Scientific Research Publishing

Open Journal of Animal Sciences, 2025, 15(4), 350-368
https://www.scirp.org/journal/ojas
ISSN Online: 2161-7627
ISSN Print: 2161-7597

Dairy Cattle Husbandry Management Practices in West Hararghe, Oromiya Regional State

Ahmedin Abdurehman Musa[1], Yesihak Yusuf Mummad[2]

[1]Department of Animal Science, Oda Bultum University, Chiro, Ethiopia
[2]School of Animal and Range Sciences, Haramaya University, Dire Dawa, Ethiopia
Email: ahmedin133@gmail.com

How to cite this paper: Musa, A.A. and Mummad, Y.Y. (2025) Dairy Cattle Husbandry Management Practices in West Hararghe, Oromiya Regional State. *Open Journal of Animal Sciences*, **15**, 350-368.
https://doi.org/10.4236/ojas.2025.154025

Received: September 13October, 2025
Accepted: October 26, 2025
Published: October 29, 2025

Abstract

This study was conducted to assess the dairy husbandry practices in the study area. A total of six districts were purposively selected to represent the highland, midland, and lowland agroecologies. From each district, two rural kebeles were identified, and from each kebele, 10 households owning dairy cattle were randomly selected. In total, 120 households participated in the survey. 58.3% of the respondents use selected bull for dairy cattle breeding practices while 30.8% use locally unselected bull and the rest 6.7% use artificial insemination. The majority 85.8% of respondents use local breed cow for milk production and the remaining 14.2% of respondents used cross breed. About 51.7% of the respondents were washing teat and udder of the cow before milking by using cool water 77.5%, towel 9.2% and warm water 5.8%. About 43.3% of HHs used separate class under the same roof, 33.3% open barn and the remaining 23.3% of HHs used separate class for their dairy cattle at night time housing. There was significant difference between the two breeds on the mean age at first calving. Local zebu cow has significantly ($P < 0.05$) higher mean age at first calving 46.73 ± 0.30 than cross breed cows 31.41 ± 0.53 at the study area. Cross breed cows had significantly shorter 14.44 ± 0.43 months of CI than that of local zebu cow 16.02 ± 0.29.

Keywords

Dairy Cattle, Husbandry Management, Milk Production

1. Introduction

The economy of livestock production largely depends upon the reproductive efficiency of the animals [1]. The traditional milk production system, which is dom-

inated by indigenous breeds of low genetic potential for milk production, accounts for about 97 percent of the country's total annual milk production [2]. The low productivity of the country's livestock production system in general and the traditional sector in particular is mainly attributed to shortage of crossbreed dairy cows, lack of capital by dairy producers, inadequate animal feed resources both in terms of quality and quantity, unimproved animal husbandry systems, inefficient and inadequate milk processing materials and methods, low milk production and supply to milk processing centers and poor marketing and market information systems [3].

Despite the largest cattle population in Ethiopia, characterizing of milk production and reproductive performance is very low. Regarding dairying, the national milk production remains among the lowest in the world, even by African standard. The total milk production is estimated at about 1.2 million tons per annum, and increases at a rate of 1.2% for milk produced from indigenous stock and 3.5% for milk produced from the improved stock [4]. The per capita consumption of milk in Ethiopia is about 16 kg per person per year, which is much lower than the African and world per capita averages of 27 kg/year and 100 kg/year, respectively (FAO, 2000). Hence, about 6 million tons of additional milk are required per annum to feed the population as per the world standard [5]. This indicates the existence of a wide gap between potential demands of the growing population of Ethiopia. In order to meet the demand of the growing population of Ethiopia, milk production has to grow at least at a rate of 4% per annum [6].

Given the considerable potential for smallholder income and employment generation from high-value dairy products [7], the development of the dairy sector in Ethiopia can contribute significantly to poverty alleviation and nutrition in the country. Dairy production is a biologically efficient system that converts large quantities of roughage, the most abundant feed in the tropics, to milk, the most nutritious food to man [8]. Of this, the dairy industry is essential and it is potentially the largest rural employer in highlands and pastoral/agro-pastoral areas [9]. Beside this, with continued urbanization and growing population size, the dairy industry becomes a major role player in agricultural development [10].

In West Hararghe zone, dairy development package interventions have been going on for the past decades and the number of farmers owning local and crossbred dairy cattle and engaged on milk production and marketing has increased over years (west Hararghe zone Livestock development Bureau). To develop appropriate interventions and assist smallholder milk producers requires a clear understanding of the dairy cattle husbandry practices. Little is known about the dairy production practices, reproductive performance of dairy cows. Thus it is justifiable to generate scientific information on the current dairy production and dairy cattle management practices in the study area.

Therefore, this study was carried out with the following objectives:

- Assessing the dairy cattle husbandry practices and
- Describing reproductive performance of dairy cow in the study area.

2. Materials and Methods

2.1. Description of the Study Area (Figure 1)

The study was conducted at west Hararghe zone. The zone was located to the eastern part of Ethiopia and Oromia, 317 km far from Addis Ababa. West Hararghe Zone shared boarder with Somali and Afar National Regional State in north, East Hararghe Zone in east, Bale Zone in south and East Showa and Arsi zone in West. West Hararghe Zone is located between 9˚52'15" - 9˚28'43"N, 40˚03'33" - 40˚34'13"E latitude and longitude. The zone was located at an altitude of 1200-3600 m above sea level. It is also characterized by three agro-climatic zones, namely highland (*Badda*), midland (*Bada-dare*) and lowland (*Gamoji*). Lowland takes more percentage 49.51%, midland 38% and highland covers 12.49%. There are two rainy seasons: *ganna* (June-September) and *badhesa* (February-April). The mean annual rain fall of the area is from 650 - 2000 mm and average temperature 20.5˚C - 24˚C.

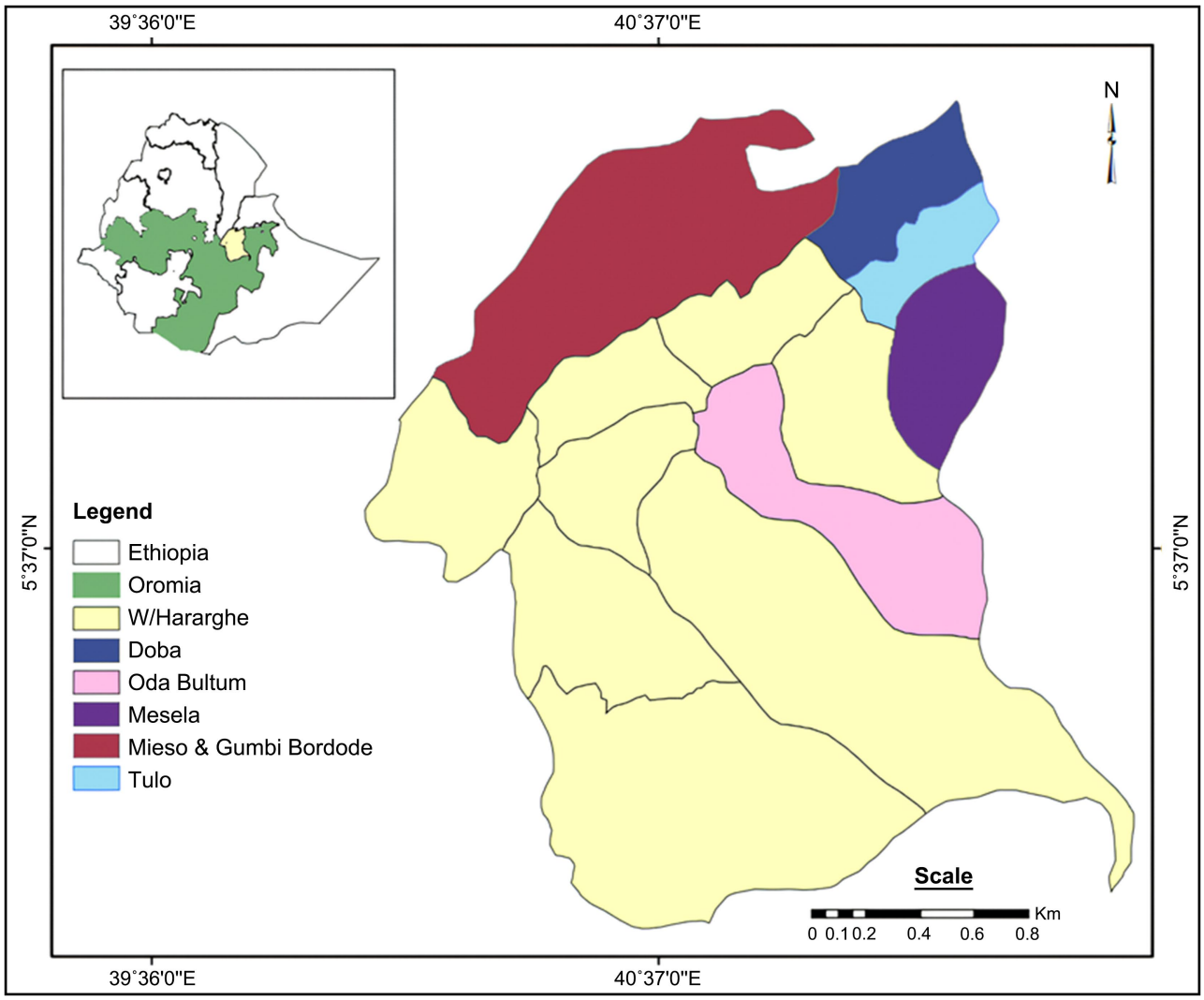

Figure 1. Location of the study area.

2.2. Livestock Population

Livestock are important component of the prevailing crop-livestock mixed farming systems of the study Zone. Small holder farmers of the study area owned various livestock species such as cattle, sheep, goat, chicken, Camel, bee hive and equines. The study zone has a total population of 1,255,753 cattle (1,250,425 local breed and 5328 crossbreed), 248,248 sheep, 1,049,140 goats, 123,783 donkeys, 3004 mules, 1900 horse, 1,141,181 chicken, 56,537 camels and 109,301 bee hives (3298 modern hive, 1548 transitional hive, 104,455 traditional hive) (West Haraghe zone livestock and fisheries development Bureau, 2017).

2.3. Sampling Techniques and Data Collection

West Hararghe zone consists of 17 districts which are situated in three Agroecology, namely Highland, Midland and lowland. Two districts from each agroecology (Mesela and Doba District from highland, Tullo and Oda Bultum District from midland and Gumbi Bordode and Mieso District from lowland District) were selected. From each districts two rural kebeles were also selected purposively based on dairy cattle population, accessibility of the kebele's, area coverage and representativeness for the study areas. The data was collected during the period of between March 2018 to January 2019.

For survey data collection group discussion was undertaken with key informants such as elders and Zonal and District Livestock development bureau staff to investigate and have an overview about the overall dairy production and cattle management. A rapid field survey was conducted before the main survey work to know the distribution and contribution of dairy cattle in the rural households. For the interview, a semi-structured questionnaire was prepared, pretested on two non-random sampled households from each study sites during the rapid field survey and the interview was conducted with the household head. Enumerators were selected and trained from the development agents of the livestock and fisheries office of the Administration. Finally the formal survey was conducted by enumerators under close supervision.

For the two rural *kebeles* purposively selected from each Agroecology, 10 households who owned dairy cattle were selected for the interview. Accordingly, a total of 120 households were selected from the three agro-ecologies.

2.4. Data Analysis

Qualitative data derived from direct observations and key informants were examined and presented in the form of discussions. Quantitative data was coded and entered in a computer spread sheets and the Statistical Package for Social Science (SPSS) software version 20 was used for the analysis. Descriptive statistics were run to give frequencies and mean difference was assessed by Tukey multiple comparison by using the General Linear Model Procedure.

Model

For reproductive performance.

$$Y_{ijk} = \mu + A_i + B_j + AB_{ij} + Є_{ijk}$$

where

Y_{ijk} = the value of the respective variable mentioned above;

μ = overall mean of the respective variable;

A_i = the effect of i^{th} Agroecology (i = 3);

B_j = the effect of j^{th} breed (j = 3);

AB_{ij} = interaction of i^{th} Agroecology & j^{th} breed;

$Є_{ijk}$ = random error term.

3. Results and Discussion

3.1. Cattle Husbandry Management Practices

3.1.1. Feed and Feeding Management

Table 1 shows that in the study area, producers were fed their animals a variety of feed materials separately or simultaneously, majority (90.8%) of respondent in all Agroecology fed their animals roughage which represent grazing natural pastures, hay and crop residue (sorghum and maize Stover) and followed by non-conventional (6.7%) feed (vegetable and fruit left over, family dish left and local brewery residue). The remaining (2.5%) of the respondents were experienced feeding on concentrated feed (wheat bran) as sources of feed for dairy cattle in the study area. This result is agree with the report of [11] that grazing natural pastures (95.8%) and crop residue (84.7%) are the main feed resources in Borana and Guji zone. Kurtu [12] on the other hand indicated that only 72% of the rural livestock keepers in Harari region make use of natural pasture.

Even though there was a problem of livestock feed shortage (84.2%) in the study area, only 11.7% of respondents were experienced in growing improved forage species like *elephant grass*, *sasbaniya*, *pigeon pea*, *lucciniya and Rhodes grass* in some parts of highland and midland Agroecology of the study area and the remaining 88.3% of respondents were depend on natural pasture. According to information obtained at time of focus group discussion there was no practices of improving quality and palatability of roughage feed like urea treatment and urea molasses treatment in the study area. This indicates that, there is no practice of supplementary feeding of animals. Similarly, as indicated by Beruk [13] the use of improved forage and supplementary feed by the pastoralists in the Afar region is insignificant, rather the primary feed sources of livestock in the region were the rangelands composed of indigenous species of grasses, shrubs and fodder trees. The feed shortage mostly happens in dry season of the year in all Agroecology of the study area which is in line with [14].

The Measure to be taken when there was feed shortage especially at dry season were giving feed in smaller quantity (41.7%) followed by giving less feed to certain types of animals like male and dry off cows (25.8%), selling less productive animals (20%) and move the animals to long distance to search for pasture and water (12.5%) (common for pastoralist society of the study area only).

Table 1. Response of respondents on dairy cow feeds and feeding.

Activities	Agroecology						Total	
	Highland		Midland		Lowland			
	N	%	N	%	N	%	N	%
Dairy feed resources								
Roughage	35	87.5	35	87.5	39	97.5	109	90.8
Concentrate	1	2.5	2	5.0	NA	NA	3	2.5
Non-conventional feed	4	10.0	3	7.5	1	2.5	8	6.7
Total	40	100.0	4	100.0	40	100.0	120	100.0
Experience in growing improved forage species								
Yes	11	27.5	7	17.5	NA	NA	18	15.0
No	29	72.5	33	82.5	40	100.0	102	85.0
Total	40	100.0	40	100.0	40	100.0	120	100.0
Feed shortage problem for dairy cattle								
Yes	31	77.5	40	100.0	30	75.0	101	84.2
No	9	22.5	NA	NA	10	25	19	15.8
Total	40	100.0	40	100.0	40	100.0	120	100.0
Measure to be taken when there is feed shortage								
Give feed in smaller quantity	13	32.5	26	65.0	11	27.5	50	41.7
Give less feed to certain types of animal	16	40.0	9	22.5	6	15.0	31	25.8
Selling the animal	11	27.5	5	12.5	8	20.0	24	20.0
Move the animal to long distance	NA	NA	NA	NA	15	37.5	15	12.5
Total	40	100.0	40	100.0	40	100.0	120	100.0

N = Number of respondents, % = proportion of respondents, NA = not available.

In the study area cattle were traveling long distance for searching feed and water depending on seasonal availability of pasture and water, production system and Agroecology. The animals are moved an average distance of 3.84 and 3.41 for searching water and pasture respectively.

There was a significant ($P \leq 0.05$) difference between Agroecology in the distance cattle cover in search of feed and water at the study area. The households in lowland travel significantly ($P < 0.05$) longer distance (6.67 ± 1.21 km) and (5.13 ± 2.17 km) for searching water and pasture respectively than highland and midland while the shortest distance was observed in highland (2.11 ± 1.57 km) and

(2.25 ± 1.51 km) for searching pasture and water respectively (Table 2). The short distance covered in highland and midland may be due to the difference in production system practiced between lowland and highland as well as midland. In the highland and midland Agroecology there is over shrinkage of private and communal pasture land due to over expansion of crop cultivation which forced the farmer to reduce the number of cattle and they can practice cut and carry system or animals are herded on individual farm land and marginal farmland for grazing. The main cattle feed in those Agroecology are crop residue, hay, natural pasture and improved forage to some extent. On other hand, households in lowland has large number of cattle because they are pastoralist or agro pastoralist and there is communal pasture land as well as communal water point. So during dry season the producers of this area may have no other chance without moving long distance with their cattle for searching pasture and water. Leng [15], also reported that smallholders in developing countries have limited resource available to feed their ruminant livestock, and they often do not have the luxury of being able to select the basal diet, they use whatever is available and at no or low cost.

Table 2. Distance traveled in searching for feed and water in west Hararghe zone.

Activity	Agroecology			Total
	Highland	Midland	Lowland	
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Distance moved for searching feed (Km)	2.11 ± 1.57[a]	2.91 ± 1.53[a]	5.13 ± 2.17[b]	3.41 ± 2.18
Distance moved for searching water (Km)	2.25 ± 1.51[a]	2.60 ± 1.80[a]	6.67 ± 1.21[b]	3.84 ± 2.73

[a,b]Means in a row followed by different superscripts are significantly different ($P < 0.05$). KM = kilometer, SD = standard deviation.

3.1.2. Water Source and Watering Practices

The farmers use different water resources for their cattle. Out of the total respondents included in the study 42.5% use water for their cattle from spring water, 36.7% from pond, 13.3% from well, 4.2% from lake and 3.3% from river. This water sources for dairy cattle was significantly different in different Agroecology based on their availability and seasonal variation. Accordingly, spring water as source of water for dairy cattle was significantly ($P \leq 0.05$) different in the three Agroecology. The majority (70%) of respondents from highland were use spring water followed by midland and lowland respondents (40%) and 17.5% respectively. Well was the only source of water for lowland respondents. The variation of this resource in different Agroecology may be due to difference in nature of the environment and ecosystem in the three Agroecology.

This water sources are located on different distance for different Agroecology of the study area from the households depending on the season. The seasonal availability and distance of the water sources have implications on watering frequency of cattle watering in different Agroecology.

As indicated in Table 3, almost all of the households indicated that watering frequency of cattle were every day, but depending on the season and Agroecology the drinking frequency may change from daily (75.0%) to once in two days (27.0%). According to information gathered at the time of focus group discussion the producers were watering daily especially for lactating cow during all season in highland and midland area by using different mechanism because their objective was to gate milk. But in lowland area during dry season the water point may be at distance from household and at this time the frequency of watering may be reduced from every day to once in two days. This result contradict with Coppock [16] reported that in Borana, there is high degree of water restriction of cattle during the dry seasons and animals may be watered once every three or four days. But agree with watering frequency of cattle were reduced from "every day" watering in the wet season to "once in two days" in the dry season reported by [17].

Table 3. Sources of water and frequency of watering in west Hararghe.

Activities	Agroecology						Total	
	Highland		Midland		Lowland			
	N	%	N	%	N	%	N	%
Sources of water for dairy cattle								
spring water	28	70.0[a]	16	40.0[b]	7	17.5[c]	**51**	**42.5**
pond	11	27.5[a]	20	50.0[b]	13	32.5[a,b]	**44**	**36.7**
Well	0	0.0[a]	0	0.0[a]	16	40.0[b]	**16**	**13.3**
Lake	0	0.0[a]	2	5.0[a]	3	7.5[a]	**5**	**4.2**
River	1	2.5[a]	2	5.0[a]	1	2.5[a]	**4**	**3.3**
Total	**40**	**100.0**	**40**	**100.0**	**40**	**100.0**	**120**	**100.0**
Frequency of watering for dairy cattle								
Daily	40	100.0[b]	40	100.0[b]	10	25.0[a]	**90**	**75.0**
Once per two days	0	0.0[a]	0	0.0[a]	30	75.0[b]	**30**	**25.0**
Total	**40**	**100.0**	**40**	**100.0**	**40**	**100.0**	**120**	**100.0**

Each subscript letter denotes a subset of Agroecology categories whose column proportions do not differ significantly from each other at the 0.05 level. N = Number of respondents, % = proportion of respondents.

3.1.3. Dairy Cattle Breeding Practices

From surveyed households 58.3%, use well performing bull as natural sources of services by selection, 30.8% use locally unselected bull and the rest 6.7% use artificial insemination (AI). This indicates that there is small number of improved dairy breed in the study area, but the use of new technology to improve dairy cattle

productivity was very low in the study area. This result is agree with report of [9]. The small numbers of improved breed in the country is an indication of the low level of the usage of modern technological packages like artificial insemination and bull services. According to [18] in Fogera wored, about 90.6% of farmers use natural mating and only 9.4% have access to artificial insemination. Yohannes [11], also reported only 1.4% of the farmers in Borana and Guji zone are using artificial insemination.

There was significant different between agro-ecologies on the different types of matting system in the study area (Table 4). In midland Agroecology selecting local bull for his milk production performance and allowing natural matting with cow was practiced by significantly more percentage (77%) of respondents than lowland (40%) respondents. But there was no significant difference of response was observed between respondents in highland and lowland as well as midland Agroecology. On the other hand, more percentage (60%) of the respondents in lowland Agroecology respond that as they were not select local bull for breeding purpose than highland and midland respondents but there was no significant difference between the result obtained from highland (22.5%) and midland (10%) respondents on using local bulls without selecting for breeding purpose. The difference between Agroecology on the types of matting system may be due to the difference on the level of individual skill and knowledge on future stock selection. The use of artificial insemination (AI) as means of improving dairy cattle is very small in the study area. From survey only highland and midland 20.0% and 12.5% households respectively, use artificial insemination to improve dairy cattle. But no body uses AI in lowland households. This is may be due to insufficient extension services of the sector in the area, lack of animal health and artificial insemination service and lack of animal feed as well as low resistance ability of cross breed animals to withstand harsh condition in lowland area. Similarly, Yohannes (2015) [11] reported that In Bule Hora and Moyale, 100% of respondents use locally unselected bull for breeding purposes.

Table 4. Types of cattle matting system in the study area.

Types of matting system	Agroecology			Total	χ^2 P-value
	Highland	Midland	Lowland		
	N (%)	N (%)	N (%)	N (%)	
Natural unselected	9 (22.5)^{a}	4 (10.0)^{a}	24 (60.0)^{b}	37 (30.8)	0.000
Natural selected	23 (57.5)^{ab}	31 (77.5)^{b}	16 (40.0)^{a}	70 (58.3)	
AI	8 (20.0)^{b}	5 (12.5)^{b}	0 (0.0)^{a}	13 (6.7)	
Total	**40 (100.0)**	**40 (100.0)**	**40 (100.0)**	**120 (100.0)**	

Each superscript letter denotes a subset of Agroecology categories whose column proportions do not differ significantly from each other at the $X^2 = 0.05$ level.

The low adoption of artificial insemination in the study area has important implications beyond household-level productivity. AI is a key pathway for disseminating improved dairy genetics at scale, enabling faster genetic progress compared to natural service [19]. Its limited use in West Hararghe therefore reflects a significant bottleneck for regional and national genetic improvement programs. Without wider uptake of AI, reliance on unselected local bulls will continue to constrain milk yield, reproductive efficiency, and adaptability of the dairy sector [6] [20]. Moreover, the underutilization of AI undermines government and development partners' investments in breed improvement strategies, slowing progress towards meeting the growing national milk demand highlighted in the Introduction [10] [18]. This finding suggests that strengthening AI delivery systems through training, infrastructure, and reliable input supply should be a priority if Ethiopia is to bridge the gap between the current low productivity and the potential contribution of the dairy sector to food security and rural livelihoods [2] [7].

3.1.4. Types of Cows Breed for Milk Production and Milking Practices

As presented in **Figure 2**, the majority (85.8%) of respondents use local breed cow for milk production and the remaining 14.2% of respondents was use cross breed of local with exotic breed. The most common cross breed cow in the study area was Holstein Francian and jersey cross breed.

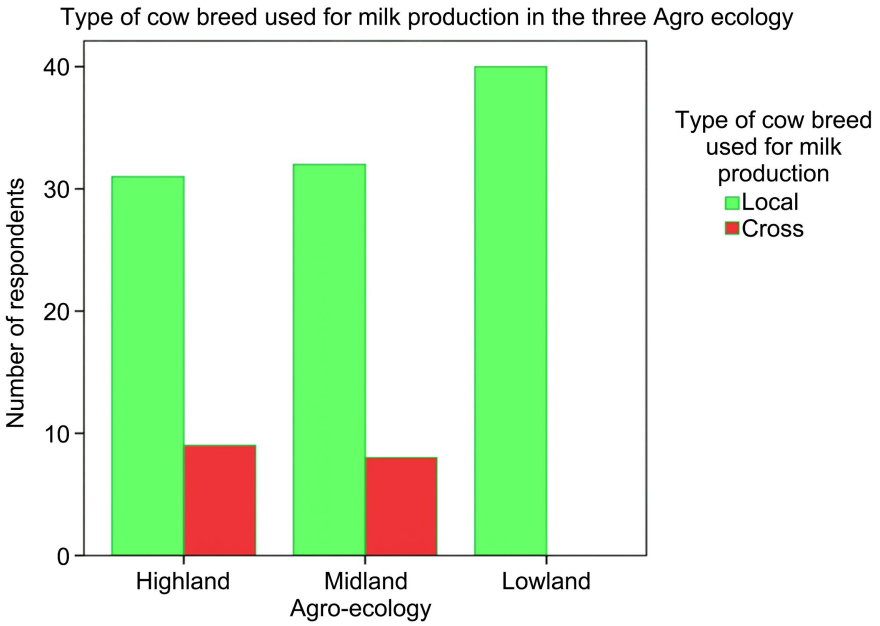

Figure 2. Types of cow breed used for milk production.

Traditional hand milking is the major type of milking practices in the study area. About 86.7% of the respondents indicated that females are more responsible for milking operation, which was in line with previous report [21] [22]. All of the respondents in the study area were properly washing milking equipment locally termed as *Qaba* by detergents and warm water and smoked by using mostly *ejersa*

(*Olea Africana*) before milking but for individual cow hygiene. While the present study indicates that 51.7% of respondents washed the teats and udders of cows before milking, this finding is consistent with Yohannes [11], who reported similar practices in Borana and Guji zones, but contrasts with Kedija [17], who observed no teat washing in Mieso district. Such discrepancies may be explained by contextual differences between study areas. In some districts, stronger extension services and awareness campaigns may have promoted basic hygiene practices, while in others these interventions were minimal or absent. Cultural norms and local customs also influence hygiene routines; for example, pastoralist communities with more extensive production systems may prioritize labor efficiency over hygiene. In contrast, mixed crop-livestock farmers often operate under closer integration with markets, creating more incentives to adopt hygienic practices. These differences highlight that milking hygiene is not uniform across Ethiopia and may depend on access to extension support, production system type, and prevailing household practices.

Table 5. Milking practices of the study area.

Milking practices		Agroecology			Total
		Highland	Midland	Lowland	
		N, %	N, %	N, %	N, %
Washing milking equipment	Yes	40, 100.0	40, 100.0	40, 100.0	120, 100.0
	No	0, 0	0, 0	0, 0	0, 0
Starting milking after calving day within a week	Yes	29, 72.5	5, 12.5	10, 25.0	44,36.7
	No	11, 27.5	35, 87.5	30,75.0	76, 63.3
Feed provision while milking	Yes	7, 17.5	5, 12.5	4, 10.0	16, 13.3
	No	33, 82.5	35, 87.5	36, 90.0	104, 86.7
Who is the milker within the family	Female	37, 92.5	35, 87.5	37, 92.5	109, 90.8
	Male	0, 0.0	0, 0.0	0, 0.0	0, 0.0
	Both	3, 7.5	5, 12.5	3, 7.5	11, 9.2
Washing teat and udder before milking	Yes	24, 60.0	18, 45.0	20, 50.0	62, 51.7
	No	16, 40.0	22, 55.0	20, 50.0	58, 48.3
Means of washing teat and udder	Warm water	5, 12.5	2, 5.0	0, 0.0	7, 5.8
	Cool water	28, 70.0	30, 75.0	35, 87.5	93, 77.5
	Towel	4, 10.0	4, 10.0	3, 7.5	11, 9.2
	No at all	3, 7.5	4, 10.0	2, 5.0	9, 7.5
Frequency of milking per day	Once	0, 0.0	0, 0.0	30, 75.0	30, 25.0
	Twice	40, 100.0	40, 100.0	10, 25.0	90, 75.0

N = Number of respondents, % = proportion of respondents.

Smallholders are using cool water (77.5%), towel (9.2%) and warm water (5.8%) as means of clearing teat and udder of the cow before milking. Milking operation in the study area is almost undertaken after one week of calving (63.3%) and the remaining 36.7% of producers start milking within one week (Table 5).

The majority of household (75.0%) in the study area respond that, milking was carried out twice a day. It is in line with the study of [11]. With the exception that milking operation is only limited to once per day in pastoral society at time of prolonged dry period and during the last stage of lactation (Table 5).

3.1.5. Housing Management

As indicated in Table 6, about 33.3% of households use open barn or traditional free stall specially the most common night time housing for lowland household which is made by fencing it with locally available materials like piece of thorn wood and different bush plants. 43.3% of households share the same roof but within separate class with their dairy cattle at night time to reduce the risk of predator. The use of this different types of housing may be depends on the number of cattle owned by individual household, objective and capability of individual and the level of predators' risk. In lowland none of respondents were share the same roof within separate class or closed shade separately for their cattle during night but all (100%) of them are use open barn or traditional free stall. The remaining 23.3% of the respondents were use separate house prepared for cattle at night time near to their own house.

Table 6. Types of housing and cleaning in the study area.

	Agroecology			Total
	Highland	Midland	Lowland	
	N, %	N, %	N, %	N, %
Types of house at night time				
Open barn	0, 0	0, 0	40, 100.0	40, 33.3
Share with family within separate class	27, 67.5	25, 62.5	0, 0.0	52, 43.3
Separate house	13, 32.5	15, 37.5	0, 0	28, 23.3
Total	40, 100.0	40, 100.0	40, 100.0	120, 100.0
Frequency of cleaning barn				
Daily	21, 52.5	9, 22.5	0, 0.0	30, 25.0
Once per week	2, 5.0	0, 0.0	32, 80.0	34, 28.3
Twice per week	6, 15.0	19, 47.5	8, 20.0	33, 27.5
Thrice per week	11, 27.5	12, 30.0	0, 0.0	23, 19.2
Total	40, 100.0	40, 100.0	40, 100.0	120, 100.0

N = number of respondent, % = percent of respondent.

The level of cleaning the barn or any of housing environment has effect on influencing quality and quantity of milk production and health problem of dairy cattle. According to the respondents' result, about 25.0%, 28.3%, 27.5% and 19.2% of the respondents clean barn daily, once per week, twice per week and thrice per week respectively. Rate of cleaning barn by producers in different Agroecology of the study area was differ, at highland (52.5% and 27.5%), midland (22.5% and 30.0%) was takes place more frequently (daily and thrice pre week) respectively compared to lowland producers. This could be due to the types of night housing system used at highland and midland was more of closed type and share the same roof with family and the environment is moisture than lowland, and there is more chance for microbial growth which facilitate more risk of disease prevalence and low milk quality as well as yield.

3.2. Reproductive Performance of Dairy Cows

3.2.1. Age at First Calving

As indicated in the (**Table 7**), the present study result indicates that the overall mean month of age at first calving of cow was 40.63 months, which is almost similar with 40.44 reported by [23] and 39.2 months reported by [24] in Ethiopia and 3 9.4 ± 1.7 months reported by [25] for Local Cows under Farmer's Management in and around Mekelle; but higher than the value of age at first calving of 36.48 ± 0.55 months reported by [26] in Hosanna town, 35.9 month reported by Kidane *et al.* [1] (2019) in Ethiopia as well as 33.27 and 29.28 months reported by [27] and [28] in Sri Lanka and Tunisian Holstein-Friesian cows respectively; 33.8 months also reported in Arsi breed in Ethiopia [29]. The mean Age at First Calving revealed in this study was shorter than the mean of 60 months in Begait breed, 53.4 months in Fogera breed and 53 months in Horro breed in Ethiopia [30]; 1729.9 ± 58.2 days reported in Boran cows at Tatesa cattle breeding center in Gurage Zone, central Ethiopia [31]; 47.16 ± 8.7 months in local cows in Chacha Town and nearby selected kebeles, North Shoa Zone, Amhara Region, Ethiopia by [32]. There was significant difference between the two breeds on the mean age at first calving. Local zebu cow has significantly ($P < 0.05$) higher mean age at first calving 46.73 ± 0.30 than cross breed cows 31.41 ± 0.53 at the study area. Cross breed cow available at the study area was the cross breed obtained by crossing local zebu cattle with HF and jersey breed. This result shows that cross breed cow was more economical than indigenous cows; because cross breed cow attain age at first calving 15.23 months earlier than indigenous cow in the agro-climatic condition of west Harahghe zone. This may be due to the genetic difference of the cow. The result obtained in this study is comparable with the report of [25] who concluded that the genetic constitution of the animals influenced reproductive efficiency of the cows. Generally, there were no interaction of breed and Agroecology on age at first calving and variation in age at first calving due to difference in Agroecology were statistically non-significant.

Table 7. Mean month of age at first calving for dairy cow breed in the three Agroecology.

Age at first calving	N	Mean ± SE	95% confidence interval	
			Lower Bound	Upper Bound
Agroecology				
Highland	64	41.04 ± 0.48	37.300	39.225
Midland	62	42.54 ± 0.50	38.243	40.223
Lowland	40	46.24 ± 0.59	44.396	46.754
Sig.		**0.488**		
Breed				
Local	120	46.73 ± 0.30[b]	46.140	47.326
Cross breed	46	31.41 ± 0.53[a]	30.369	32.461
Sig.		**0.000**		
Agroecology *breed				
Sig.		**0.062**		
Overall	**166**	**40.63 ± 0.26**	40.167	41.199

SE = standard error of mean, sig. = significant, N = number of observation considered as number of cows, [a,b]Means in a row followed by different superscripts are significantly different at ($P < 0.05$).

3.2.2. Calving Interval

The overall mean calving interval for indigenous zebu cows and cross breed cows included in this study was 16.19 ± 0.25 months (Table 8). The longer calving interval observed in this study has direct economic consequences for smallholder dairy farmers. Extended intervals reduce the number of calves born and lactation cycles per cow over the animal's lifetime, which lowers total milk output and reproductive efficiency. This means households receive fewer opportunities for milk sales and calf crop revenues, ultimately constraining cash flow and income generation. In contexts where dairy already operates under feed shortages and limited market access, a calving interval exceeding 16 months intensifies the financial vulnerability of producers. These findings emphasize that improving reproductive performance is not only a biological objective but also an economic necessity. Interventions that shorten the calving interval through better nutrition, heat detection, and breeding services can enhance farm profitability and contribute to the broader goal of making dairy production a more viable livelihood strategy in Ethiopia. The result obtained in this study is comparable with 16.23 months reported for crossbred dairy cows in different production systems in the central Highlands of Ethiopia [20]. The value obtained in this study is higher than the CI of 14.63 months reported by [25]; 12.43 months reported in Asella town, Oromia regional state, Ethiopia by [33] and 13.4 ± 5.1 months in crossbred cattle in and around Gondar, North Western Ethiopia by [34]. This estimated CI in this study was less

than 21.36 ± 3.84 months in Zebu X Holstein-Friesian crossbred dairy cows in Jimma Town, Oromia, Ethiopia [35]. In this study statistical significant was not observed on the value of CI for varied Agroecology, but there was significant ($P < 0.05$) difference of the mean month value of CI for the two breeds of cows. Cross breed cows had significantly shorter (14.44 ± 0.43) months of CI than that of local zebu cow (16.02 ± 0.29). The result obtained in this study is agree with the report of [25] that Indigenous cows had the significantly longer average CI (453.22 ± 71.81 days) than that of HF crossbreds cows (428.11 ± 64.32 days) in Gonder. Generally, the calving interval in the present study is above the standard interval of 12 months expected usually considered as ideal for profitable milk production. This longer calving interval might be related to genetic factors, environmental factors, poor husbandry management practices, poor nutrition or failure to detect heat by the farmer. There is a need for future improvement on CI for more economic benefits of dairy cow in the study area. Comparably, as indicated by [25] Indigenous cows are also included in their investigation might be important contributory factor for high CI. Feed shortage, silent estrus and lack of proper heat detection might have other contributory factors for long CI reported in thier study. Influence of genetic-constitution of dairy animals on their CI was also reported to be significant in Arsi and Zebu breeds of cows and its crosses with Jersey and Holstein-Friesian in Arsi region of Ethiopia [36] and in indigenous and crossbred cows in private sector in sub-tropical region [37].

Table 8. Mean month of calving interval for dairy cows in the study area.

Calving interval	N	Mean ± SE	95% confidence interval	
			Lower Bound	Upper Bound
Agroecology				
Highland	65	16.18 ± 0.41	15.565	17.195
Midland	66	15.76 ± 0.41	14.956	16.567
Lowland	40	16.67 ± 0.51	15.664	17.686
Sig.		**0.172**		
Breed				
Local cow	120	16.02 ± 0.29[b]	15.442	16.608
Cross breed cow	51	14.44 ± 0.43[a]	12.546	17.337
Sig.		**0.024**		
Agroecology *breed				
Sig.		**0.472**		
Overall	**171**	**16.19 ± 0.25**	14.691	16.692

SE = standard error of mean, sig. = significant, N = number of observation considered as number of cows, [a,b]Means in a row followed by different superscripts are significantly different at ($P < 0.05$).

4. Conclusion

The major sources of feed for dairy cattle in the study area were roughage representing natural grazing pasture, hay and crop residue. Even though there was a problem of livestock feed shortage the experience of growing improved forage species is very poor and there was no practices of improving roughage feed. Local zebu cow was the major source of milk. However, the level of using technologies to improve milk production was low. Traditional breeding practices is common. Cross breed cow was more economical than indigenous cows. Overall, the study revealed that feed shortages, reliance on unimproved breeds, low uptake of reproductive technologies, and extended calving intervals continue to constrain dairy productivity in West Hararghe. Crossbred cows were found to be more economical, yet their adoption remains minimal due to structural and management barriers. These findings highlight that while multiple challenges affect the sector, the most critical intervention lies in strengthening genetic improvement strategies particularly through wider access to artificial insemination supported by improved feeding practices. Addressing these dual constraints is essential for transforming smallholder dairying into a profitable and sustainable enterprise in the region.

Recommendation

Depending on the result of the findings and conclusion made the recommendations below has been given for future dairy cattle improvement and the sector development in the study area.

- Introduce and develop improved forages with the strategy of increased biomass and quality on limited land because in the study area shortage of land for both crop cultivation and pasture production and also low annual rain fall with recurrent draught is common.
- Farmers or producers should have to practice crop residue improvement techniques like urea and molasses treatment as well as concentrate supplementation.
- Applying breed improvement strategies like: Selection, Artificial Insemination (AI) and distribution of improved breeds and Provision of the good quality heifers and multiplication center is incredibly important.
- Improvement of routine management activities through provision of training on dairy husbandry to the small-scale dairy farmers is great input of the sector.
- Short term training for districts' experts, development agents and farmers on dairy production, processing and marketing is advantageous.

Acknowledgements

The authors would like to express the deep gratitude to Oda Bultum University for funding and facilitating research logistics for this research Work. The authors also like to thank West Hararghe zone Livestock and fisheries development office staffs specially Mohammed Ahmed (DVM) and Kedir Adem as well as the staffs

of all the six (Tullo, Doba, Oda Bultum, Mesela, Gumbi Bordode and Mieso) livestock and fisheries development offices of the districts' included in the project as well as Development Agents specially (DAs from Animal Science) department who participated in the project for their kind facilitation and support at the time of data collection.

Ethical Approval

Ethical approval was not necessary because this paper was focused on survey data collection.

Conflicts of Interest

The authors declared that there is no conflict of interest between authors and organizations.

References

[1] Kidane, A.B., Delesa, K.E., Mummed, Y.Y. and Tadesse, M. (2019) Reproductive and Productive Performance of Holstein Friesian and Crossbreed Dairy Cattle at Large, Medium and Small Scale Dairy Farms in Ethiopia. *International Journal of Advanced Research in Biological Sciences*, **6**, 15-29.

[2] Getachew, F. (2003) Milk and Dairy Products, Post-Harvest Losses and Food Safety in Sub-Saharan Africa and the Near East. A Review of the Small Scale Dairy Sector-Ethiopia. FAO Prevention of Food Losses Programme, FAO.

[3] Yilma, Z. Guernebleich, E. and Sebsibe, A. (2011) Review of the Ethiopian Dairy Sector. 1-83.

[4] Redda, T. (2002) Small-Scale Milk Marketing and Processing in Ethiopia. *Proceedings of a South Workshop Held at NDDB*, Anand, 13-16 March 2001, 352-367.

[5] Saxena, M.M., Katpatal, B.G. and Pandey, H.S. (1997) Study of Milk Constituents and Their Yield in Holstein-Friesian Cows. *Indian Journal of Animal Production and Management*, **13**, 127-130.

[6] Tegegne, A. (2003) Financing Market Oriented Dairy Development: The Case of Ada'a-Liben District Dairy Association, Ethiopia. Koninklijke, 45 p.

[7] Staal, S.J., Pratt, A.N. and Jabbar, M. (2008) Dairy Development for the Resource Poor. Part II: Kenya and Ethiopia Dairy Development Case Studies. PPLPI (Pro-Poor Livestock Policy Initiative) Working Paper No. 44-2, ILRI (International Livestock Research Institute).

[8] De Leeuw, P.N., Omore, A., Staal, S. and Thorpe, W. (1999) Dairy Production Systems in the Tropics. In: Falvey, L. and Chantalakhana, C., Eds., *Smallholder Dairying in the Tropics*, ILRI (International Livestock Research Institute), 19-37.

[9] Livestock Cooperative Agreement (2010) Dairy Value Chains, End Markets and Food Security. The Next Stage in Dairy Development for Ethiopia. 88.

[10] SNV (The Netherlands Development Organization) (2008) Study on Dairy Investment Opportunities in Ethiopia. 59.

[11] Urgessa, Y. (2015) Status of Dairy Cattle Production in Borana and Guji Zone, Ethiopia. *International Journal of Innovative Research & Development*. **4**, 5-16.

[12] Kurtu, M.Y. (2003) Certain Aspects of the Dairy System in the Harar Milk Shed, Eastern Ethiopia. Ph.D. Thesis Dissertation, University of the Free State, Bloemfontein,

Faculty of Natural and Agricultural Sciences, 195.

[13] Yemane, B. (2000) Livestock Feed Resource Status of Afar Region. *Proceeding of the 8th Annual conference of ESAP* (*Ethiopian Society of Animal Production*), Addis Ababa, 24-26 August 2000, 35-43.

[14] Ibrahim, H. and Olaloku, E. (2002) Improving Cattle for Milk, Meat and Traction. ILRI, Manual 4, ILRI (International Livestock Research Institute), 135.

[15] Leng, R. (1999) Feeding Strategies for Improving Milk Production. 207-224. In: Speedy, A. and Sansoucy, R., Eds., *Smallholder Dairying in the Tropics*, ILRI (International Livestock Research Institute), 462.

[16] Coppock, D.L. (1994) The Boran Pleatue of Southern Ethiopia: Synthesis of Pastoral Research, Development and Change, 1980-91. ILCA Systems Study, No.5, ILCA, 393.

[17] Hussen, K. (2007) Characterization of Milk Production System and Opportunity for Market Orientation: A Case Study of Mieso District, Oromia Region, Ethiopia. MSC. Harmaya University.

[18] Anteneh, B., Tegegne, A., Beyene, F. and Gebremedhin, B. (2010) Cattle Milk and Meat Production and Marketing Systems and Opportunities for Market Orientation in Fogera Woreda, Amhara Region, Ethiopia. Improving Productivity and Market Success of Ethiopian Farmers Project Working Paper 19, No. 19, 65.

[19] FAO (2000) Food and Agriculture Organization 2000 Year Book. http://faostat.fao.org/

[20] Shiferaw, Y., Tenhagen, B.-A., Bekana, M. and Kassa, T. (2003) Reproductive Performance of Crossbred Dairy Cows in Different Production Systems in the Central Highlands of Ethiopia. *Tropical Animal Health and Production*, **35**, 551-561. https://doi.org/10.1023/a:1027377722576

[21] Weldearegay, H., Yilma, Z. and Tekle-Giorgis, Y. (2012) Challenges and Opportunities of Milk Production under Different Urban Dairy Farm Sizes in Hawassa City, Southern Ethiopia. *African Journal of Agricultural Research*, **7**, 3860-3866. https://doi.org/10.5897/AJAR12.497

[22] Abebe Workneh and Ulfina Galmessa (2012) Gender Role in Peri Urban Dairy Production System of Ambo Town, Ethiopia. *Journal of Agricultural Extension and Rural Development*, **3**, 224-228. https://doi.org/10.5897/JAERD11.030

[23] Asaminew, T. and Eyassu, S. (2009) Smallholder Dairy Productin System and Emergence of Dairy Cooperaties in Bahir Dar Zuria and Mecha Woredas, Northwestern Ethiopia. *World Journal of Dairy and Food Sciences*, **4**, 185-192.

[24] Tadesse, B., Zelalem, Y., Alemu, G. and Sebsibe, D. (2011) Milk Yield Performanceof Two and Three Breed Crosses of Dairy Cattle in the Central Highland of Ethiopia. *Journal of Dairy Science*, **2**, 61-74.

[25] Kumar, N., Eshetie, A., Gebrekidan, B. and Gurmu, E.B. (2014) Reproductive Performance of Indigenous and HF Crossbred Dairy Cows in Gondar, Ethiopia. *IOSR Journal of Agriculture and Veterinary Science*, **7**, 56-61. https://doi.org/10.9790/2380-07155661

[26] Kebede, H. (2015) Productive and Reproductive Performance of Holstein-Friesian Cows under Farmer's Management in Hossana Town, Ethiopia. *International Journal of Dairy Science*, **10**, 126-133. https://doi.org/10.3923/ijds.2015.126.133

[27] Kollalpitiya, K., Premaratne, S. and Peiris, B. (2012) Reproductive and Productive Performance of Up-Country Exotic Dairy Cattle Breeds of Sri Lanka. *Tropical Agricultural Research*, **23**, Article 319. https://doi.org/10.4038/tar.v23i4.4867

[28] Ajili, N., Rekik, B., Gara, A.B. and Bouraoui, R. (2007) Relationships among Milk

Production, Reproductive Traits and Herd Life for Tunisian Holstein-Friesian Cows. *African Journal of Agricultural Research*, **2**, 47-51.

[29] Gabriel, H.K., John, C.M., Trail, M.Y., Kurtu, G.W., Frank, M.A. and Jeffrey, D. (1983) Crossbred Dairy Cattle Productivity in Arsi Region, Ethiopia. ILCA Research Report, No. 11.

[30] Rege, J.E.O., Ayalew, W., Getahun, E., Hanotte, O. and Dessie, T. (2006) DAGRIS (Domestic Animal Genetic Resources Information System). International Livestock Research Institute. http://dagris.ilri.cgiar.org

[31] Yifat, D., Bahilibi, W. and Desie, S. (2012) Reproductive Performance of Boran Cows at Tatesa Cattle Breeding Center. *Advances in Biological Research*, **6**, 101-105.

[32] Mulugeta, A. and Belayeneh, A. (2013) Reproductive and Lactation Performances of Dairy Cows in Chacha Town and Nearby Selected Kebeles, North Shoa Zone, Amhara Region, Ethiopia. *World Journal of Agricultural Sciences*, **1**, 8-17.

[33] Hunduma, D. (2012) Reproductive Performance of Crossbred Dairy Cows under Smallholder Condition in Ethiopia. *International Journal of Livestock Production*, **3**, 25-28. https://doi.org/10.5897/IJLP11.055

[34] Nibret, M. (2012) Study on Reproductive Performance of Crossbred Dairy Cows under Small Holder Conditions in and Around Gondar, North Western Ethiopia. *Journal of Reproduction and Infertility*, **3**, 38-41.

[35] Belay, D., Yisehak, K. and Janssens, G.P.J. (2012) Productive and Reproductive Performance of Zebu X Holstein-Friesian Crossbred Dairy Cows in Jimma Town, Oromia, Ethiopia. *Global Veterinaria*, **8**, 67-72.

[36] Kiwuwa, G.H., Trail, J.C.M., Kurtu, M.Y., Worku, G., Anderson, F.M. and Durkin, J. (1983) Crossbred Dairy Cattle Productivity in Arsi Region, Ethiopia. Research Report No. 11, ILCA, 1-29.

[37] Singh, K., Khanna, A.S. and Kanaudia, A.S. (2000) Factor Effecting Lactation Performance and Persistency in Crossbred Cattle. *India Journal of Dairy Science*, **53**, 354-360.