactation	Mean±SE	Mean±SE	Mean±SE	Mean±SE	
Local cows	Beginning	63.25±0.22a	58.31±0.21a	47±0.19b	168.56±0.62	
	Mid	41.27±0.17	30.25±0.19	20±0.21	94.52±0.57	
	Late	37±0.25	28.1±0.1	22.02±0.2	87.12±0.55	
	Total lactation yield	141.52±0.64a	116.66±0.5a	89.02±0.6b	350.2±1.74	0.048
Crosse Cows	Beginning	362±2.4a	293±2.1a	138.21±3.3b	793.21±7.80	
	Mid	200.39±1.5	130±0.57	115±0.5	445.39±2.57	
	Late	120±0.52	71±0.4	59.71±0.6	250.71±1.52	
	Total lactation yield	682±4.42	494±3.07	312.92±4.4	1489.31±11.89	0.031
Average	Beginning	212.63±1.31a	175.65±1.16a	92.61±1.75b	480.89±4.35	
	Mid	120.83±0.84	80.125±0.38	67.5±0.355	268.45±1.58	
	Late	78.5±0.39	49.55±0.25	40.87±0.4	168.92±1.04	
	Total lactation yield	411.76±2.53a	305.33±1.79a	200.97±2.5b	918.06±6.82	0.002

SE-Standard Error, a-b means with different superscripts within Columns differ significantly, SE=Standard Error.

4.3. Reproductive performance

4.3.1. Age at first services (AFS

As indicated Table 8, there was no significant difference in the three Districts for the age at first service.

Table 8 Ages at first service of local and crossbred dairy Heifers in the three districts based on farmers' response in months.

	Districts				
	Mekan	S/sodo	Endegagn	Over all	P-value
Bred type	Mean±SE	Mean±SE	Mean±SE	Mean±SE	
Local cows	39.35±2.06	37.2±2.0	36.25±1.4	37.6±1.82	0.48
Crosse cow	28.5±2.1	26.02±1.7	25.04±1.3	26.52±1.70	0.61
Average	33.9±2.25	31.6±1.53	30.65±1.5	32.06±1.76	0.09

SE=Standard Error.

4.3.2. Age at first calving (AFC)

As indicated Table 9, there was significant difference between the three Districts and breed type for the age at first calving. AFC were higher among the native cattle than crossebred. In the district Meskan higher than the S/sodo and Endegagn districts.

Table 9 Ages at first calving of local and crossbred dairy cows in in the three districts based on farmers' response in months.

	Districts				
	Meskan	S/sodo	Endegagn	Over all	P-value
Bred type	Mean±SE	Mean±SE	Mean±SE	Mean±SE	
Local cows	54.2±3.13a	49.22±2.03a	41.3±2.1b	48.24±2.42	0.042
Crosse breed	40.2±2.3b	37.5±1.4b	35.25±2.6a	37.65±2.10	0.03
Average	47.2±2.2	43.36±2.24	38.3±3.34	42.95±2.26	0.036

SE-Standard Error, a-b means with different superscripts within Columns differ significantly, SE=Standard Error.

4.3.3. Calving interval (CI)

Calving interval is the time between two consecutive calving. Local and crossbred dairy cows in the study area had average calving intervals of 17.38±1.2 and 14.34±1.0 months, respectively, according to data collected from the respondents (Table 10). As indicated Table 10, there was significant difference between the three Districts and breed type for calving interval.

Table 10 Calving interval of local and crossbred dairy cows in in the three districts based on farmers' response in months.

	Districts				
	Meskan	S/sodo	Endegagn	Over all	P-value
Bred type	Mean±SE	Mean±SE	Mean±SE	Mean±SE	
Local cows	19.14±1.6a	17.5±1.4a	15.5±1.5b	17.38±1.2	0.021
Crosse breed	17.5.±1.01b	15.02±0.97b	10.51±1.02a	14.34±1.0	0.007
Average	18.32±1.31	16.26±1.19	13±1.26	15.86±1.1	0.014

SE-Standard Error, a-b means with different superscripts within Columns differ significantly, SE=Standard Error.

4.3.4. Participation of Household Members in Dairy Activities

Participation of Household Members in Dairy Activities is improving dairy animal handling requires household involvement in dairy management.

Table 11. 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	60	16	22	6	160	42.2	360	94.9
Spouse	275	72.5	21	5.5	290	76.5	58	15.3	12	3.2
Children	84	22.2	205	54.0	55	6.5	62	16.4	7	2
Workers	20	5.3	93	24.5	42	11	99	26.1	0	0
Total	379	100	379	100	379	100	379	100	379	100

Freq. = frequency

5. DISCUSSIONS

5.1. Household characteristics

Table (4) displays the respondents' primary household characteristics. On average, households headed by men made up the majority of all respondents (83.4%), while households led by women made up the remaining 16.6%. Similar findings were reported by Zewdie (2010) and Fekede *et al*. (2013), who found that in the central highlands, the ratio was roughly 86.7% male to 13.3% female and 84.4% male to 16.6% female. The current study's findings differ from those of Azage (2004), who found that 33% of families in Addis Ababa were headed by women and 67% by men. They are also less than those of Haile *et al*. (2012), who found that 70% of homes in Hawassa City were headed by men and 30% by women. The degree of urbanization in the studied area may be the cause of the discrepancy.

5.2. Production Performance

5.2.1. Daily milk yield

The research area's local and crossbred dairy cows produced an average of 1.31±0.12 and 4.61±0.34 liters of milk per day, respectively, as shown in Table 5.The daily milk production of local cows in the present study area was higher than that of Quara district (1.05±0.04 liters) and comparable to that of indigenous dairy cows in Alefa distrct (1.30±0.05 liters) (Alganesh, 2002). According to the information gathered from the interview, the season of calving and the stage of lactation had a significant impact on the daily milk supply in the research area. The local cow's current daily milk output was less than what Gebrekidan *et al*. (2012) reported. He reported that the overall daily milk yield of local cow in Dawro zone was 1.8±0.045 liters. The milk output of the study district's local cows is nearly the same as the daily milk reported for different areas of the country's local cattle, which ranges between 1.7 and 1.9 liters per day (Wondssen Tesfaye, and CSA, 2017; FAO, 2018).

A Ministry of Finance and Economic Development (MoFED) report highlights the significant productivity difference among local dairy breeds, with local dairy breeds yielding approximately 1.5 liters per day per cow, or about one-eighth of the 9 liters per day per cow for improved dairy breeds (Belay, 2012). The average milk yield per cow is 1.9 liters per day (Dam *et al*., 2013).

However, Wondifraw *et al*. (2013) reported that the national average milk yield from local cows per day is 1.37, which is nearly equal to the current finding.

5.2.2. Lactation length

In the majority of improved dairy farms, a lactation length of 305 days usually accepted as a benchmark. This standard allows for calving every 12 months with a 60-day dry period. The 12-month interval has considered "Ideal" for many years. If acow milked longer than 305 days, her yield for the first 305 days taken as the lactation yield. Some cows are not milked for a full 305 days because they go dry or the lactation terminated for any of several reasons. These short records projected to a 305 days equivalent Lemma *et al*.(2005).

Considering the average lactation duration of dairy cows, both native and crossbred were 8.99±0.56and 10.74±0.52 months, according to the responders (Table 6). The mean lactation duration of 255.75 days for local Ethiopian milking cows was reported by Staal *et al*. (2008), which was less than the current observed lactation length. According to Wondifara *et al*. (2013), the average lactation period per cow during the reference period at the national level was approximately six months; however, the current lactation length for local cows is three months longer. However, it is close to the lactation duration findings of (Belay, 2016), who found that native cattle in and around Bahirdar had mean lactation lengths of 9.5 and 9.13±2.63 months. Compared to the report of Mebrahtom and Hailemichael (2016), which stated that the total lactation length of native dairy cows in the Wolita zone was 10.80 + 0.053 months, the current observed lactation length was shorter. Generally speaking, in addition to the amount of milk produced each day, one of the elements that affect a dairy cow's productivity and profitability is the length of lactation. Ethiopian dairy cows are typically characterized by a short lactation period and a long calving interval, indicating that the animals are kept for extended periods of time without producing any output (milk or calf), only receiving feed and other production costs.

The genetic composition of the local cattle and the preferred treatment that favors crossbreds may be to blame for this. The results also show that, in comparison to cattle grown in the midlands, native cattle raised on the highlands had longer LL. The findings are consistent with those of Adiss and Godadaw (2014) and suggest that the variation in LL may be explained by the availability of grazing pastures at higher elevations and by the colder climate, which results in lower environmental stress, including disease and parasite incidence.The LL of the indigenous

cattle is longer than that of the Ethiopian Boran breed (Gebrgziabher *et al*., 2013) and the Ngongoni *et al*. (2006) in Zimbabwe, and it is shorter than that of the Mekele Tigray native cow (Kumar, 2014).The study's average crossbred LL was longer than those reported by Ngongoni *et al*. (2006) and Belay *et al*. (2012), but it was shorter than those published by Wassie *et al*. (2014) and Ogundipe and Adeoye (2013)

5.2.3. Lactation Milk yield

In the research area, the estimated lactation yields of crossbred and local dairy cows were 1489.31±11.89and 350.2±1.74 liters, respectively. The present outcome exceeded the findings of Algfanesh (2002), who found that the lactation output of local cows in the Alefa and Quara districts was 329.6 and 348.8 liters, respectively. At the national level, the current results for indigenous dairy cows exceeded 277.2 liters (UndumaDinka, 2013). Conversely, it was less than the 457.89±86.4 liters that local cows in the North Shoa Zone were reported to have (Taju, 2018).

5.3. Reproductive Performance

5.3.1. Age at first services (AFS)

The average age of local and crossbred dairy heifers in the research area Ageat first service was 37.5±1.82 and 26.55±1.70 months, respectively, based on the results in table (8). AFS of native female cattle in the current study was longer than crossbred. Similar result was also reported by Gebeyehu *et al*. (2005 and Demissu *et al***.** (2013).According to the findings (Mulugeta and Derje, 2005), the age at first service of crossbred dairy heifers in the current study region was slightly lower at 24.9 months (range 18 to 36 months), 722.24 days, and 24.30 months, respectively. The breeds' genotypes, heifer management throughout calf age with supplementary concentrate diets during weaning age, and feed availability may all be to blame for this.

5.3.2. Age at first calving (AFC)

The native and crossbred animals had respective AFCs of 48.24±2.42 and 37.65±2.10 months (Table 9). The present study also indicates that the age at first calving (AFC) of native cattle was lower than that reported by Mekonnen *et al*. (2012); however, it was comparable with the result of Duguma *et al*. (2012) and Menal *et al*. (2011). This could be attributed to both management

and the genotype of the cattle. On the other hand, AFC of the crossbred as observed in the current study was shorter than with the reported by Demissu (2013) for Horro x Jeresy crossbred and Belay *et al*., (2012) for HF x Zebu cattle at Jimma Oromia region. Lower AFC among the crossbreds indicates that the lifetime productivity of the cows was higher and more numbers of calves are expecte from such cows, which is again a profitable feature for dairy farming (Kefena *et al*., 2013). The variation in AFC between genotype and agro-ecologies is probably due to the difference in management and feeding systems, the effect of non-genetic factors Shiferaw *et al*.(2003) have also been reported reproductive efficiency of dairy cows is influenced by different factors including genetic, season, age, production system, nutrition, housing and management, environment and disease (Shiferaw *et al*., 2003). In addition to genetic variation, the lower AFC of the crossbred may be attributed to their genetics, besides the farmers tend to provide better management and nutrition to the crossbreds when compared to those of the native cattle. The observations are in accordance with those of Masama *et al*. (2003) who reported that management and nutrition status of the cows influences their pre-pubertal growth rates and later their productive and reproductive status.

5.3.3. Calving interval (CI)

The results in table (10) show that the interval of local cows obtained in this study is longer than the previous CI reported by Gashu (2005) and Gary (1997), who reported CI of 431.08±78.3 days, 13.8±9 months, 14.82, and 12.03 months for local cattle in the Mekele Tigray regional state, crossbred in the Bishoftu area, and cattle in the highlands of the Bure districts of the Oromia regional state and Begaite cattle in the Amhara regional state, respectively.On the other hand CI higher than current study 54.1months (Dejen,2014), 54.1 months(Gebretnsae.,*et al*,2004) 54.7 (Takele,20050), 26.6±06 and 18.72±0.5months (Zewdu,2004). For Kerrayu, Sheko, Wegera, and cattle around Gonder areare spectively was reported. CI varies due to age of cows, breed of cows, calving season and forage availability in any particular year (Mohamed, 2016).

5.4. Participation of Household Members in Dairy Activities

Nonetheless, research by Shiferaw *et al*. (2003) and Nuraddis *et al*. (2014) also showed that poor semen handling practices, the removal of incentives for AI technicians, the breeding season, management factors, the timing of insemination, and pregnancy skill are all contributing factors

to the rising number of services per conception (NSPC). A study by Azage *et al*. (2013) also shows that there is a significant disparity in the efficacy and efficiency of AI services in the region, despite the fact that these services have expanded in highland areas. Milk transportation to the cooperative or closest market is mostly the responsibility of children (54.0%), but other family members also assist when the kids are in school. Dairy goods were sometimes picked up by consumers from the producer's gate in metropolitan areas. Processing of milk is often considered as woman's work that is why female spouses and daughters (72.5%) of respondents are mainly responsible for processing activities. Breeding decisions are mainly made by male heads (94.5%), in some occasions in consultation with spouse, seldom with children. Milk transportation to the cooperative or closest market is mostly the responsibility of children (54.0%), but other family members also assist when the kids are in school. Dairy goods were sometimes picked up by consumers from the producer's gate in metropolitan areas. However, children were typically in charge of transporting milk to milk cooperatives or the closest markets, which is in contrast to findings published by Aneteneh *et al*. (2010), who discovered that adult males and females were mostly in charge of this activity. The distance between the dairy farmers' homes and the milk collection cooperative could be the cause of the discrepancy.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

- Productive and reproductive performances are the most important traits in animal production for economic benefit of producers and now a day it is worry of many countries with special emphasis in developing countries like Ethiopia. From the result, it can be concluded that crossbred cows were better than indigenous cow's in terms of their productive and reproductive performance improving the livelihood of smallholder farmers . There was significant ($p<0.05$) difference in parameters of local and crossbred cows. From current survey results in parameters we have studied crossbred animals are showing better performances, than the local animals, even though both are showing low performances. Generally concluding the production and reproductive performances of dairy cattle in the study area were difficult without, coordinated interventions from all the stakeholders.Specially With focuses on feed helth,environment etc. With proper management.

6.2. Recommendations

Based on the above conclusion, the following recommendation is forwarded:

- To improve the performance (production and reproductive) of dairy cattle, improvement the adoption of appropriate dairy technology such as artificial insemination is mandatory. Thus, coordinated works of all concerned bodies should be in place to boost production and productivity and thereby enhance the livelihood of the dairy farmers. Therefore, as matter of fact improvement of production and reproduction of local cow by improving the feeding system, providing better health management, genetic improvement of local bred through crossbreeding to meet dramatically increasing need of milk yield and to cut off price of milk in order to make affordable cost by all classes of country's population is unquestionable agenda and the work that need collective effort by household, government and other concerned bodies too.

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8. APPENDIX

Appendix 7.1.Questionnaire Used to collect information from dairy farmers

I. House hold characteristics

A. Socio economic information of respondent

1. Zone_____ Woreda _____ kebele _____

2. Name of interviewee _____ Sex _____ age _____

3 .Sex of Household head _____ 0= Male 1= female

4. Age of the house hold head ____0= below 25 yrs 1= 25 yrs to 35 yrs 2= 36yrs to 45 yrs 3= 46 yrs to 65yrs 4= above 66 years

5. Occupation of the household head__0= off- farm self- employment 1. Farming 2 = emploed

6.Household size _____ 0. 2 1. 3-5 2. 6-9 3. Above 9

7. Marital status of the farmer _____ 0 = Single 1= Married 2= Separated/divorced 3= widowed

8. Production system of the area _____ 0= Rural 1 = Peri- Urban 2 = Urban

9. Educational status 0= Illiterate 1=1-8 2=9-12 3 >12

10. What is your major farming activity? 0= Livestock production 1= Crop production 2= Mixed production

11. What is your major activity in livestock production? 0= dairy production 1= beef Production 2= Mixed type of production

12. Feed source for dairy cattle

Source of feed	0=Yes, 1=No	Season 0=Yes, 1=No	
		Wet	Dry
Natural pasture			
Crop residue			
Cut and carry system			

13. What type of housing system of your dairy cows?

Type of housing	0=Yes 1=No
1.Wood wall stone floor thatched roof	
2.Stone wall stone floor thatched roof	
3. Mud walls with tin roof	
4. Cement floors with tin roof	
Drainage & Ventilation 5.Only ventilated 6.Only drained	
7.Well drained and ventilated	
8.Poorly drained and ventilated	
keep in your dairy cattle's? 9.Present or Separately according to the cattle type 10. Absent or together with all native and crossbred 11. others---	

14. What is the source of water for dairy cattle?

source of water	0=Yes, 1=No	Wet season (0=Yes, 1=No)	Wet season (0=Yes, 1=No)
1.River			
2.Pond/dam			
3.Tape water			
4.well water			
Separate waterier 5.Users 6.None user			

15. Do you have veterinary service in dairy cattle in your area? 0. Yes 1. No

16. How far from distance of cling in your house?

Distance of cling	0=Yes 1=No
Less than1km	
1-5km	
6-10km	
> than10km	

B. Labor Distribution

17. Who is responsible for Processing of milk in your dairy cattle?

0. Head 1. Spouse 2. Children3. Workers

18. Who is responsible for processing on farm (Fodder harvesting ,feeding) in your dairy cattle?

0. Head 1. Spouse 2. Children3. Workers

19. Who is responsible for milking in your dairy cattle?

0 . Head 1. Spouse2. Children 3.Workers

20. Who is responsible for breeding decision in your dairy cattle?

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

21.Who is responsible for transport of milk in your dairy cattle?

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

22. Does your cow's milk production safety? 0. yes 1. No 2.other

23. What is the most important use of milk on your farm? (Rank them1-4)

important use of milk on your farm? (Rank them1-4)	0= Yes 1=no
Baby consumption	
Used as watt	
Used as drink water	
Used as economics source (sale)_	

C. production performance of dairy cattle

Breeds types	Early(Litter /day)	Mid(Litter /day)	Late(Litter /day)
Local			
HFC			
JERC			

24. Have you Local (native) bred cows? 0 .yes 1.no

25. If you yes question 24, how much milk production of your Local (native) bred cows at Early (Litter /day) ?

0=0.1-0.5Litter 1= 0.6 -1 litters 2=1.1- 1.5 litters 3=1.51- 2litters 4= 2.1- 2.5 litters 5=2.51-3litter 6= >3Litter

26. If you yes question 24, how much milk production of your Local (native) bred cows at Mid(Litter /day)

0=0.1-0.5Litter 1= 0.6 -1 litters 2=1.1-1.5 litters 3=1.51-2litters 4= 2.1-2.5 litters 5=2.51-3litter 6= >3Litter

27. If you yes question 24, how much milk production of your Local (native) bred cows at Late (Litter /day)

0=0.1-0.5Litter 1= 0.6 -1 litters 2=1.1- 1.5 litters 3=1.51- 2litters 4= 2.1-2.5 litters 5=2.51-3litter 6= >3Litter

28. If you yes question 24, how much overall average daily milk yield of your Local (native) cow (litter)?

0=0.1-0.5litter 1=0.6-1 litters 2= 1.1-2.5itters 3=2.51 -3litters

29. Have you Jersey Cross bred cows? 0=yes 1=no

30. If you yes question 29, how much milk production of your Jersey Cross bred cows at Early (Litter /day) ?

0= 4-5litters 1=5.1-5.5litters 2=5.6-6litters 3= 6.1-6.5litters 4=6.6-7litter 5= 7.1-7.5litter 6=7.6-8litter 7=8.1-8.5litter

31. If you yes question 29, how much milk production of your Jersey Cross bred cows at Mid (Litter /day)

0=2-3 litters 1=3.1-3.5 litters 2=3.6-4litters 3= 4.1-4.5 litters 4=4.6-5litter 5= 5.1-5.5litter 6=5.6-6litter 7=6.1-6.5 litter

32. If you yes question 29, how much milk production of your Jersey Crossbred cows Late (Litter /day)

0= 0.1-0.5litters 1=0.6-1 litters 2=1.1-1.5 litters 3= 1.51-2 litters 4= 4.21-2.5litter 5= 2.51-3 litter 6=3.1-4 litter 7= 4.1- 4.5 litter

33. If you yes question 29, how much overall average daily milk yield of your Jersey Cross bred cow (litre)? 0=6 -6.4litters 1=6.5-7 litters 2= 7.1-7.5 litters 3=7.6-8 litter

34. Have you Holstein cross bred cows? 0 =yes 1= no

35. If you yes question 34, how much milk production of your Holstein cross bred cows at Early (Litter /day) ? 0= 5-5.5 litters 1=5.51-6 litters 2=6.1-6.5 litters 3= 6.51-7 litters 4= 7.1 - 7.5 litter 5= 7.51-8 litter 6=8.1-8.5 litter 7= 8.51-9 litter

36. If you yes question 34 , how much milk production of your Holstein cross bred cows at Mid (Litter /day)

0= 2-3 litters 1=3.1-3.5 litters 2=3.51-4 litters 3=4.1-4.5 litters 4=4.51-4.5 litter 5= 4.51-5litter 6=5.1-5.5litter 7=5.51-6 litter

37. If you yes question 34, how much milk production of your Holstein cross bred cows at Late (Litter /day)

0= 1.5-2litters 1= 2.1-2.6litters 2=2.61-3litters 3= 3.1-3.5 litters 4= 3.51-4 litter 5= 4.1-4.56=5 4.561-5litter 7 5.1-6litter

38. If you yes question 34, how much overall average daily milk yield of your Holstein Cross bred cow (liter)? 0=4.5-5litters 1=5.1-5.6 litters 2= 5.7-6.3 litters

D. Reproduction performance of dairy cattle

Breeds types	AFS	CL	DO	NSPC
Local				
Jersey Cross				
Holstein				

39. What is the Average lactation length of your local cow (months)?

0= 8 -9 month 1=9.1-10month 2= 10.1- 11month 4= 11.1-12month 3=12.1-13 month

40. What is the Average lactation length of your jersey cross cow (months)?

0= 8 -9 month 1=9.1-10 month 2= 10.1- 11month 4= 11.1-12month 3=12.1-12 month

41 .What is the Average lactation length of your Holstein cross cow (months)?

0=7-7.5month 1=7.51-8month 2=8.1-9.6 month 3= 9.61-10month 4=10.1-11month

42. What is the Average calving interval of your local cow (months)?

0=18-19month 1=19.1-20month 2=20.1-21month 3=21.1-22month

43. What is the Average calving interval of your jersey cow (months)?

0=15-15.5month 1=15.51-16month 2=16.1-16.5month 3=16.51-17month

44. What is the Average calving interval of your Holstein cow (months)?

0=15-15.5month 1=15.51-16month 2=16.1-16.5month 3=16.51-17month

45. What is the average age at first service for your local heifers (months)?

0=20-21month 1=22-23month 2=24-25month 3= 26-27 month 4=28-29month 5=30-31month 6=40-41

46. What is the average age at first service for your jersey heifers (months)?

20-21month 1=22-23month 2=24-25month 3= 26-27 month 4=28-29month 5=30-31month 6=40-41

47. What is the average age at first service for your Holstein heifers (months)?

20-21month 1=22-23month 2=24-25month 3= 26-27 month 4=28-29month 5=30-31month 6=40-41

48. What is the Average day open your local heifers (months)? .

0 =2-3month 1=3.1 -4month 2=4.1-5month 3=5.1-6month 4=7-8month

49. What is the Average day open your jersey heifers (months)?

0 =2-3month 1=3.1 -4month 2=4.1-5month 3=5.1-6month 4=7-8month

50. What is the Average day open your Holstein heifers (months)?

0 =2-3month 1=3.1 -4month 2=4.1-5month 3=5.1-6month 4=7-8month

51. What is the Average NSPC your Local heifers (months)?

0=0.5-1month 1=1.1-1.5 month 2= 1.51-2month 3= 2.1- 2.5month

52. What is the Average NSPC your jersey heifers (months)?

0=0.5-1month 1=1.1-1.5 month 2= 1.51-2month 3= 2.1- 2.5month

53. What is the Average NSPC your Holstein heifers (months)?

0=0.5-1month 1=1.1-1.5 month 2= 1.51-2month 3= 2.1- 2.5month

E. Factors affect productive and reproductive performance

54. What are the most difficult challenges of dairy cows production?

1. Feed resource 2.Genotype 3.Management 4. Disease

55. Have you faced failure of the productive and reproductive performance of Synchronation and artificial insemination of dairy cattle? 0. Yes 1= No

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

No	Variable	Priority/Rank with(1-6)
1	Heat detection and time of insemination	
2	AI technician efficiency problem	
3	Factor related to insemination techniques	
4	Shortage of AI technician	
5	Shortage of input delivery	
6	Disease problem	
7	Not failure of the productive and reproductive	

57. How do you get the first information about productive and reproductive performance of Synchronization and artificial insemination of dairy cattle _____? 0= Extension agent 1= AI technician 2= Project agent farmers 3= Neighbors 4= From Other area (specify_____)

58.Did you ask also other people for more information about productive and reproductive performance of Synchronation and artificial insemination of dairy cattle ? 0: yes 1: no

59. If yes which other people did you ask for information on productive and reproductive performance of Synchronization and artificial insemination of dairy cattle ? 0=farmer 1= Extension staff 2=NGO staff 3=Researcher 4= cooperative member

60. As a user of dairy animal for milk and milk products do you get the service AI regularly and without interruptions? 0=Yes 1= No

61. If your answer for question No. 51.what is the reason for this?

0= The service is not available on weekends & holidays 1=There is shortage of AI technicians (AITs) 2= Shortage of input 3= All of the above

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

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

63. Do you have any say in the selection of the type of semen you use? 0=Yes 1=No

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

0= Milk production 1= Beef type 2= 1&2 3= Not use

65. Have willing use if sexed semen is supply for you? 0=Yes 1= No

66. If yes what type sex you want to use 0= Male 1=Female

67. Did you get support with dairy breeding (full package from elsewhere; heifers or AI)? 0= yes 1= no

68.If yes specifies Organization: 0= Government org. 1= NGO 2 =Cooperatives 3= Private sector 4=. Not get support

69.How did the organization which implemented dairy breeding support your breeding activities?

0= Give training 1 = Give bull and heifers/ calves 2= Give AI service 3 = Give veterinary services

70. Have you participated in synchronization program? 0=Yes 1=No

71. What is your opinion on the regular AI service versus the synchronization program? Is synchronization more efficient than regular AI? 0=Yes 1=No

72.What is the main objective of keeping/dairy cattle?

	Breeding objectives (S)	Rank 1. Most important) 2. Important; 3. Least important; 4. Not important;
1	Milk	
2	Meat	
3	income	
4	Draught power	
5	manure	

73. Do you record the reproductive performances of your dairy cattle estrus date?----- 0=Yes 1=No

74. Do you record the reproductive performances of calving date? ----- 0=Yes

1=No

75.Do you record the reproductive performances of mating date ?----- 0=Yes

1=No

76. Do you record the reproductive performances of birth date? ----- 0=Yes

1=No

77. Have you detected estrus in cow/heifers? 0= yes 1= no

78. If you see your cow is in heat in the morning at what time, do you take your cow for bull or AI service? 0= After noon of that day 1=Morning of that day 2=morning of the next day , 3= After noon of the next day 4= based on the availability the AIT 5=Others

79. If you see your cow in heat in the afternoon at what time do you take your cow for bull or AI service? 0= After noon of that day 1= Morning of that day2= morning of the next day 3= After noon of the next day 4= based on the availability the AIT 5= Others—

80. Do you have AI service in your area? -- 0= yes 1=No

81. Are you willing to use AI in animal breeding? 0=Yes 2=1=No

82. Do you have a problem of getting AI service? 0=Yes 1

No

83. If yes, what is the Constraints of existing AI service? 0= AI service not available on time 1= Repeat breeder, 2= Heat detection 3= Distance of AI station

84. Have you participated in the estrous synchronization program? -------0= Yes 1= No

85. If yes, are you satisfied with estrus synchronization? 0=satisfied 1=no satisfied

86. Are you satisfied with the overall AI service? ---- 0=Yes 1= No