OMO International Journal of Sciences

DOI: https://doi.org/10.59122/14438wx

Vol. 6 Issue. 2, December , 2023, pages: 87~110

ISSN(Print): 2520-4882 :ISSN(Online):2709-4596

Full-Length Research Article

Crossbreed Dairy Cow Production, Feeding and Management practice at Gidole Town, south Ethiopia

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ABSTRACT

The study aimed to evaluate the production, feeding, and management techniques of Holstein Friesian (HF) crossbred dairy cows at Gidole town, south Ethiopia. Cross-sectional survey involving 60 households selected through systematic random sampling from a total of 150 households with crossbred HF dairy cows in the town. Chemical compositional analysis performed on key feed items collected from the study households. Data analyzed using the Statistical Package for the Social Sciences software. Average daily milk yield was 7.29±0.22 liters, while average lactation milk yield was 1727.73±9.57 liters. The average lactation length was 7.9±1.45 months. While 53.3% of households possessed crossbreed cows with a blood level of 50%, 43.3% had cows with a blood level of 50-75% and 3.3% had cows with a blood level beyond 75%. Crop residue, improved forages (*desho*, Guatemala, and elephant grass), *enset*, *atella*, and salt were the most important cattle feed resources. In the non-conventional diet, *atella* has the highest crude protein (CP) content (29.24%), followed by elephant grass (18.44%) and teff straw (6.34%). Despite its importance, feed availability remains a challenge in terms of both quality and quantity. To address this, the study recommends strong extension efforts focused on: promoting the use of concentrate feed, developing and utilizing improved forage options and treating crop residues to enhance their quality.

Keywords: Crossbred dairy cow, Gidole, feed, feeding practices, milk production

Received: 18 July 2023; Accepted: October 8, 2023; Published: December, 2023

1. INTRODUCTION

Ethiopia's diverse agro-ecological zones and large livestock population make it a significant hub for livestock in Africa (Ayalew and Abateneh, 2019; Belay and Janssens, 2014; CSA, 2021). The majority of cattle are indigenous breeds, with a small percentage being crossbred and fewer pure exotic breeds. Livestock, particularly dairy production, plays a crucial role in the country's agricultural and socio-economic landscape. However, challenges such as feed scarcity, poor management, and low genetic potential hinder milk production and overall productivity. Much of the available feed resources are utilized to support the maintenance requirements of the animals, with little surplus for production. There is marked seasonality in the quantity and quality of available feed resources due to various environmental determinants such as drought and frost (Jimma *et al.*, 2016) and poor management and conservation techniques.

Livestock feed resources are classified as natural pasture, crop residue, aftermath grazing, and fodder, of which the first two contribute the largest feed type (CSA, 2012). The contribution to these feed resources, however, depends on the agro-ecology, the type of crop produced, accessibility, and production system (Ahmed *et al.*, 2010). To meet the future demand, production of milk, including milk production per lactating cow, would need to be significantly increased if the available feed resources were sufficient, especially in terms of DM, CP, and ME. Moreover, unbalanced feeding could lead to the excess feeding of some nutrients while others remain deficient. This not only reduces productivity and increases costs per kg of product but also affects various physiological functions, including long-term animal health, fertility, and productivity (Yisehak and Geert, 2014).

Crossbreeding native cattle has been suggested as the most effective and quickest method of genetically enhancing the productivity of regional dairy herds. Crossbred cows are thought to have higher genetic potential and produce more milk than native cows (Lembeye *et al*., 2016; Getahun, 2022). However, crossbred and exotic cattle breeds account for only 1.62% and 0.18% of Ethiopia’s total cow population, respectively (Getahun, 2022). Even crossbred cow milk output is low under farmer management, which is attributed to inadequate feeding and management circumstances (Hatew *et al*., 2023). Efforts to increase indigenous bovine milk output through crossbreeding with exotic genotypes under smallholder farmer settings in Ethiopia have yielded minimal results.

Milk output from these crossbred cows has yet to reach its full potential, producing enough milk and dairy products to meet domestic demand. Implementing genetic improvement strategies in smallholder crossbred populations presents numerous challenges, the most significant of which is a lack of performance or pedigree recording, as well as uncertainty about what accuracy can be achieved when herd sizes are small and production environments vary greatly between farms and over time (Rao *et al*., 2014). Funding and action fatigue are barriers to commencing genetic improvement in such populations due to the significant lag time between when performance recording begins and when enough pedigree information is acquired to provide breeding values (Al Kalaldeh *et al*., 2021). However, to achieve a specific level of milk yield potential in crossbred cows, equivalent improvements in management and feeding are required (Tekeba *et al*., 2014). According to Haile et al. (2009), despite the potential for increased milk production with higher intervention levels, traditional smallholder management and feeding techniques are often regarded as insufficient to sustainably support the higher productivity potential of crossbred cows in Ethiopia. Tekeba *et al*. (2014) explored the interplay between genetic potential and the plane of nutrition and discovered that management systems and supplementing conventional diets supplied to cows with energy and protein-rich concentrates resulted in higher daily milk production. Additionally, they reported that improved nutrition helped crossbred cows significantly more than native cows in terms of milk production and body condition maintenance, crucial factors in reproductive success. Therefore, the main obstacle to the development of Ethiopia's livestock subsector is the paucity of feed in both the quantity and quality dimensions. In Ethiopia, the adoption of better dairy husbandry techniques is positively and significantly correlated with training in dairy farming, aside from feed (Dehinenet *et al*., 2014; Samuel *et al*., 2016).

This study aimed to assess the production system and management conditions of crossbreed dairy cows at Gidole town, South Ethiopia. In Derashe special district, Gidole town, improved or crossbred dairying plays a vital role in the livelihood of the farming community. This activity serves both as a source of income generation and as a means to meet family milk needs. The emergence of small-scale, market-oriented urban dairy production has gained popularity, contributing significantly to bridging the demand-supply gap for milk and milk-based products. This gap arises due to population growth, income dynamics, and urban expansion. Despite its importance, challenges persist. Smallholder semi-urban dairy producers at Gidole town face obstacles related to

feed scarcity, subpar feed quality, and inadequate feeding management practices. As a result, milk production from the cows they rear remains disappointingly low. Efforts to address these challenges are crucial for sustaining dairy production, improving livelihoods, and meeting the growing demand for dairy products in the region.

2. MATERIALS AND METHODS

2.1. Descriptions of the Study Area

This study was conducted in Derashe special district to examine the production, feeding and management practices of Holstein Friesian crossbred dairy cows at Gidole town. Gidole is the capital town of Derashe and is about 550 km away from Addis Ababa, the capital city (Asfaw, 2017). Derashe has an estimated area of 148,700 hectares (SASA, 2016). Among the total area, 50514.14 (33.97) hectares are cultivated land, 7589.5 hectares are rangeland, 17,165.38 hectares are forest, 16278.18 hectares are water bodies, and 57152.8 hectares are others (21051 hectares of settlement, 15561.8 hectares of arable land, and 20540 hectares of unarable land).

Derashe shares borders with Amaro and Konso Zone in the east, Alle district and Gamo Zone in the west, Gamo Zone in the north, and Konso Zone and Alle district in the south. Astronomically, the district extends from 5.390–5.780 N latitudes and 37.010–37.560 E longitudes. Its altitude (elevation) ranges from 501 to 2500 meters above sea level (SASA, 2016). According to the 2007 Census report, the total population of the district was about 140,197, of which the male population is 68,471 and the female population is 71,726 (CSA, 2007).

It is estimated that about 119,127 (84.97%) of the population live in rural areas, of which 58,081 (48.75%) are males and 61,046 (51.24%) are females (SASA, 2018). Based on its location and altitude characteristics, it is categorized into three traditional agro-climatic zones: the *Dega* (highland), the *Woyena Dega* (midland), and the *Kolla* (lowland). *Dega* comprises 9.8%, *Woina-Dega* 34.5%, and *Kolla* 55.7% of the total land area of the district (WFEDOASA, 2019). The climate of the area is dry and warm, with relatively low precipitation. It receives two rainy seasons, the *Belg* and *Maher* rainy seasons. *Belg*'s short rainy (cropping) season extends from February to June, whereas *Meher*'s long and main rainy (cropping) season extends from July to December. The

long-term mean maximum and minimum temperature are 27.5 °CC, respectively. The dominant soil type in the district is sand soil, which accounts for 48%. The annual rainfall of the district is between 601 mm and 1600 mm (SASA, 2016). Rainfall is irregular and bimodal, peaking around April and October. Feeding recommendations for dairy cows include an optimum ratio of forage to concentrates of 60 to 40%, with variations between 55:45 and 65:35% being optimal in ammonia N levels, free amino acids, and the acetate: propionate ratio (Kljak et al., 2017). The levels of inclusion of concentrates influence milk yield, fat, and protein.

Gidole farmers practice a traditional smallholder mixed crop-livestock agricultural technique. Livestock have a vital role in the economy of both the region and the study area. Livestock are kept primarily as a source of capital that may be converted into cash when needed, for agricultural cultivation, food for humans, and as a supply of manure to improve soil fertility. The dominant livestock of the area is cattle, which is estimated to be 156,875 head. Small ruminants, poultry, and equines account for around 168,936, 250,000, and 15,000, respectively.

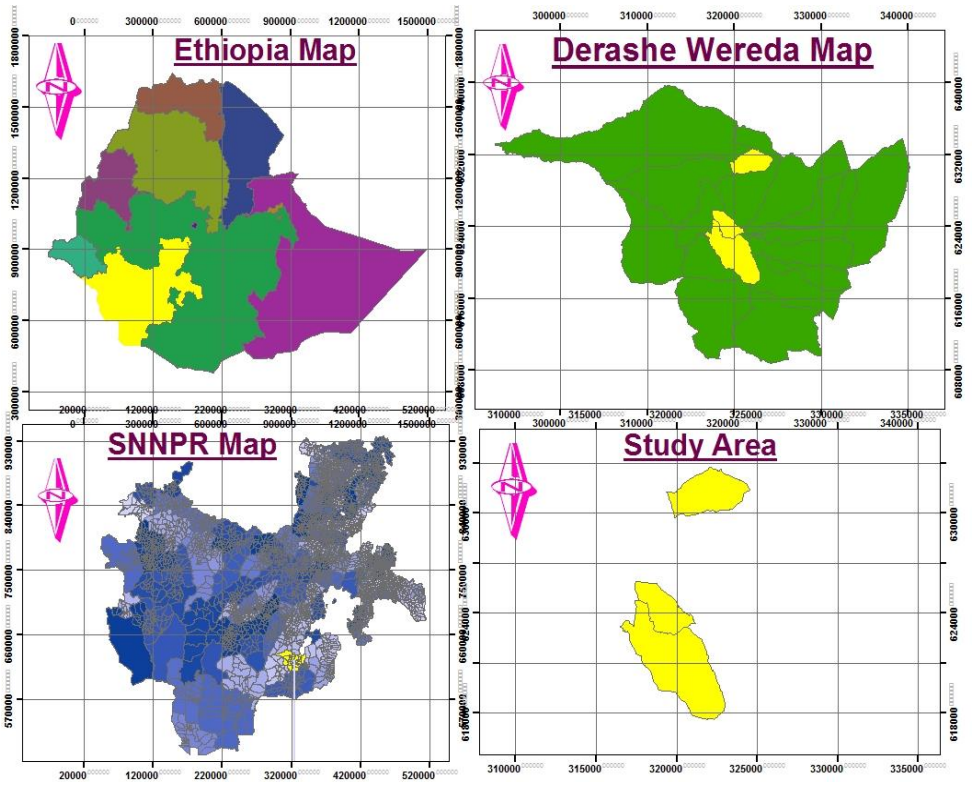

Figure 1. Map of the Derash district in the southern nation nationalities people region of Ethiopia

2.2. Sample Size and Sampling Technique

The purpose of this study was to examine the production system, feeding, and management circumstances of crossbreed dairy cows at Gidole town, utilizing systematic random sampling procedures and a cross-sectional household survey to capture dairy cattle management practices in the study region. The cross-sectional study was conducted in three kebeles of Gidole town: Hallale, Solle, and Layighaw Arguba administrative units (kebeles) with 100% highlands. From a list of 150 households, 60 respondents were selected using systematic random selection techniques from the list of farmers that have Holstein Frisian (HF) crossbred dairy cows in their herd (Table 1). A field study was carried out on urban dairy production systems at Gidole town.

Table 1 Proportion **s**ample size in each unit (kebele) in the Gidole town

Name of unit (kebele) Selected	**Total households have crossbred Holstein Frisian cow**	**Proportion of household**	**Sample size in each unit (*kebele*)**
Hallale	60	0.4	24
Solle	56	0.37	22
Layighaw Arguba	34	0.23	14
Total	150	1.0	60

2.3. Method of Data Collection

The current study collected data from both primary and secondary sources. The primary data sources came from the study households. Furthermore, in the selected study houses, a daily milk yield and feed type recording sheet were maintained and recorded. Secondary data were gathered from the district and town livestock and fishery resource offices. Initially, the questionnaire examined the blood level (%), parity stage, milk supply, and feeding practice (quantity of feed delivered, type, quality, suppliers, and so on). Data on socioeconomic level, productivity, labor distribution, housing, and cleaning frequency were also collected. Data were obtained using well-prepared questions and qualified enumerators from livestock and fishery resource offices, with the researcher closely monitoring the household interviews. The compositional quality assessment of feedstuffs collected from the intervening household for dry matter (DM), crude protein (CP), neutral

detergent fiber (NDF), and ash was conducted at Arba Minch University's College of Agriculture research laboratory.

2.4. Data Analysis

Means and standard errors (SE) were calculated with a significance level of P = 0.05 to determine the impact of diets and feeding procedures on milk yield in the categories. Cross-tab analysis was used to examine the frequency data. Statistical analyses were performed using SPSS 20 for Windows (SPSS Inc., Chicago, USA).

3. RESULTS AND DISCUSSION

3.1. Socio-Economic Characteristics

The socioeconomic characteristics of the respondent households in the study area are shown in Table 2. The age category of the majority (60%) of the respondents was found between 41 and 60 years, followed by 36.7% between 31 and 40 years. There was no significant difference in the age categories of the study households. The age group of the current result is comparable with the result of Megersa (2016), who reported that the majority of respondents' ages ranged from 25 to 62 years in the west Shoa zone, Oromia region, Ethiopia. The current age distribution pattern reflects that young people are less dependent on urban and peri-urban dairy production, which might be due to financial and experience-related problems.

The educational status of the majority of the respondents was in primary school (43.3%), followed by high school (30%) and college and above (26.7%) education (Table 2). There was no significant difference in educational status in the study area. The current result is contrary to the result of Abebe *et al*. (2017), who reported that the first degree (6.58%) was the highest educational level achieved by household heads in the central highlands of Ethiopia. When farmers have a higher educational level, it helps in better understanding and adoption of new farm technologies as well as better husbandry practices (Lemma *et al*., 2012; Gizaw *et al*., 2012). The educational status of the current result indicates that there is a good opportunity to practice dairy farming in a better manner and to transfer knowledge and technologies easily to those small dairy producers to obtain better milk production.

In the current study, the highest percentages of household heads (70%) were male, which implies that higher proportions of males were engaged in dairying than females (30%). There is no significant difference in household head members in the study area (Table 2). The current result of the household head is comparable with the result of Saba (2015), who reported that the majority of the household heads is male in the Adea Berga and Ejerie districts of the west Shoa zone, Ethiopia. In the central zone of Tigray, Gebrekidan *et al*. (2012) also indicated that the proportion of male household heads was higher than that of female heads. This indicates that females are less dependent on urban dairy production than males, so attention must be given to the females participation in smallholder dairy farming for work, employment, and income generation.

Table 2 Socio-economic characteristics of the respondent household in the Gidole town

Variable	Frequency	Percent (%)	P- value
Age			
Below 30 years	2	3.3	
Between 31 to 40 years	22	36.7	0.370
Between 41 to 60 years	36	60	
Total	60	100	
Education			
Primary school	26	43.3	
(High school	18	30.0	0.300
College and above study	16	26.7	
Total	60	100	
Sex			
Male	42	70.0	0.240
Female	18	30	
Total	60	100	

3.2. Household Income Source

The household income source of the study household is shown in (Table 3). Livestock and off-farm activities earn about 40% of the majority of the respondent household income in the study area. While followed by off-farm activities generated 26.7% of the income. However, there is no significant difference in income sources. The current result is comparable with the result of Kassu (2016) who reported that the majority of the respondents were primarily involved in milk production (78%) followed by poultry production (14.7%) and goat production (7.3%) in the area of

Bona Zuria district of Sidama Zone, southern Ethiopia. The result indicates that a livestock farming practice plays a great role in the generating of household income and work employment.

Table 3 Income source of the household in the Gidole town

Activity	Frequency	Percent (%)	*P* –value
Crop production	10	16.7	0.101
Off-farm activities	16	26.7	
All activities	2	3.3	
Mixed farming	4	6.7	
Crop and off-farm	4	6.7	
Livestock and off-farm	24	40	
Total	60	100	

3.3. Milk Yield of Crossbred Dairy Cow

3.3.1. Daily milk yield of crossbred cow

The daily milk yield (DMY) and lactation length of dairy cattle in the study area are shown in (Table 4). The mean value of the daily milk yield of crossbred cows in the study area was 7.29±0.22 liter/day. The reported average daily milk yield of crossbred cows in this study is less than the value of 11.9 and 11 liters/day reported by Getu *et al*. (2009) and Saba (2015), respectively. Similarly, the higher overall mean daily milk yield per cow was reported from the crossbred dairy cows which was 13.56 ± 1.34 liters, in the Smallholder dairying of the ada'a district of Ethiopia (Habtamu, 2018).

A DMY of 11.6 and 10.8 liters were recorded in Bishoftu and Akaki towns, respectively, for crossbred cows (Dessalegn *et al*., 2016), and in Adama milk shed, it was 11.3 liters (Nigusu and Yoseph, 2014). In Hawassa, a DMY of 10.32 liters for cross-bred cows is recorded (Haile *et al*., 2012). This result is again less than the findings of Yitaye *et al*. (2008), who reported 7.8 liters at Bahir Dar and Gondar peri-urban milk sheds, and Yayeh *et al.* (2017), who reported 7.3 liters in Debre Markos town. However, this result is higher than Asaminew and Eyasu's (2009) reported 5.2 liters of DMY in Bahir Dar Zuria. Demissu (2014) reported that the average daily milk yield in three towns in the Horo Guduru Wollega zone was 7.21 liters. Those findings revealed that the bigger the cities where dairy production is found, the higher the recorded daily milk yield. This

could be because bigger cities have better access to inputs like concentrate feeds, AI, veterinary services, and markets. Therefore, to improve the milk productivity of cow inputs like concentrates and industrial by-products, AI, veterinary services, and market accessibility must be facilitated.

3.3.2. Lactation length of crossbred cow

Lactation length refers to the period from the time a cow starts to secrete milk after parturition to the time of drying off. The low lactation lengths and low milk yield of the study area dairy cows might be related to breed, production system, herd management related to feeding, disease, and other environmental factors. The mean lactation length of crossbreed cows in the study area was 7.9±1.45 months. The mean lactation length of the current study was less than the results of Mulugeta and Belayneh (2013) and Ketema (2014), which were 11 months in North Showa and 10.1 months in Kersa Malima Woreda, respectively. This finding is also lower than 9.17 months in Gondar town (Kumar *et al.*, 2014), 8.7 months in Debre Markos (Yayeh *et al*., 2017), 10 months in Bahir Dar Zuria (Assaminew and Eyasu, 2009), 10 months in Jimma town (Ulfina *et al*., 2013), and 9.22 and 9.36 months in Bishoftu and Akaki (Dessalegn *et al*., 2016).

The average lactation length of crossbred cows in the study area was 7.9±1.45 with an estimated lactation milk yield of 1727.73±9.57 liters (Table 4). This result was low compared to the average lactation period reported by Ike *et al.* (2005), which was 11.2 months with a lactation yield of 3949.6 liters for cows in urban farms, and also because the current result of lactation milk yield is less than the result of Ike *et al.* (2005), which was 12.2 months with a lactation yield of 2596.2 liters for cows in peri-urban farms in Awassa.

Table 4 Milk yield and lactation length of crossbred dairy cow in the Gidole town

Milk production	Mean ± Standard Error
Milk yield per day in liter	7.29±0.22
Lactation length (month)	7.9±1.45
Lactation milk yield (year) in liter	1727.73±9.57

3.4. Purpose of Keeping Dairy Cow

The purpose of keeping dairy cows is indicated in Table 5. The majority of the households' milk products were for market sale and household consumption (33.3%), for market sale (30%), and for household consumption only (26.7%). This implies that dairy cow milk production in the study area plays a great role in food nutritional security and income generation.

Table 5 Purpose of rearing dairy cows in the household in the Gidole town

Purpose	Frequency	Percent (%)
Market sale only	18	30.0
Free calve suckle and growth only	6	10.0
Household consumption only	16	26.7
Market sales and household consumption	20	33.3
Total	**60**	**100.0**

3.5. Breed Type and Blood Level of Dairy Cow

The breed type of dairy cow in the study area is shown in Table 6. Local breeds made up 63.33% of the breeds of cows in the research area, while crossbreeds made up 36.66%. In the study area, 53.3% of families possessed crossbreed cows with a blood level of 50%, 43.3% had cows with a blood level of 50–75% and 3.3% had cows with a blood level of more than 75%. This shows that crossbred dairy production in the research area will eventually increase. This dairy system is significantly contributing to closing the massive demand-supply gap for milk and milk-based products driven by population, income, and urban growth. This was an excellent opportunity for dairy farming.

The blood level of dairy cows in the study area was comparable to the results of Melku *et al.* (2017) and Megersa (2016), who reported that the exotic blood level of crossbred cows was less than 50% in the peri-urban and urban ranges of 50–75% of the exotic blood level in West Gojam Zone, Amhara Region. The study also indicated that the majority of respondents ranked at the first 50–75% exotic blood level of crossbred dairy cows in West Shoa Zone, Oromia, Ethiopia, with an index result of 0.46. The experimental unit of on-farm monitoring and evaluation of the effect of household feed and feeding practices on milk yield of Holstein Friesian crossbred dairy cows was

carried out and registered a maximum sample size in a better manner for 12 dairy cows of blood type 50–75% of parity two at the same lactation stage.

Table 6 Breed type and blood level of dairy cow in the household in the Gidole town

Breed type	**Frequency**	**Percent (%)**
Local breeds	38	63.33
Crossbreeds	22	36.66
Total	60	100
Blood level (%)		
50	32	53.3
50-75	26	43.3
Above 75	2	3.3
Total	60	100

3.6. Dairy Cattle Management Practices

3.6.1. Labor use of dairy cattle husbandry

Table 7 shows the study results for labor use in dairy cattle husbandry. Women performed the majority of dairy cattle husbandry management duties, including 50% herding, 64% milking, 50% barn cleaning, 50% feeding, 23% live animal sales, and 80% livestock product sales. Men handled 88% of live animal sales, 79% of breeding decisions, and 57% of health management.

The current result is comparable to Kedija's (2008) findings, which revealed that milking is largely done by women in the Meiso district. Men (95.4%) make the majority of decisions regarding live animal sales and breeding. Similarly, Tesfamichea and Yien (2021) revealed that household members engaged in varied dairy animal husbandry activities in Gambella's lowlands. This research demonstrated that women play a minor role in household decision-making, with men making the majority of decisions. As a result, this outcome demonstrated the importance of gender education in the district so that women might be empowered in all social, economic, cultural, and political contexts.

Table 7 Labor division of the household in dairy cattle husbandry in the Gidole town

	Responsible family members in percent			
Activity	**Children%**	**Women%**	**Men%**	**Hired labor %**
Herding	17	50	23	10
Milking	0	64	26	10
Barn cleaning	15	50	15	20
Sale of animal	0	23	88	0
Feeding	10	50	15	25
Sell of dairy product	0	80	20	0
Caring of calves	35	27	13	25
Breeding decision	0	21	79	0
Health management of dairy cattle	5	23	57	15

3.6.2. Breeding practice

Natural mating and artificial insemination were identified as common breeding practices in the research area, as indicated in Table 8. Natural mating is used by 43.3% of responders, artificial insemination by 50%, and a combination of natural and artificial insemination by 6.7%.

The current result is analogous to that of Desalegn (2008), who found that the proportion of AI users was higher near Addis than in regional locations. Major constraints associated with AI in Ethiopia include a lack of collaboration and regular communication between the National Artificial Insemination Centre (NAIC) and stakeholders, the absence of a proper and functional breeding policy and herd recording system, insufficient resources in terms of inputs and facilities, and the absence of incentives and rewards to motivate AI technicians (Desalegn, 2008).

In controlled mating systems, heat detection and timing of service in the study area were carried out by the farmers, and each cow was mated once during each heat period. During the breeding season, some farmers mate their cows and heifers with the superior bulls owned by themselves or their neighbors. Most of the farmers breed their cows with the best performing crossbred bull available in the herd when their cows come to heat.

Table 8 The mating system of dairy cattle in the Gidole town

Mating systems	**Frequency**	**Percent (%)**
Natural mating only	26	43.3
Artificial insemination only	30	50
Both	4	6.7
Total	60	100

3.6.3. Dairy cattle housing and facilities

Dairy cattle housing practices in the study locations is presented in Table 9. All of the respondents (100%) in the research areas kept their cattle in separate houses. The current result's housing system is identical to the Saba (2015) report, which said that all farmers in the Adea Berga and Ejerie districts use housed barns for their cows. Similarly, Ayalew (2017) found that in South Wollo Zone, Dessie town, Ethiopia, all (100%) urban and peri-urban respondents kept their dairy cows in separate houses. Furthermore, 80% of urban dairy farms and 3.33% of peri-urban medium and large dairy farms in Mekelle, Ethiopia, used distinct housing systems (Hulagersh *et al*., 2017). In contrast to Babege et al. (2020), who reported that 96.7% of respondents shared the same dwelling with their animals in the Cheha District of Gurage Zone.

Table 9 shows dairy cattle feed and water trough facilities. The majority of responses (60%) has both feed and water troughs, whereas 40% only have a feed trough. Kibru *et al*. (2015) found that most farmers in the Aleta Chukko district of southern Ethiopia had stables with water and feed troughs. To summarize, well-designed feeders and drinkers are crucial materials for dairy cows in terms of feed quality maintenance, animal nutrition improvement, and feed waste reduction.

Table 9 Dairy Cattle housing facilities in the Gidole town

Variables	**Respondent N=60**	**Percent**
Housing type		
Separate house	60	100
Facilities in the barn		
Feed trough only	24	40
Both feed and water trough	36	60

3.6.4. Frequency of barn cleaning and milking

Table 10 displays the frequency of barn cleaning and milking practices used in the current investigation. The majority of respondents (56.66%) clean the barn once each day, while 43.33% clean it twice per day. The current results are low in comparison to Saba (2015) and Abebe *et al*. (2012), who reported that the majority of respondents (65%) removed it daily and 35% removed it

three times a week in the Adea Berga and Ejerie districts of the West Shoa zone, respectively. Abebe *et al*. (2012) observed similar findings, with 47% of respondents cleaning their barn three times per week in Gurage Zone, Ezha district.

Maintaining the sanitary state of the milking environment is critical for clean milk production (Zelalem, 2010). The current research area's milking site was approximately 70% in the barn, with 30% outside the room. The results were comparable to those of Godferey (2013) and Mbabazi (2005), who found that farmers milking their cows in the open air could expose milk to contaminants from the environment, and farmers milking their animals in undesignated, poorly maintained milking shades or parlors predispose milk to contamination and spoilage.

Table 9.Frequency of barn cleaning, and milking area of cows in the Gidole town

Variables	**Respondent (N=60)**	**Percent**
Frequency of cleaning barn		
Twice a day	26	43.33
Once a day	34	56.66
Milking parlor		
In the barn	42	70
Outside of the room	18	30

3.6.6. Major Feed resource for crossbreed dairy cow

Table 11 shows the ranks of major types of feed resources used for dairy cattle in the study area. The primary feed resources were crop residues (1st rank), improved forages (2nd rank), crop leftovers (*enset*/banana) (3rd rank), and natural pasture (4th rank). The results show that crop residues, enhanced forages, and crop leftovers (*enset*/banana) were the most commonly used diets for cross-bred dairy cattle at Gidole town.

The feed resource observed in the current study was comparable to the results of Ayalew (2017) and Kassu (2016), in which the major feed resources are natural grazing, crop residues, hay, improved forage, agro-industrial byproducts, and non-conventional feedstuffs in the South Wollo Zone.

Mesfin (2015) observed natural grassland (57.5%), agricultural leftovers (26.3%), crop aftermaths (16.2%), and crop aftermaths (16.2%) in the Bona Zuria area of Sidama Zone, which contradicts the current result. Today, the relevance of natural pasture is gradually declining due to increased crop production on grazing land and land degradation. This suggests that it requires attention for better forage cultivation and the right use of agricultural leftovers and crop aftermath.

Table 11 Types of Feed resources used for dairy cattle in the Gidole town

Feed types	Frequency	Percent	Ranking
Improved forages	8	13.3	2nd
Natural pasture	4	6.7	4th
Crop residues	42	70.0	1st
Crop leftover (*enset*/banana)	6	10.0	3rd
Total	60	100.0	

3.6.7. Supplementary Feed resource of crossbreed dairy cow

Table 12 shows the supplemental feed resource consumption for dairy cattle in the research area. According to the respondents interviewed, *atella* (1st rank), salt (2nd rank), industrial by-products (3rd rank), and a combination of *atella* of all additional feeds (4th rank).

Supplementary feed resource use for dairy cattle in the study area is shown in Table 12. According to respondents interviewed, *atella* (1st rank), salt (2nd rank), industrial by-products (3rd rank), and *atella* and combination of all supplementary feeds together (4th rank). The current result is comparable to the result of Mengistu *et al*. (2016), who reported that the use of these by-products for supplementary livestock feeding is justified when the forage supply is inadequate for the animals' needs in terms of either quality or quantity or when the cost of the supplementation is less than the value of increased animal production. Similarly, in Adwa and Axum, hay, crop residue, grazing, crop aftermath, and non-conventional feed like *atella* (a by-product of *katikala*) were identified as major sources of feed (Gebrekidan and Gangwar, 2015).

Table 12 Supplementary feed resource for crossbred dairy cows in the Gidole town

Types of supplementary feed	Frequency	Percent	Ranking
Atella	30	50	1st
Salt	18	30	2nd
Industrial by-products	8	13.3	3rd
Combination of all supplementary feeds together	4	6.7	4th
Total	**60**	**100**	

3.7. Feed type and composition

Table 13 shows the principal feed types employed in the study region, as well as their chemical composition. *Atella* had the highest CP content of the feeds, followed by elephant grass, Guatemala grass, and *enset*. The NDF concentration of feed was greater in Guatemala, *teff* straw, *desho* grass, and elephant grass. The CP levels of feedstuffs were greater in *atella*, elephant grass, Guatemala grass, *desho* grass, *enset* stem and root, and teff straw. This result suggests that *atella* has the most metabolized energy of the others, followed by elephant grass, and *teff* straw has the lowest CP of the others from the diet supplemented with dairy cows in the study area.

Feeds that have high metabolic energy are important for the development of rumen for younger animals and the increment of production in any activity of the dairy cattle. The current result of the study area is comparable with the result of Kassu (2016), who reported that the major feed types commonly used in the study area and their chemical composition were higher for *atella* in the Bona Zuria district of Sidama Zone, southern Ethiopia. Pandev and Voskuil (2011) have recommended a daily dry matter (DM) intake of 3.6 to 4% of body weight for milking cows. They further suggest that 0.2 to 0.3% of daily feeds are proteins. The fibrous feeding material, important for ruminant nutrition, is needed in adequate amounts between 40 and 50% of the diet for crude fiber, with 19–21% of ADF and 26–28% of NDF (Pandev and Voskuil, 2011).

Table 10 Chemical compositions of some selected feedstuffs used for dairy cattle in the Gidole town

Feed type	**DM %**	**Ash%**	**CP%**	**NDF%**	**ADF%**	**ADL%**
Enset stem and root	90.02	6.74	13.15	47.48	22.13	2.88
Desho grass	92.68	5.73	9.51	63.85	40.29	5.43
Guatemala grass	91.77	3.35	15.43	79.97	46.09	7.91
Teff straw	91.07	4.39	6.34	73.18	47.05	7.42
Elephant grass	92.29	7.02	18.44	59.65	39.18	6.22
Atella	91.77	4.06	29.24	36.41	2.31	3.7

DM, Dry Matter; CP, Crude Protein; NDF, Nutrient Detergent Fiber; ADF, Acid Detergent Fiber; ADL, Acid Detergent Lignin

4. CONCLUSIONS

This study at Gidole town, located in the Derashe special district, discovered numerous critical findings of dairy production and management. According to our observations, young people are underrepresented in urban and peri-urban dairy production. This trend may be due to financial restrictions and a lack of experience. Older adults, particularly those with higher education levels, may have more information and abilities concerning dairy cow nutrition and management practices, as well as better financial resources for acquiring dairy cows. The major feed resources in the study area include crop residues, especially *teff* straw and maize thinning, as well as crop aftermath, hay, and improved forages such as elephant grass, *desho* grass, and Guatemala grass. Non-conventional feeds like *atella* is also utilized. Despite its importance, feed availability remains a challenge in terms of both quality and quantity. To address this, we recommend strong extension efforts focused on promoting the use of concentrate feed, developing and utilizing improved forage options, and treating crop residues to enhance their quality. The study observed a steady increase in the number of crossbreed dairy cows within households. This presents a potential opportunity for expanding medium- or large-scale dairy farms. Milk producers should explore supplementary feeds from agro-industrial byproducts to boost dairy cattle productivity. Implementing feed conservation methods, particularly hay and silage making during periods of excess feed availability, can mitigate shortages. Collaboration among experts and institutions is vital for realizing this potential.

Conflict of Interest

The authors declare no conflict of interest.

Acknowledgements

We are grateful for the financial assistance received from Arba Minch University in Ethiopia.

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