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Urban dairy production and waste management in Oromia special zone around Finfine, Ethiopia

Jalel Fikadu[1*], Berhan Tamir[2], Ulfina Galmessa[3] and Kefena Effa[3]

[1]Department of Animal Science, College of Agriculture and Natural Resources Assosa University, P. O. Box 18, Assosa, Ethiopia.
[2]Department of Animal Production, College of Agriculture and Veterinary Medicine, Addis Ababa University, P. O. Box 34, Bishoftu, Ethiopia.
[3]Ethiopian Institute of Agricultural Research Institute (EIAR), Holetta Agricultural Research Center, Ethiopia.

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The survey was conducted to assess urban dairy production and waste management system in Oromia Special Zone around Finfinnee, Ethiopia. The three study towns (Burayu, Sululta and Sebeta) were purposively selected due to the high potential for commercial dairy production. A total of 90 commercial dairy producers 30 from each town who at least own 10 dairy cows were randomly selected. The farmers interviewed individually using the survey questionnaire. The collected data were analyzed and the study revealed that 47.8 and 52.2% of the interviewed were female and male respectively. Next to daily laborers, household wives shared larger responsibility for feeding (21.1%), milking (28.9%) and cleaning (13.3%). The genetic composition of dairy cows in the study areas ranges from 50% exotic gene inheritances to pure (100%) exotic Holstein Friesian. Accordingly, 50, 62.5, ≥75% and pure Holstein Friesian cows account for about 24.4, 38.9, 24.4 and 11% of the herd, respectively. The major sources of feed were both formulated feed and feed that mixed at home (55.6%) and tap water (74. 4%). The average age at first calving, calving interval and days open was 2.26±.05years 20.8 ± 0.05 months and 161.76±34.80 days respectively. The major waste in the farm is manure (73.3%) and followed by feed left over (14.45%) and dust (12. 25%). High price feed, shortage of land, unavailability of dairy cow/heifer in time, feed quality, unavailability of feed in nearby area, diseases and lack of access to credit, shortage of water and inadequate training were among the major constraint of dairy production that need urgent intervention to utilize the untapped resources in the area.

Key words: Dairy cattle, urban, production, milk, waste.

INTRODUCTION

Urban livestock production constitutes an important subsector of the agricultural production system in Ethiopia. The contributions of urban livestock production to overall development include income and employment generation, poverty alleviation, and improvement of human nutrition and health (Azage, 2004). Keeping animals in urban areas is not new and nowadays the practice of keeping livestock in urban areas is increasing in many developing countries. Urban agriculture is generally characterized by closeness to markets, high

*Corresponding author. E-mail: jalelyadeta@gmail.com.

competition for land, limited space, use of urban resources such as organic solid wastes and wastewater, low degree of farmer organization, mainly perishable products and high degree of specialization. By supplying perishable products such as vegetables, fresh milk and poultry products, urban agriculture to a large extent complements rural agriculture and increases the efficiency of national food systems (Veenhuizen, 2006). Throughout the developing world, and especially in Africa, animals are an important physical and financial capital for many urban households. In the African settings, broiler chicken, milk and eggs come from city farms or the suburbs (Moustier and Danso, 2006). As a regular source of income, they represent a form of savings. They may also generate additional physical capital in the form of manure (Prain, 2006).

However, the major problem in less developed countries is lack of recognition of urban agriculture as a major contributor to food self-sufficiency and its many other actual and potential benefits towards sustainable urban development. In most of these countries there is no even baseline data and information on the very activity of the industry. In Ethiopia, market-oriented urban and per-urban dairy production systems are emerging as important components of the milk production systems. These systems are contributing immensely towards filling in the large demand-supply gap for milk and milk products in urban centers where consumption of milk and milk products is remarkably high (Azage and Alemu, 1998). Unlike rural livestock production in the country, which has recently given great emphasis for development in order to fulfill the livelihood of smallholder livestock farmers, research and development interventions are limited for urban livestock production in general and dairy production in particular in Oromia special zone around Finfine. Therefore, taking into consideration of these gaps, this study is designed to assess urban dairy production system and waste management practices in Oromia special zone around Finfine, Ethiopia.

MATERIALS AND METHODS

Description of the study areas

The study was conducted in Oromia Special Zone surrounding Addis Ababa, Ethiopia. The Oromia Special Zone has seven administrative towns. It is situated at an altitude ranging between 1700-3600 masl. The average minimum and maximum annual temperatures are 23 and 36°C, respectively. With the bimodal rainfall patter, the mean annual rainfall is between 800-226 mm. The long and heavy rainfall is received during the months of June to September while the short and small shower is received during February to April.

Study population

Urban dairy farmers and dairy animals kept by the dairy farmers represented the study population. Sample size from the three urban towns was determined as indicated in the formula below. Cross-sectional and retrospective studies were conducted to collect data using questionnaire. On-farm observations and laboratory analysis were also conducted on relevant data.

Sample size determination

The sample sizes for data collection through dairy farmers' survey were determined by using the sample size determination formula proposed by Yemane (1967).

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

Where, n= designates the sample size the researcher uses; N= designates total number of households heads. e= designates maximum variability or margin of error; 1= designates the probability of the event occurring. Accordingly, a total sample size was 90 urban dairy farmers/producers were selected from the three study sites. Then random sampling technique was applied to determine samples from each city and 30 dairy farmers were included from each urban town.

Sampling procedure

Two-stage sampling techniques were used to collect data. The first stage involved purposive selection of three towns out of the seven towns based on the practices and the availability of dairy farms in those areas. In the second stage, urban dairy farmers were selected randomly from the list of urban dairy farmers from each selected town. Key informant interview (KII) was also used for the purpose of data collection.

Data collection methods

The methods to be employed for collecting data in line with the objectives of the study involved questionnaire survey, key informants interview, on farm observations. Primary data were collected through interviews using a structured questionnaire.

Data analysis

All the collected data were coded and entered into a data-base using statistical package for social sciences (SPSS virgin 20). Descriptive statistics such as mean, standard error, percentiles, and frequencies were calculated.

RESULTS

Socio-economic characteristics

The socio-economic characteristics of the study sites are presented in Table 1. The study showed that 47.8% of the surveyed dairy farms were owned by female households while 52.2% of them were owned by male households. The average age of the dairy farmers was 41.5 years (ranging from 24 to 59 years). Larger percentages (96.7%) of the dairy farmers were married, 1.1% was single and 2.2% were widows. Most (51.1%) of the dairy farmers had no sideline business. Besides dairying, about 42.2% of the respondents run small

Table 1. Socio-economic characteristics of urban dairy farmers in the study sites.

Variable	Number of responds	Percentage
Sex		
Male	47	52.2
Female	43	47.8
Age (years)		
24-38	23	25.5
39-48	49	54.7
50-59	18	19.8
Average age	41.5	
Marital status		
Married	87	96.7
Single	1	1.1
Widows	2	2.2
Educational level		
No formal education	15	16.7
Primary education	39	43.3
Secondary education	23	25.6
Tertiary education	13	14.4
Farming experience (yrs.)		
0-3	18	20
4-5	23	25.6
>5years	49	54.4
Sideline business		
Small business	38	42.2
Civil servants	6	6.7
Dairy only	46	5.1
Family size		
1-3	10	11.1
4-7	67	74.4
8-11	13	14.4
Herd size		
10-15	74	82.2
16-24	10	11.1
>24	6	6.7

businesses (shopping and waving) while 6.7% were civil servants engaged in dairying as a sideline business. About 5.1% of the respondents exclusively engaged in dairying alone. The average family size was 5.5 persons (ranging from 1 to 11 persons per household). The average farming experience was 3.41 years, which ranged from 1 to 10 years. The herd size per farm ranged from 10 to 39 dairy animals with a mean of 13.77 animals per household. Highest number (43.3%) of the dairy farmers attended primary education (1-8), 25.6% attended secondary education (9-12), 14.4% attended tertiary education and 16.7% had no formal education.

Household labor allocation for dairy farm activities

Household labor allocation to dairy farming and related activities are shown in Table 2.

Table 2. Household labor allocation for dairy farm activities.

Activists	Husband		Wife		Daughter		Young son		Household maids	
	N	%	N	%	N	%	N	%	N	%
Feeding	14	15.6	18	21.1	1	1.1	-	-	56	62.2
Cleaning	13	14.4	12	13.3	2	2.2	2	2.2	61	67.8
Milking	9	10	26	28.9	4	4.4	-	-	51	56.7
Milk selling	20	22.2	48	53.3	10	11.1	-	-	12	13.3
Input purchasing	60	66.7	28	31.1	-	-	-	-	2	2.2

Table 3. Blood Level and parity.

Blood level dairy breed	Number of respondents	Percentage
50%	22	24.4
62.5%	35	38.9
>75%	22	24.4
More than 75%	11	12.2
Parity classes of dairy animals		
Heifers	30	33.3
After one parity	26	28.9
After 2nd parity	6	6.7
After 3rd parity	2	2.2
mixed all class	26	28.9

The study showed that all of the dairy farmers make use of both hired labor and family member labor for the farm operation. Major farm activities of the farms like feeding, cleaning, milking, milk selling and input purchasing and other related farming activities were run by household wives, husbands and daily laborers (hired labor). Most of the chores that require physical activities like feeding (62.2%), cleaning (67.7%), and milking (56.7%) were accomplished by hired labor. Next to daily laborers, household wives engaged in larger responsibility for feeding (21.1%), milking (28.9%) and cleaning (13.3%). But the wives were more responsible in milk selling (53.3%) and the husbands were more responsible in purchasing inputs (66.7%). Though daughters were involved in some less labor demanding dairy farm activities, the share of young sons was nonexistent except in cleaning, which accounts only 2.2% of the labor share. This provides compelling evidences that, unlike our forefathers, the present day cyber generations or youths are less interested in agricultural activities that demand continuous labor input.

Level of exotic gene inheritances and parity

The genotype of dairy cows in the study towns are indicated in Table 3. The genotype of dairy cows ranged from 50% Holstein gene inheritances to high-grade dairy cows that even exceed 75% exotic gene inheritances. In the study towns, dairy cows whose exotic gene inheritances range from 62.5 and above constitutes about 75.6% while dairy cows with 50% exotic gene inheritances accounts for only 24.4%. The majority of the farmers start up their dairy business with heifers (33.3%) followed by second parity cows (28.9%) and less interested in older cows (Table 3).

Feeds and feeding system

The types of feeds used by dairy farmers and feeding system are shown in Table 4. The study showed that 20% of dairy farmers purchased formulated feeds from commercial feed producers, 24.4% of the respondents purchased feed ingredients and mix at home while 55.6% of the respondent used both practices. The main source of formulated dairy feed was from commercial feed producers. Five private feed sources were commonly used by dairy farmers for dairy farms in the study area. It was observed that all home-mixed feeds were almost all prepared from local available feed ingredients like wheat bran, noug (Giyzotia abyssinica) seed cake, wheat middling, linseed cake, bean hulls, cottonseed meal, brewery by-product, teff straw and salt. Respondents

Table 4. Types of feed and feeding system.

Variable	Number of respondents	Percentage
Types of feed		
Formulated purchased	18	20
Mixed at home	22	24.4
Both formulated and mixed at home	50	55.6
Problems of purchased feed		
Low quality	8	8.9
Price of feed	54	60.0
Unavailability	28	31.1
Method of feeding		
Individual Feeding	62	68.9
Group feeding	28	31.1
Amount of feed provided /day/head		
Based on body weight	2	2.2
Based on milk production	48	53.3
Based on body weight and milk production	40	44.4
Provisions of green feed		
Yes	76	84.4
No	14	15.6

revealed that one of the major bottlenecks in the study area was high price for formulated feeds (60%), unavailability (31.1%) and low quality (8.9). The majority of the feeding system was individual (68.9%) followed by group feeding (31.1%). The amounts of feed provided per head per day were based on milk production (53.3%), body weight (2.2%) milk production (44.4%) and bodyweight only (2.2%). The study indicated that the majority of the dairy farmers supplement their cows with green feed (84.4%) while 15.6% of the respondents supplement their dairy cows with grass hay as basal diet.

Water sources and frequency of watering

Water sources and watering frequencies in the study areas are shown in Table 5. The study showed that dairy farmers in the study areas had three different water sources for their dairy animals. These include tap water, water hole and pond water. The majority 74.4% of the dairy farms in this study use tap water followed by water hole (14.4%) and pond water (11.1%). The majority of the respondents provide water to their dairy cows twice a day (64.44%) while 35.5% of the respondents provide ad libtum indicating that water was not a critical problem in the study sites. On the other hand, it can be concluded that dairy farmers in the study sites are well aware of the importance of frequent watering on the production performances and wellbeing of dairy cows.

Dairy cattle housing system

Housing condition and housing type of dairy cows in the study areas are indicated in Table 6. About 81.1% of the dairy farmers used the stanchion housing type, 17.8% used the loose type and 1.1% free stalls. All dairy farmers constructed a separate dairy cattle house from the main residence and constructed within the living fences of the dairy farmers. About 76.7% of the houses were not constructed according to recommended dairy housing design while 23.3% followed standard barn construction design. The present study revealed that 91.1% of the dairy houses have enough ventilation and light whereas the reaming 8.9% was not enough light and ventilation. According to the respondent, the main reason for not getting proper light and ventilation was due to the land scarcity inappropriate site selection. It was observed that most of the houses were not conducive for the rearing of dairy cattle based on dairy housing standards. They were poorly constructed in terms of housing orientation and ventilation.

In the study sites, respondents responded that 66.7% of the dairy houses had individual pen while 33% were managed in free stall. About 94.4% of respondents replied that dairy houses had maternity pen while 5.6% of the surveyed dairy farm did not have maternity pen. In the study area, 47.8% of dairy farmer practiced head to head cow standing followed by tail to tail (35.6%) while 16.7% of the respondents practice neither of the

Table 5. Water sources for dairy cows around Oromia special zone.

Source of Water	Number of respondents	Percentage
Hole water	13	14.4
Tap water	67	74.4
Pond water	10	11.1
Frequencies of provisions water		
Free accesses (*ad libtum)*	32	35.5
Morning and afternoon only	58	64.44

standards (free standing). The majority of the dairy house (83.3%) used only for dairy cattle and the rest (16.7%) mixed their dairy cows with other livestock like sheep. The floor design for housing was concrete (90%), stone-paved (4.4%) and ground (5.6%) types. About 97.8% of the roof in the farms from urban was rainproof (corrugated iron sheet cover). About 86.7% of the barns were with good drainage whereas, 7.8% had satisfactory drainage. The general farm hygiene condition of farms in the study site was generally satisfactory.

Disease and biosecurity measure

Disease management practices and dairy farm biosecurity practices are shown in Table 7. According to the respondents, 80.7% of the respondents call for veterinary services while 19.3% of them treat by themselves. All the respondents (100%) replied that their dairy cows received vaccination services from government service providers. The most commonly occurring diseases were swelling of the udder. Based on the information obtained from the town's veterinary officers, the most common bacterial diseases that occurred in the commercial dairy farms were mastitis and less frequently brucellosis. Among the viral disease, foot and mouth disease rarely occurred. The majority (78.1%) of the dairy farmers used dedicated boots and cloths like overall when they were entering into the dairy house as one of a biosecurity measure against diseases. It was observed that only 23.3% of the dairy farmers used foot dips at the entrance of the dairy houses. The common foot dips used by the dairy farmers were detergents like 'Berekina" which is not actually known for its effectiveness.

According to the dairy farmers, blind teat happed due to mastitis diseases mainly occurred on the farm that negatively affects milk quality and quantity production. About 97.8% of dairy farm had mastitis disease and only 2.2% reported no mastitis. Both external and internal parasite control could practice in the dairy farm 65.6 and 78.9% respectively while 34.4 and 21.2% of the respondents had no program to control external and internal parasite respectively. According to respondents 98.9% of the farmers were used annual vaccination, also all the dairy farmers were isolate the sick dairy cow from the health dairy cattle into isolation pen and 67.8% of dairy farmers cull their dairy cow when the dairy cow treated and no heal, old and low productivity while 32.2% of the farmers in the study area were not culled the animals until those cattle has died.

Institutional support and extension services

According to the present study, most of the dairy farmers (73.3%) received expert support from extension services while 26.7% had no experiences of receiving extension services. Institutional supports like training and veterinary services were provided by the urban agricultural offices while loan providers provide training on the financial management. It is interesting to note that about 35.6% of the respondents reported that they receive credit services to start dairy farming, which was not actually common in livestock investment. Almost a quarter of the dairy farmer (27.8%) received trainings before starting the business while about 25.5% of dairy farmers received training after they established dairy farms. The training they received ranges from a few days to one month. For instances, 8.9% of the respondents received the training for one month followed by a few weeks training (5.5%), few days (38.9%) while 46.7% of dairy farmers were had no training. The training was provided by various institutions like urban agricultural offices, micro and small-scale enterprises and NGO (religion organization) situated in the city. 52.2% of the dairy farmers get training by the urban agricultural office, and 1. 1% was by NGO.

Productive and reproductive performances

Average daily milk yield

The estimated average daily milk yield is presented in Table 8. The estimated overall mean daily milk yield based on the sampled household response and observation during the survey was 13.4±.4 kg/cow/day at the study site. A significant difference ($P<0.05$) of average daily milk yield was observed in different parity

Table 6. Dairy housing condition.

Variable	Number of respondents	Percentage
Type of house		
Free stall	1	1.1
Lose type	16	17.8
Stanchion	73	81.1
Housing condition		
With other livestock	15	16.7
Dairy cattle only	75	83.3
Standard or recommended house design		
Yes	21	23.3
No	69	76.7
Enough ventilation and light		
Yes	82	91.1
No	8	8.9
Provision individual pen		
Yes	60	66.7
No	30	33.3
Maternity pen		
Yes	5	5.6
No	85	94.4
Frequencies of house cleaning		
One time a day	23	25.6
Two times a day	60	66.7
Three times a day	5	5.6
As needed	2	2.2
Type of floor		
Concrete	81	90
Stone slab	4	4.4
Ground compact	5	5.6
Type of roof		
Rain proof	88	97.8
Not rain proof	2	2.2
Drainage		
Good	78	86.7
Satisfactory	7	7.8
Poor	3	3.3
Farm hygiene		
Good	74	82.2
Satisfactory	11	12.2
Poor	5	5.5

as well as the stage of lactation. The overall estimated mean yield at 1st parity, 2nd parity, and 3rd parity was 10.7±0.26, 13.33± 0.31 and 16.06±0.61, respectively. The overall mean of pick lactation was 18.13±0.39; this was highly significant ($p<0.05$) across average daily milk production. The mean yield of early lactation and late

Table 7. Productive and reproductive performance of animal.

Variable	Mean ±SE
Average daily milk yield (ADMY)/head/day	13.3±.4
Yield at1st Parity	10.7±.26
Yield at 2nd parity	13.33±.31
Yield at 3rd Parity	16.06±.61
Yield at early lactation	12.5±.35
Yield at pick lactation	18.13±.39
Yield at late Lactation	8.5±.23
Age at first parity	2.26±.05
Age at pick lactation	4.33±.08
Lactation animals in farm	8.27±.25
Length of lactation	7.52±.08
Days open	161.76±34.80
Calving interval(CI)	1.88±.05
Number of service per conception (NSC)	3.22±.58
Pregnant animals in farm	3.32±.182
Mastitis animals in farm	0.98±.11
Culled animas in farm	0.44±.11

Table 8. Common waste and methods of west removal.

Variable	Number	Percentage
Frequency of removing waste		
Every day	43	47.8
Two times a day	47	52.2
How to transport		
By wheel barrow	73	81.1
By polythene and hessian sack	17	18.9
Kinds of disposal methods		
Dispose in pit or damp site	56	62.2
Use as fertilizers in their own garden	27	30
Give free to the other farmers	7	7.8
Have you biogas		
Yes	4	4.4
No	86	95.6

lactation were 12.5±.35 and 8.5±.23 respectively.

According to the respondents, the average age at pick yield was 4.33±.08 year and the estimated lactation length mean in the study site was 7.52±.08 months. In the current study area, the overall mean of lactation animals, pregnant animals and culled animals on the farm were 8.27±.25, 3.32±.182, 0.98±.11 and 0.44±.11, respectively. The total average numbers of dairy cattle on the farm in the study site are 13.01±0.652. These are categorized in large urban commercial dairy farms.

Age at first calving (AFC)

According to the respondents of the study area, the average age at first calving was 2.26±.05 years. The age at first calving changes the heifer from a non-producing expensive item into an income-generating cow. Early AFC reduces unproductive periods and a higher the AFC will be the additional rearing cost of the animal (Panja and Taraphder, 2012). In the current study area even if the dairy cattle breeds are crossbreed, the age at first

Table 9. Major constraints of waste disposal in urban dairy farming.

Constraints	1st	2nd	3rd	4th	5th	Index	Rank
Lack of convenient dump site	49	21	18	2	0	0.29	1
Nuisance from its odor	31	45	8	4	2	0.27	2
Lack of transportation	8	23	24	3	32	0.17	3
Lack of market for selling manure	0	0	20	55	15	0.14	4
Shortage of labor	2	1	20	26	41	0.12	5

calving was longer and its almost more than two years. Age at first calving is closely related to generation interval and, therefore, influences response to selection. In the current study area, heifers are usually mated when they are mature enough to withstand the stress of parturition and lactation.

Calving interval (CI)

Calving interval is a time elapsed between two consecutive successive parturitions. The overall estimated mean calving interval was 20.8 ± 0.05 months in this study area. Yifat et al. (2012) reported that crossbreeds have slightly shorter calving intervals than indigenous in Tatesa Cattle Breeding Center. According to the respondents, the CI in the study area is shorter than the local cattle.

Days open

Days open, the number of days between calving to conception, influences the profitability of the dairy industry. The overall estimated mean days open in the study site was 161.76±34.80 days. This current finding is agreed with (Zewdie et al., 2011; Belay et al., 2012; Hunduma,2012; Niraj et al., 2014) who recently reported the average length of days open of 85.6 to 197 days for crossbred dairy cows in Ethiopia.

Number of service per conception (NSC)

NSC is one of the measurements for reproductive efficiency. It expresses the fertility level of the dairy herds. The present study Data showed that the mean of the numbers of services per conception is 3.22±.58.

Dairy farm waste management practice

Common wastes in commercial urban dairy cattle farming

According to the urban dairy farmers, manure (73.3%) was the major waste in their farms followed by feed left over (14.45%) and dust (12.25%) depending on the type of housing system. The major constraints of waste disposal encountered by the urban dairy farmers of the study area were lack of convenient waste disposal pit, nuisance odor, and disinterest in daily laborers (Table 9). Furthermore, bulkiness is manure is inconvenient for transportation as facilities are lacking. According to the respondents, 52.2 and 47.8% of the farmers remove waste two times per day and one time in a day respectively. About 81.1% of the farmers were used wheel barrow for transport while 18.9% used polythene and hessian sack. About 62.5, 30 and 7.7% of farm wastes in the study area were disposed at the manure disposal pit, used it as a fertilizer in their own garden and given freely to neighborhood farmers, respectively. Animal manure is one of the best sources for producing biogas and generate energy for household consumption. Contrary to this fact, only 4.4% used manure to produce biogas and 85.6% of the respondents were not using the manure to produce biogas.

DISCUSSION

It is a reality that the proportion of male and female-headed dairy farms that run a dairy farm business varies from town to town and communities with different socio-economic and socio-cultural backgrounds. This study demonstrates that the cultural taboos that offer male-headed households a sole owner of dairy farms started changing and female-headed dairy farms are overtaking the business in urban settings. Relative comparisons show that the proportion of female-headed dairy farmers is relatively higher than the proportion reported by Belay et al. (2012) in Jimma Town (24%) but lower than reported by Assaminew (2014) who reported 60% female-headed dairy owners farm owners in Holeta Town. On the other hand, the proportion of female-headed dairy farms is comparable with the value reported (47.7%) by Haile et al. (2012) in Hawassa Town. In either case, it is interesting to observe cultural taboos that deny females to run dairy business are started shifting implying that the long-awaited concept of gender equality started bearing fruits in urban settings.

In any country, running of effective dairy business has a direct association with the level of literacy. In the present study, most of the interviewed dairy farmers were

literate and attended formal education from primary to the tertiary level. The implication is twofold. On one hand, they run effective dairy business as they record every farm transaction related to health services, inputs and outputs. On the other hand, they can easily adopt full dairy packages, extension and advisory services given by experts. In fact, comparable results have been reported by previous studies (Fekede et al., 2013) who reported that 41% of the interviewed farmers attended primary education in the Addis Ababa milk shed. Therefore, it is unsurprising that the level of literacy of dairy farmers varies from town to town in the same country and from country to country depending up on the socio-economic and socio-cultural settings.

The current study revealed that most of the dairy farmers are within active and productive age group who can effectively run cumbersome dairy business. Results of the present study are similar with report of Berhanu (2012) who reported average age of 44.1 years and family size of 5.42 in the majority of urban settings in Ethiopia. Likewise, Azage et al. (2013) reported age range from 39.7 to 51.9 years in Mieso and Shashamane towns of Ethiopia, respectively. The average farming experience (3.4 years) in the present study was lower than the value (9.67 years) reported by Berhanu (2012) for the commercial urban dairy farms of Ethiopia.

The overall average number of crossbred cows owned per household in the study site is greater than the figure reported for medium farms (6.43 cows) in Bishoftu, Ethiopia (Mulisa et al., 2011). The variations could be attributed to differences in production objectives between urban to urban farmers, and also the lack of sufficient space to accommodate large herd size in urban centers.

The study revealed that all the dairy farmers used hired labor and family member labor for the farm operation. Household members and hired labor were participating in various dairy cattle management practices. This was dependent not only on the sex and age of the family members but on the type of activities (Kassu, 2016). Young son and daughter had a small involvement in all activity but next to hired worker's, household wife had higher involvement in the heavy part of the activity; this agrees with the work of Habtamu (2018). More women's contribution to the dairy labor force continued to be a heavy burden on women, in addition to their daily routines of preparing food and caring for the family. The higher participation of hired labor in this study agreed with those of other African counties, in urban dairy farms of Dar es Salaam, Tanzania (Kivaria et al., 2006), and Kisumu; in Kenya (Kagira and Kanyari, 2010) hired labor was used intensively in 97 and 76% of households, respectively. In relation to dairy breed, the result indicated that all urban dairy producers reared the crossbred dairy cows and this is in line with the results of Habtamu (2018). The present study result, agrees with the result reported by Staal et al. (2002) that dairy farming experience is positively related to the keeping of crossbred dairy cattle. Adoption of improved dairy cow technologies is expected to be negatively associated with the size of livestock ownership (Moll et al., 2007).

The study revealed that few of the dairy farmers of the study area used purchased formulated feed alone for feeding their cattle's and some of them used only feed that were mixed at home but the majority of urban dairy farm in the study area used both formulated feed and feed that were mixed at home. The current study result is not in line with those of Fekede et al. (2013); the urban and peri-urban dairy operations depend mainly on the natural pasture hay as a source of roughage feed in the central highlands of Ethiopia but the result compliance with those of Azage et al. (2013), agro-industrial by-products such as bran, middling, oil seed cakes and molasses are fed as supplement to crossbred dairy cows in urban and peri-urban areas. In the study area all of the dairy farmers used hay grass and straw as basal diet for their dairy cattle. Since there is the scarcity of formulated feed, the farmers mostly used feed that mixed at home. The common types of concentrates feed ingredients used included: wheat bran, noug seed cake, wheat middling, linseed cake, bean hulls and salt. Among the different ingredients used, noug seed cake and salt are the sole concentrates feed ingredients for home-mixed concentrate mixture in the study site. The present study agrees with those of Assiminew (2014) that the dairy farmers blend the concentrate mixture for crossbred dairy cows from wheat bran (42.60%), noug seed cake (34.20%), wheat middling (10.27%) and the remaining proportions from linseed cakes bean hulls and common salts in Holeta town.

The feeding methods of urban dairy farm in the study area were mostly individual feeding system and few of them were feeding in group and this is agrees with the study of Assaminew (2014) assessment of feed formulation and feeding practices for urban and periurban dairy cows around holetta, Ethiopia. More of the farmers in the study area determine the amounts of feed provided per head per day based on the level of milk yield only this is agrees with the work of Azage et al. (2013). Some of the farmers in the study area relied on the level of milk production and the dairy cattle life body weight but few of them were relied only on the life body weight of the dairy cattle rather than the level of milk yield; this may due to lack of experience for rearing dairy cow. The main source of water in this study site were tap water which is comparable to the report of Azage et al. (2013) who reported that the majority (71.8%) of the urban dairy farming system (Hawassa, Shashemene, Yirgalem,Dilla), in southern Ethiopia rely on tap water and Assimenew (2014) reported 76.4% of the Holeta town dairy production system. Regarding frequency of watering, most of the dairy farmers water their cattle twice a day in this study which is agrees with the report of Lemma et al. (2005) who reported that almost all the respondents watered their cattle twice in a day and few of farmers were

provided water ad libtum. Actually watering frequency of dairy cattle depends on access to water sources, age structure of the herd, physiological stage of animals and season Azage et al. (2013).

The purpose of housing dairy cattle like other farm animals is to reduce climatic stress on the animals that hinder production, reproduction and proper growth and development (Yibrah et al., 2005). The highest stanchion housing type were observed in this study; these were higher than the finding of Mulisa et al. (2011) in Bushoftu town for the majority of medium dairy holders (71.4%). All roofs of the barn were rain proof which is higher than most of the farms in all scales of production; 78.8% kept their dairy cows under cow shed roofed with corrugated sheets of materials (Mulisa et al., 2011) in Bisheftu town. The general farm hygiene conditions in this study site were more hygienic than Asela town where 39% dairy farms were hygienic (Hunduma, 2013). All the dairy farmers constructed a separate dairy cattle house from the main residence and constructed within the living fences of the dairy farmers. The houses were not constructed according to recommended dairy housing design extensions package service; however, majority of them had enough ventilation and light. In the study, majority of the dairy house had individual pen and maternity pen. In this study, majority of dairy houses were used only for dairy cattle and few of them were mixed with other livestock.

The health of dairy stock was affected by inaccessibility of veterinary service, death, disease occurrence and expensive private veterinary service. There were similar reports of veterinary-related problem in Ethiopia and elsewhere. Provision of veterinary service in Ethiopia is inadequate and underdeveloped (Ayele et al., 2012; Jaleta et al., 2013). Kitaw et al. (2012) also reported that veterinary service was the least commercialized among inputs of dairying with provisions limited to drug vending. On the other hand, service from private veterinarians is expensive and with limited outreach. The most common sign frequently occurred in their farm were swelling of the udder and closure of the teat. The common bacterial diseases that occurred in the study area were mastitis disease and less frequency occurrence of brucellosis and also lameness was happed. According to the respondents whenever sick dairy cow were observed in their farm, major of the farmers called Vet doctor and few of them were treat by themselves. This result is similar with the result of (Habtamu 2018) mastitis, lameness and brucellosis diseases were affected dairy cows, which are diseases associated with intensification. In Kenya clinical mastitis (66.7 %), lameness (23%); Lumpy skin disease (23 %) were reported as major health problems (VanLeeuwen et al., 2012). This study revealed that the contact between extension serve agents and urban dairy producers was good and frequent. According to the respondents, most of the dairy farmers had access to extension services while few numbers them had no access to extension services. The present study agrees with those of Berhanu (2012) that about 60.4% of farmers did not access livestock extension services because of inadequate capacity of extension service and only about 16% of farmers received extension services such as veterinary and crossbred cows, milk value addition and market information. Institutional supports like training, extension and veterinary services were provided by the urban agricultural offices while credit services were provided by the micro finance of the urban office.

The estimated mean daily milk yield of 13.4±.4 kg/cow/day of this study is comparable to the report of Nigusu and Yoseph (2014) of 14.1 kg /day/cow in urban and secondary town dairy production systems in Adama milk shed. However, it is higher than the finding from Hawassa City of 10.32±1.5 kg/cow/day (Haile et al., 2012) and Dar es Salaam, Tanzania of 10.4±0.7 kg/cow/day (Gillah et al., 2013). There were significant different ($P<0.05$) the average daily milk yield was observed in different parity as well as the stage of lactation. The overall estimated mean yield at 1st parity, 2nd parity and 3rd parity was 10.7±0.26, 13.33± 0.31 and 16.06±0.61 respectively. The overall mean of pick lactation was 18.13±0.39; this was highly significant ($p<0.05$) across average daily milk production and also there was significant difference between the mean yield of early lactation and late lactation. The estimated lactation length mean in the study site was 7.52±.08 months. This value was shorter than those reported by Adebabay (2009) that reported result of 10.1 months in bure town. The present study result was comparable to the lactation length of dairy cows (7.29 months) at Meiso district (Kedija, 2008). The lactation length in crossbred cows observed in this study is slightly shorter than the lactation length of 11.7 months reported for crossbred cows in the Central Highlands of Ethiopia (Zelalem and Ledin, 2001). The average ages at first service (AFS) reported for cross breed heifers 2.26±.05 years in this study is similar with those of Kassu (2016) which reported 2.69±.08 years for crossbred heifers in Sidama zone.

The AFC obtained in the present study for urban dairy crossbred cows is shorter than the result reported by Asaminew (2007) that the average AFC was 37.6 months in Bahir Dar milk shed area. Average AFC obtained in the current study is shorter than the finding of Fisseha (2007) with the overall mean of AFC 43.13 ±1.7 months for Holstein Frisian cows in Alage. Age at first calving is closely related to generation interval and, therefore, influences response to selection. Early AFC reduces unproductive period and a higher the AFC will be the additional rearing cost of the animal (Panja and Taraphder, 2012). The reported average numbers of services per conception (NSC) of the study area were slightly similar with those of Adebabay (2009) that the number of service preconception cross bred cow in bure town was 3.91. The present result is greater than those of Tadesse and Tegegne (2018) and the number of services

per conception reported around Mekelle, Bako research center; the overall least squares means in the Maksegnit town and Fogera cows were 2.1±0.1, 1.34±0.11 2.0±0.65 and 1.42±0.05, respectively. According to Mukassa-Mugerwa (1989), cows with values of NSC greater than two, are regarded as poor, the average natural service conception has 1.18 whereas artificial insemination users has 1.5 up to 2.3.

The overall estimated mean calving interval was 18.8±.05 months' in this study area which is comparable to the value reported by Gidey (2001) for Frisian x Fogera breed (18.6 months) and it was longer than those reported by Kiwuwa et al. (1983), Enyew et al. (2000); Obese et al. (2013). Niraj et al. (2014) reported about 459 days for crossbred cattle in Arsi region Ethiopia. The current calving interval value is shorter than the estimates of Mukassa-Mugrewa (1989) (25 months) in cross bred cattle. Long calving interval implies that farmer's income suffers because cows spend a greater portion of their lactation at low production levels (Swai et al., 2007).

The overall estimated mean days open in the study site was 161.76±34.80 days. This current study agrees with those of Zewdie et al. (2011); Belay et al. (2012); Hunduma (2012) and Niraj et al. (2014). The average length of days open recently reported for crossbred dairy cows in Ethiopia was 85.6 to 197 days. The average days' open value in this study was slightly shorter than for the report of Lemma and Kebede (2011) which is 176.8 days from Addis Ababa and 171.18 days of Alphonsus et al. (2014) from Nigeria. The reproductive performance of cattle, particularly the probability of conception, may be negatively associated with the magnitude and duration of negative energy balance in early lactation (Walsh et al.,2011).

Manure is among the most important contributions that livestock make to intensification and sustainability (Ehui, 2000). Adoption of improved manure handling techniques is crucial in stall fed cattle (Powell and Williams, 1995; Paul et al., 2009). The majority of manure in this study area was disposed in dump site and some of farmers were used as fertilizer in their very small garden farm. Limited numbers of the farmers were used biogas. The most common environment concern with animal wastes is that it affects the atmospheric air with offensive odors, release of large quantities of CO2 and ammonia which might contribute to acid rain and the greenhouse effect. The most threats of urban dairy farms in this study area were displacement and complain from the neighbors improperly management wastes.

Recommendations

Based on the findings, the following recommendations could be drawn:

1) Provision of urban dairy husbandry training and extension services should be improved for the better efficiency of the commercial urban dairy cattle production.
2) Provision of credit facilities from financial institutions with lower interest rates can play a significant role to the expansion and improvement of the urban dairy cattle farming.
3) The high price of feed and its unavailability at required amount and quality is becoming a threat for the sector. Thus, it needs government and private investors' participation in the establishment of feed processing centres so as to provide a feed with a standard quality and a fair price which is an adequate.
4) Large number of AI service should be done wth less conception rate; this will increase day open cow and decrease production and reproduction. Thus, the research institute and educational organization should give training for AI technicians and fill their skill gap.
Provision of credit facilities from financial institutions with lower interest rates can play a significant role in the expansion and improvement of the urban dairy.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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