

Full Length Research Paper

Challenges and opportunities of milk production under different urban dairy farm sizes in Hawassa City, Southern Ethiopia

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The objectives of this study were to understand the production potential, challenges and opportunities in Hawassa. A total of 132 randomly selected milk producing households (HH's) were interviewed. Dairy cattle in Hawassa city were mainly reared for commercial milk production. 87.5, 79.8 and 60% of large, medium and small size dairy farms, respectively, produced cow milk for sale. The main feed items available in Hawassa city are crop residues, including stover, grass hay, industrial by-products and to some extent Attela – a by-product of a local alcoholic beverage. Deep wells, tap water and rarely, the Lake Hawassa and accessible rivers are drinking water sources for their animals. The average daily milk yield at household level was estimated to be 13.3, 51.5 and 81.4 liters (L) HH⁻¹ for the small, medium and large size farms, respectively with an average being 20.31 L HH⁻¹. Shortage of animal feeds (26%) is the most important limiting factor of dairy production followed by limited space (23%), and animal disease incidence (18%). Therefore, empowering the urban dairy producers by addressing the hampering problems, are helpful to improve production and increase the income of the producers as well as to fulfill the wide range of dairy product demand in the urban areas.

Key words: Urban dairy, farm size, challenges, opportunities, Hawassa, Ethiopia.

INTRODUCTION

Ethiopia holds large potential for dairy development due to its large livestock population and Urban and peri-urban livestock production constitutes an important sub-sector of the agricultural production system. Urban and peri-urban dairy production systems involve production, processing and marketing of milk and milk products that are channeled to urban centers (Azage et al., 2000; Mohamed et al., 2004). These market-oriented systems are emerging as important components of the milk production systems in Ethiopia. These systems are contributing immensely towards filling the gap between demand and supply for milk and dairy products in urban

centers, where consumption of milk and milk products is remarkably high (Azage et al., 2000). The livestock sub-sector in general and the dairy sub-sector in particular do not make a contribution to the national income considering with its potential. However, lack of outlets for milk, diseases associated to udder infection, scarcity of feed, inefficient and insufficient AI and veterinary services are among the major constraints that hamper the development of the dairy sector thereby, limiting the benefits that can be obtained from the sector. The reasons for this are several factors such as technical, socio-economic and institutional factors (Fekadu, 1994; Ketema and Tsehay, 1995). Given the considerable potential for smallholder income and employment generation from high-value dairy products, development of the dairy sector in Ethiopia can contribute significantly to poverty alleviation and availability of foods (Mohamed

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et al., 2004). Currently, the trend of rapidly increasing human population together with growing urbanization creates even greater markets and increases the demand for milk and milk products. The major sources of milk in Ethiopia are produced from cows (83% of total milk production in Ethiopia) and the remainder from goats and camels in certain regions is particularly in pastoralist areas (LDMPS, 2007). As dairying play significant role in the lives of the urban and peri-urban poor households (Yitaye et al., 2007), promotion of the dairy sector in Ethiopia can therefore contribute significantly to poverty alleviation as well as, availability of food and income generation. Urban and peri-urban dairying plays an important role in the Southern Nations, Nationalities, and Peoples Region (SNNPR). Hawassa and Yirgalem, for instance, are among the major urban areas of the region where livestock farming is an important component of agriculture. These towns are also among the high potential areas for milk production in SNNPR. However, in urban area of Hawassa, there are very limited research efforts so far conducted to explore the status of dairy production and challenges faced by the farmers. The current study was, therefore, targeted to generate the required information on the production, challenges and opportunities in reference to urban milk producers.

MATERIALS AND METHODS

Description of the study area

The study was conducted in Hawassa, capital city of the Southern Nations Nationalities and Peoples Regional State (SNNPRS), which is one of the high potential areas for milk production in Southern Ethiopia. It is located 275 km south of Addis Ababa along the Addis Ababa - Moyale highway. Hawassa is situated at an altitude of 1750 m above sea level and according to an estimate, it lies between 6°83' to 7°17' N and 38°24' to 38°72' E. Hawassa receives an average annual rainfall of 955 mm with mean annual temperature of 20°C (BoFED, 2007) and the city has a total area of about 50 km² divided into eight sub-cities and 32 kebeles (*kebeles* are the smallest administrative unit below the sub-city/*woreda* level).

Data collection

Survey was conducted to ascertain the status of dairying in Hawassa which are; the purpose of cattle keeping and its limitations associated with milk production and marketing of milk produced in the study areas using a semi-structured questionnaire. In order to identify milk producing households (HH's) considered in the current study, an initial list of dairy farms in the city was obtained from Hawassa City Administration Agricultural and Rural Development Office. Then, dairy farming households were categorized into three groups based on the number of dairy cows owned as suggested by Ike (2002) as small (<5 cows), medium (6 to 10 cows) and large farms (>10 cows). Accordingly, there were 776 small farms, 147 medium size and 10 large size farms. Then, about 14.2% of the small farms that is, 110 households and 8.2% of the medium size farms that is, 12 households were randomly selected for the study. Since the numbers of the large size farms were limited, all the 10 households were included in the study. A total of 132 households were selected for the survey based study. The study was

conducted between December 2009 and April 2010.

Data analysis

Descriptive statistics was used to illustrate the variables in the production using SPSS software (ver.16). Indices (weighted averages) were developed to provide the total ranking of the prevailing constraints of milk production and handling limitations in the study area.

RESULTS AND DISCUSSION

Features of dairy production system of Hawassa city

The main feed resources available in the farm for livestock in Hawassa city were crop residues, including stover (especially, maize), grass hay, industrial by-products and to some extent *Attela* (a by-product of a local alcoholic beverage). Common salt as mineral supplement was offered to their dairy animals. Most of the respondents commonly feed their animals fresh grass, hay, and flour and oil industry by-products such as wheat bran, wheat middling and noug (*Guizotia abyssinica*) cake. Occasionally, few respondents supply their animals with household wastes as well as fruit by-products (wastes of fruits and Vegetables, leftover food). Animals were also let loose in the city in search of feed. Deep wells, tap water and rarely the Lake Hawassa and accessible rivers are drinking water sources for their animals. According to respondents, the commonly occurring animal diseases in the area were mastitis, pneumonia, skin diseases, external parasites and abortion listed according to their importance. Most respondents highly depended on artificial insemination (AI) service which is mainly provided by the Ministry of Agriculture (MOA) to breed their cows. Interviewed producers indicated that whenever the Ministry fails to give the service, they get the service from the private sectors that provide either bull or AI service. The respondents complained about inadequacy of the governmental AI service provision.

Household characteristics

Among the interviewed households (HH's), 52.3 and 47.7% were owned by male and female owners, respectively. The proportion of male and female-headed households was comparable in small sized farms (Table 1). The present result was higher as compared to Yitaye et al. (2007) for Bahir-Dar who observed that 11% of the studied households were headed by females. By contrast, most large and medium sized farms were owned by male headed HH's than female-headed HH's. The assessment results revealed that the considerable role of female household heads was in decision making in dairy farm related activities. This might be related to

Table 1. Household (HH) characteristic of dairy producer farmers in Hawassa city.

Variable	Farm size			Overall (n=132)
	Small size(n=110)	Medium size (n=12)	Large size(n=10)	
Gender of HH head (%)				
Male	50.0	70.0	62.5	52.3
Female	50.0	30.0	37.5	47.7
Age of HH head, Yrs (Mean±SE)	45.90± 1.25	40.50± 4.07	40.63± 5.33	45.17± 1.17
Family size (Mean±SE)	7.13±0.24	6.70± 0.88	7.13± 0.77	7.10± 0.22
Family age distribution (%)				
<15 years	22.0	23.9	24.5	22.3
15 – 64 years	74.3	74.6	73.6	74.3
> 64 years	3.70	1.5	1.8	3.4
Major occupation of HH head (%)				
Employee (Government)	27.2	10.0	12.5	25.0
Trader	14.9	40.0	50	18.9
Dairy Farmer	10.5	30.0	25	12.9
Housewife	40.4	10.0	-	35.6
Retirement	4.4	10.0	-	4.5
Daily laborer	0.9	-	-	0.8
Student	-	-	12.5	0.8
Non-government	1.8	-	-	1.5

Govt.-employed in governmental institutions; Non-Govt.-employed in non-governmental institutions; SE=standard Error; HH=household; n=number of respondents.

the economic strength of women to own a medium or large size farm. The average age of household head was between 40 and 45 years and it is comparable for all farm categories.

Mean family size of dairy producers in Hawassa city was 7.1±0.22 persons per household and it is quite comparable in the three farm sizes. The average family size was comparable with the one reported by Rahel (2009) for Wolayta zone (7.01), and it is higher than that of Woldemichael (2008) for Hawassa (3.29) but is slightly higher than the average family size reported by Belay et al. (2009) for Jimma town (6.02 person/HH). Regardless of farm sizes, most of the family members (about 74.3%) of the interviewed households were between 15 and 64 years (Table 1). Whereas, age group <15 years (22.3%) and >64 years (3.4%) were relatively low and these were generally dependent on the other family members and contribute less to the farming activity. Sintayehu et al. (2008) reported that dairy producing household members in the active age group accounted for about 59% of the total family size in urban and rural areas of Shashemene and Dilla milk shed. Compared to this, the proportion of active labor contributing family members for Hawassa dairy producers is considerably high. Compared to most of the dairy producers elsewhere for example, the active labor age

groups in Hawassa were higher than that reported for Bahir Dar town dairy producing (33.8%) HH's (Yitaye et al., 2007). The present study generally indicated that more number of family members can potentially be involved in dairy farm work in Hawassa city.

Occupational status of dairy farm owning households

The respondents of Hawassa city were engaged in other income generation activities in addition to dairy operation (Table 1). Overall, about 35.6% of the dairy farms interviewed were owned by female headed households and/or housewives, followed by employees in different Governmental institutions (25%), traders (18.9%), dairy farmers (12.9%), and retired persons (4.5%) (Table 1). The present results were in the line with the report of Yitaye et al. (2009) who found that the contribution of non-dairy agricultural and off-farm activities to the household income was higher in urban farms in the North western Ethiopian highlands.

The results indicated that relatively, most small sized farms were owned by housewives (40.4%) followed by government employees (25.4%). The medium and large farms were dominantly owned by traders (40 and 50%, respectively) as well as dairy farmers (30 and 25%,

Table 2. Dairy cattle holding and herd structure (Mean±SE HH⁻¹) of dairy farm owner households in Hawassa city.

Cattle type	Farm size			Overall (n=132)
	Small size (n=110)	Medium size (n=12)	Large size (n=10)	
Total herd	3.79± 0.20	11.00± 0.84	22.75± 3.10	5.48± 0.49
Total number of cows	1.99± 0.11	7.30± 0.40	14.50±1.55	3.15±0.31
Proportion of lactating cows (%)	70.4	42.5	48.3	59.4
Blood composition of cows (%)				
Local	22.1	19.2	29.3	23.4
Crossbred	41.7	21.9	31.9	35.6
Exotic	36.2	58.9	38.8	40.1
Total number of heifers	0.82±0.09	1.80±0.42	4.50±0.96	1.12±0.13
Blood composition of heifers (%)				
Local	26.8	22.2	33.3	27.7
Crossbred	37.8	33.3	25.1	33.9
Exotic	37.8	44.4	41.8	39.3
Number of Calves	0.93±0.10	1.70±0.33	2.88± 0.79	1.11±0.11

SE = standard Error; HH=household; n=number of respondents.

respectively). Traders and dairy farmers were relatively few in small sized farms. Conversely, employees and housewives were few as medium and large sized farm owners. This may be because of the low financial capacity of housewives and employees to possess medium and large scale farms. Accordingly, strengthening the economic status of at least housewives through credit access may be an option to improve the participation of women in dairy farming in Hawassa city.

Dairy cattle holding

Large farms had an average of 14.5 cows of which 7.0 (48.3%) were lactating cows (Table 2). On the other hand, medium and small farms owned 7.3 and 1.99 cows of which 3.1(42.5%) and 1.4(70.4%), respectively, were lactating cows. The overall mean number of cows per household was 3.15 with a high proportion of lactating cows (1.87), composing close to 59.4% of the total cow population per household in the three farm categories. Sintayehu *et al.* (2008) reported rather low number of lactating cows (1.22 per HH) for Shashemene-Dilla milk shed where he included rural areas also. The present result for the average proportion of cows is quite lower than that reported from Dire Dawa (Emebet and Zeleke, 2008) whereas; it was higher for the medium and small-size farms.

Breed composition of dairy cattle owned by the

respondent farmers varied between farm categories. In small scale farms, proportional crosses and exotic breeds represented the majority of dairy cows (41.7 v/s 36.2%) than local cows (22.1%). While in medium size farms, most of the dairy cows were exotic (58.9%) and crosses and local cows accounted for only a small proportion (21.9 and 19.2%, respectively).

The variations in the proportion of the three blood groups in the cow population of large size farms were not as noticed in the case of the two farm categories (Table 2). Following the cow population, heifers constitute the second category of the dairy herd, which is typical of the most dairy farms since heifers are kept mainly for replacement purposes. Following heifers, calves composed the remaining categories.

In general, small size farms tend to keep relatively more of the exotic and crossbred cows than larger size farms intentionally to increase total milk production by keeping high yielders than low yielders.

Thus, they can somehow compensate the effect of small herd size on total milk production. Since urban dairying is quite expensive in terms of feed and other costs, small size farms should keep high yielders to increase their daily milk production so that they get profit after covering their production cost.

As per the field work, mainly due to absence of appropriate recording system, producers were not sure of the exact exotic blood levels of crossbred cows and what they call pure exotic breeds, which is used for crossbreds with estimated exotic blood level of over 75%. As

Table 3. Purpose of milk production, milk yield and seasonality of milk production in Hawassa city.

Parameter	Farm size			Overall (n=132)
	Small size(n=110)	Medium size(n=12)	Large size(n=10)	
Purpose of producing milk (%)				
Sale	79.8	60.0	87.5	78.8
Home consumption	9.6	-	-	8.9
Sale and consumption	10.5	20.0	12.5	10.8
Charity (Non-govt.)	-	20.0	-	1.5
Daily milk production, liters per HH (Mean±SE)	13.29±1.35	51.5±14.8	81.38 ± 28.65	20.31±2.79
Milk yield, liter/cow⁻¹ day⁻¹ (Mean ± SE)				
Local	3.65±0.33	3.5±0.5	3.33±0.88	3.62±0.32
Crossbred	10.07±1.67	12.67 ± 3.53	12.25±1.93	10.32±1.5
Exotic	11.19±0.64	15.57±2.15	11.0±1.68	11.81±0.63
Time of high milk production (%)				
Wet season	53.5	50.0	62.5	53.8
Dry season	0.9	10.0	-	1.5
Depending on feeding	45.6	40.0	37.5	44.7

SE=standard Error; n=number of respondents; HH = households.

reported by Sintayehu et al. (2008), the cattle herd size (4.25 in TLU) for Hawassa is lower as compared to the present result. The increasing trend in holding of high herd size with crossbred dairy breeds in the study area might be due to the commencement of commercial dairy farms in the city. The present assessment revealed that the total herd size owned by small and medium size farms in Hawassa is in line with the results reported by Emebet and Zeleke (2008) for Dire Dawa administrative region, eastern part of Ethiopia but the present resulted was observed lower for the large size farms.

General purpose of milk production

Like most urban dairy production systems, dairy cattle in Hawassa city are mainly kept for market oriented milk production. As there is a readily available market for whole milk, which is mostly sold fresh without further processing into more shelf stable products. There are few commercial dairy enterprises that are emerging since recent years. *ALMI* milk and milk products manufacturer is the major one involved in milk collection and distribution as well as, processing it into products such as table butter, cheeses, and yoghurt in Hawassa. Although, most urban dairy producers are engaged in the dairy business to generate income, a few households keep dairy cows mainly local breeds to produce milk for HH consumption. As observed during the study, production objective varied based on herd size.

Accordingly, 87.5, 79.8 and 60% of large, medium and small size farms, respectively produced milk for sale (Table 3).

Overall, dairy farmers that produce milk for direct sale accounted for 78.8% and only few farms produce milk for home consumption in its natural form (8.9%) or for both home consumption and sale (10.8%). Sintayehu et al. (2008) reported that 74.2% of dairy producers in urban area of Hawassa produce milk primarily for sale. Similarly, Yitaye et al. (2009) reported that 68% of milk produced in urban dairy system of northwestern Ethiopia is for sale. In general, most HH's produce milk in Hawassa city for sale is mainly due to the higher demand for milk in urban centers representing an opportunity to expand commercial dairying.

Besides supplying milk to neighbor users and retailers on a contract basis, there are also same farms (1.5%) established to assist orphan children, HIV/AIDS victim families through income generation from milk sale. Other uses of dairying in the study area included manure as fuel as well as fertilizer for homestead farm lands, cash income from sale of live dairy animals and use of animals as a guarantee for different reasons.

Milk production potential

The average daily milk yield at HH level was estimated to be 13.3, 51.5 and 81.4 liters (L) HH⁻¹ for the small, medium and large size farms, respectively with the overall average being 20.31 L HH⁻¹ (Table 3). The overall

Table 4. Prevailing constraints of dairy cattle production ranked by interviewed dairy farm owner households in Hawassa city.

Constraints	Limitations of dairy production as ranked by HH's						Weighted average rank Index
	1 st	2 nd	3 rd	4 th	5 th	6 th	
Availability of feed	62	55	12	3	-	-	0.26
Limitation of space	59	32	21	8	5	5	0.23
Disease prevalence	4	24	51	34	16	2	0.18
Lack of Clean Water	1	12	25	54	31	7	0.14
Lack of improved breed	6	8	16	17	69	12	0.12
Limited market outlet	-	1	6	12	8	102	0.07
Total	132	132	131	128	129	128	1.00

Index = [(6 for rank 1)+(5 for rank 2)+(4 for rank 3)+(3 for rank 4)+(2 for rank 5)+(1 for rank 6)] divided by sum of all weighed for the prevailing constraints mentioned by the respondents; HH's = households.

mean milk production per HH's in the present study is lower than vales as reported by Sintayehu et al. (2008) for crossbred keeping households in Shashemene, Hawassa and Yirgalem towns (27.12 L) as well as Yitaye et al. (2009) who reported a daily milk yield of 43.0 L per households for Bahr Dar and Gonder urban milk shed areas. On the other hand, the present estimate was higher as compared to the average daily milk yield of 10.21 to 15.90 L HH⁻¹ reported by Sintayehu et al. (2008) for Hawassa area. The mean daily milk yield of local cows was higher in small size farms (3.65 L) as compared to medium size (3.5 L) and large size farms (3.33 L) (Table 3). This is in line with the reported range of daily milk yield of 0.67 to 5.0 L for smallholder farmers in East Wollega (Alganesh et al., 2007), 3.5 L in East Showa zone (Lemma et al., 2004) and 1 to 4.0 L in Wolayita Zone (Rahel, 2009). On the other hand, the present estimate for local cows is lower than that reported by Nigussie (2006) in the Northern part of Ethiopia (7.0 L).

Daily milk yield of crossbreds were higher in medium (12.67 L) and large size (12.25 L) farms as compared to small size farms (10.07 L). This indicated that medium and large size farm owners give more care to crossbred and pure exotic breeds as they have a comparative advantage in milk production. No apparent difference was observed in daily milk yield between pure exotic and crossbred cows (Table 3). In the present study, most dairy producers indicated that milk yield increased after the long rainy season following increased availability of feed, but still, considerable proportion of respondents mentioned that milk production depends on rather the feeding system followed regardless of season.

Challenges and opportunities of dairying in Hawassa

As it was the case of rural dairy production system, urban dairying is constrained by many factors that affect the quantity of milk produced as well as quality and safety of milk and milk products in the milk value chain. As

prioritized by the respondent milk producing households, shortage of animal feeds (26%) is the most important limiting factor of dairy production followed by limited space for proper housing, milking, waste disposal, and expansion (23%), and animal disease incidence (18%). Other important constraints include limited access to clean water, lack of improved dairy breeds and limited market outlet for milk (Table 4).

Generally, feed is the major cost of a given dairy farm. Dairy producers in Hawassa city reported that animal feed cost increases regularly and there is limited access to feeds and these are major problems that hamper dairying in Hawassa city supports this statement. In addition to availability and cost of feeds, problems related to waste disposal as well as poor animal health services were common dairying constraints reported for urban producers (Ike, 2002; Sintayehu et al., 2008). Besides, most urban producers keep their cattle within their own residence compound (Sintayehu et al., 2008). Space for waste disposal as well as lack of sufficient land for proper housing, milking, and farm expansion have been considered as one of the important challenges to produce good quality milk in urban dairy production unlike the rural and peri-urban areas (Table 4). Allocation and giving place for efficiently farming dairy producers in Hawassa city with clean water and efficient waste disposal mechanism can play a significant role for quality milk production.

Characteristics of milk marketing system in Hawassa city

Producers sell their milk to their neighbors and small milk retailers on informal contractual basis, which is a milk marketing system common among farms possessing small number of cows. The most marketable dairy product in the study area is raw milk. The present result is comparable with that of Yitaye et al. (2009), who reported on informal milk marketing system for urban dairy producers in the central highlands of Ethiopia,

which involved direct delivery of raw milk by producers to consumers in the immediate neighborhood and sales to itinerant traders, milk cooperatives or individuals in nearby areas. In Hawassa, farms having large number of cows, however, supply milk mostly to hotels, restaurants, large retailers, and small amount of milk to neighbors. Woldemichael (2008) also reported that the share of milk sold was high among crossbred dairy farms due to their larger milk production and market-oriented production objectives. *Ergo* and milk (in its natural form or with tea or coffee) are available in small coffee and tea houses and catering places.

Conclusion

The most reported constraints of milk production in Hawassa city include; feed shortage both in availability and price, which is related to the present trend of increase in human population and urbanization, which in turn leads to limited areas for forage production and grazing; lack of space for dairy cattle housing and dairy farm waste disposal coupled with herd health problems. It is important to induce an appropriate feed resources management and processing technology like treatment of low quality feeds, back yard forage production and encouraging small-scale animal feed suppliers and producers. Giving attention to urban dairy investment as well as, disease controlling programs can minimize the prevailing limitations. Therefore, technical intervention to provide training and experience sharing forum with farmers is worthy of improving dairy farming.

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