

Dairy Production and Marketing Constraints in the Urban and Peri-urban Settings of Ethiopia: An Implication for Poor Performance of the Dairy Sector at Small-scale Farms

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Authors' contributions

This work was carried out in collaboration between both authors. Author ZT prepared and designed the study, reviewed the literature in the introduction, performed the statistical analysis, wrote the protocol and write the first draft of the manuscript, while author JH commented, edited and re-organized the prepared version for final publication. Both authors read and approved the final manuscript.

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ABSTRACT

Ethiopia has a large potential for dairy development because of its large livestock population and favorable climate for improved high yielding breeds. But milk productivity is still low as lower productive indigenous dairy animals characterize the dairy sub-sector in the country.

Aim: Hence, the study intends to assess the major dairy production and marketing constraints in the urban and peri-urban settings of Southern zone of Tigray.

Study Design: Using a multi-stage sampling procedure, cross-sectional data were collected from 184 randomly selected dairy producers.

Place and Duration of the Study: The study was conducted in the Southern Zone of Tigray regional state, Ethiopia, and it was for one-year time duration.

Methodology: The study employed both primary and secondary data where primary data were collected through pre-tested semi-structured questionnaire instrument. Descriptive analysis particularly, Likert scale was used to analyze data.

Results: Results show that farmers ranked shortage of quality animal feed, frequent drought, lower productivity of local dairy breeds and shortage of land for dairying as first priority dairy production constraints (scale lies between 1.668 to 1.75) in the study areas. Similarly, farmers perceived that poor institutional support, high price uncertainty of dairy products, lack of adequate and timely market information, high price uncertainty, domination of informal markets, lack of milk cooling and processing machines, lack of adequate dairy cooperatives and high seasonality in production and the demand for milk as the first key dairy marketing constraints in the study areas.

Conclusion: Dairy policies and strategies in the study areas should primarily focus on improving the institutional arrangements, raise the awareness on adoption of milk enhancing improved dairy technologies and dairy intensification in small landholding to improve the dairy productivity in the areas. Moreover, strengthening the existing and establishing newly emerging institutionalized markets such as dairy cooperatives and milk processing plants encourage urban and peri-urban dairy commercialization, which could also contribute to the household food security and income diversification.

Keywords: Dairy marketing; Ethiopia; marketing constraints; production constraints; Urban and peri-urban.

1. INTRODUCTION

Livestock production is the major source of household food, income, traction power and a means to accumulate assets in most developing countries, where most of the smallholder farmers practice mixed farming system [1]. Hence, large numbers of smallholders in developing countries keep livestock to support their livelihoods [2]. However, smallholder farmers often lack sufficient capital, land, labor and feed resources for the intensification practices, which leads them to keep less animals that do not fit their socio-cultural reality [2,3]. Dairy production is one of the livestock productions, which provides milk and milk products for dairy producers and consumers in both the rural and urban areas of most developing countries. Ethiopia is among these countries with a large potential for dairy development as it has a large livestock population and favorable climate for improved and high yielding cattle breeds. According to Tegegne, et al. [4], the large and diverse livestock genetic resources, existence of diverse agro-ecologies suitable for dairy production, increasing domestic demand for milk and milk products, better market opportunity, and proximity to Europeans international markets are indicators of the potential and opportunities for dairy development in the country. However, milk productivity in the country is low as lower productive indigenous dairy animals characterize the dairy sub-sector in the country. According to Lenjiso, et al. [5], the dairy sector in Ethiopia is largely subsistence oriented with low milk

production (only 4 billion liters of milk per annum) and lower in per-capita consumption (26.6 kg/year/person) as compared to the global milk production and consumption.

Urban dairy farming is constrained by lack of land for expansion, the risk of severe disease outbreaks and the challenges of managing livestock waste products [6]. According to Bereda, et al. [7], lack of land, feed shortage, insufficient artificial insemination (AI) services and shortage of water are among the major milk production constraints in Ezha District of the Gurage Zone, southern Ethiopia, as in many parts of the country. The authors also suggested that unavailability of feed probably limit milk production potentials of cows beyond any other factor, with good milk producing ability of dairy animals where [8] quoted feed shortage and its poor quality as the most serious constraint to improve dairying in the country. Smallholder dairy farmers in urban and peri-urban areas lack grazing land and hence, depend on purchased feeds. The problem of feed shortage is more or less related to the small landholding to produce sufficient quantities and farmers have limited knowledge on the conservation of seasonally available feed resources. There is a critical shortage of animal feed in the country and when available it is expensive and of poor quality. Most producers also lack the knowledge of efficient utilization of animal feed resources.

Land use problem, which is associated with the growth and concentration of urban populations, is

also another challenge of the dairy sub-sector in the country. Lack of space in the urban fringes is certainly a problem where urban development overgrows existing agricultural systems. Factors such as poor housing and high cost of roughage also force animals to roam free in the streets. Reduction of property size as a consequence of pressure on the price per square meter can be considered as an important threat for the future. Indeed, with time, the pressure of urban population growth may create an increase in the demand for accommodation and a shift to construction. Disease breakout among dairy animals is also another challenge considered as dairy production and marketing constraint in the country. According to Asmare, et al. [9], smallholder dairy farmers in and around Bahir Dar are shifting from local breeds to crossbreeds to increase milk productivity. However, milk production from such crossbreeds still does not satisfy the increased demand for milk and milk products due to different constraints of which disease is among the major constraints. For instance, internal parasites, anthrax, lumpy skin disease, bloating and Blackleg are among the major diseases for mobility and mortality of dairy cattle in and around Bahir Dar farms, northwestern Ethiopia, that severely affected dairy production [9]. The thin spread of animals over a large number of urban households hampers the delivery of services to livestock keepers. Service delivery is of lower quality in the most urban and peri-urban areas due to a lack of personnel, government services and diagnostic capacity. The question is whether this problem is characteristic of the urban context. Free roaming also creates opportunities for theft and gives rise to conflicts with neighbors. It also creates a negative attitude towards urban livestock from non-producers and authorities, who even remove stray animals from the streets they are then put in shelters, auctioned or killed. Moving animals to peri-urban areas is often suggested, but it is not practicable for people operating on a small or very small scale.

From microeconomics point of view, good market access is essential to achieve the goal of obtaining revenues [10]. From the moment that animals or products are taken to the marketplace, the urban dairy keeper starts to compete with retailers selling products from the peri-urban and rural areas. The relative cost of production becomes a significant factor at this point. Many urban and peri-urban residences in the study areas use dairy production as a main source of income. But, dairy producers in these

areas are not generating the expected income from this sector as the dairy productivity and its marketing performance in the areas remain poor. Hence, this study was proposed to identify the major dairy production and marketing constraints facing urban and peri-urban dairy producers in the study areas.

2. MATERIALS AND METHODS

2.1 Description of the Study Areas

The study was conducted in two districts of the Southern Zone of Tigray region, which are among the five districts found in the zone, and area description for each study area is presented as follows.

Enda-mekhoni District is geographically located at latitude of 12°47'50.22" and 12°42'35" N and longitude of 39°32'54" and 39°28'32.8" E, and the altitudinal ranges from 1653 to 3909 masl [11]. It is found 664 kilometers to the North of Addis Ababa, the capital city of Ethiopia, and 121 kilometers South of Mekelle city, the capital city of Tigray National Regional State, from Maychew town. The total land area of the district is estimated to be 65,000 ha and 17,992 ha (29%) of this total area is arable land and 14,462.75 ha [12]. The mean annual rainfall ranges from 600 to 900 mm with a mean daily temperature that ranges between 16 to 25°C [11]. Major crops grown in the area include wheat and barley from cereal crops while maize, sorghum and *teff* cover less area coverage. Faba bean, lentils, field pea and chickpea are also cultivated from the pulse crops. Cattle, goats, sheep and poultry are among the major livestock production enterprises that most of the village communities rear, where dairy production is practiced in the rural, peri-urban and urban areas of the district. Maychew town, which is located at 12.7833°N longitude and 39.5333°E latitudes with an altitude of about 2479 masl, is the zonal administration office of the zone.

Raya-Alamata is the second study area which is geographically located at 12°19'21" and 12°24' 28.5" North latitude and 39°14' 52" and 39°45' 47.8" East longitude [13]. It is found about 600 kilometers North of Addis Ababa and 184 kilometers South of Mekelle city from Alamata town. The altitude ranges from 1178 to 2300 masl. The total population of the district is estimated to be 118,557 [14] of which, 59, 966 (50.6%) were female. Out of this total population, about 49,883 (42%) resides in Alamata town. About 75% of the area is characterized as

lowland agro-ecology (1500 masl or below) and only 25% belongs to the midlands (1500-2300 masl). Rainfall is characterized as bimodal with erratic and uneven distribution with its average value of 663 mm per annum [15]. The main rainy season extends from June to September also known as the kiremt season while the short rainy season also called as the belg season, which falls between January and April. The temperature varies between 14.5°C and 29.7°C with an annual average value of 22.3°C [15]. The total cultivated land of the district is estimated to be 34,503 ha [15] where about 33,778.8 ha of this total cultivated land is rain fed while the remaining 724.2 ha is irrigated land. It has also a high ground water potential, which facilitates irrigation development programs. Major crops grown in the area include teff, sorghum, maize and finger millet. Pulse and oil crops like chickpea, fenugreek, grass pea and Niger seed are also cultivated. Major horticultural crops grown include papaya, mangoes, guava, avocado and oranges. Besides, onion, garlic, tomato and pepper are the widely cultivated cash crops. The major livestock species reared include cattle, sheep, goats, camel and poultry bird, which serve as draught power, food and source of income besides the asset holding of the household. A map of the study areas as shown in Fig. 1.

2.2 Sampling Procedure and Sample Size

A multi-stage sampling procedure was employed to select representative districts, kebeles and sampled households. In the first stage, two administrative districts were purposely selected from the five districts in southern zone based on their potentials for dairy production and market availability. In the second stage, two urban and two peri-urban kebeles were randomly drawn from a total of four urban and six peri-urban kebeles in each district. That is why the number of urban and peri-urban kebeles considered in this study is equal for both districts. Finally, 184 urban and peri-urban dairy producers, who had dairy cows, were randomly selected using the probability proportional to size sampling procedure. Yamane's formula, which was developed for finite population [16] was employed to derive the sample size. According to him, the sample size is given by:

$$n = \frac{N}{1+N(e)^2} \quad (3.1)$$

Where n = the required sample size, N = total number of urban and peri-urban dairy producers and e = the sampling error or level of precision at 7% probability level. Thus, the total urban and peri-urban dairy producers in the study areas were 1943 households with a given total dairy population at each kebele as shown in Table 1. Therefore, a total of 184 sample households were drawn randomly using the formula given above.

2.3 Method of Data Analysis

The study employed descriptive analysis to analyze data. A five scale Likert scale (started from strongly agree to strongly disagree) was used to prioritize the given major dairy production and marketing constraints in the study areas according to their order based on the farmers' perception. The procedure followed is that first, the scale was determined based on the difference between the highest assigned value and the lower assigned value divided by the higher assigned value ($5-1/5 = 0.8$). Then, the scale range becomes 1-1.8 as strongly agree, 1.81-2.60 as agree, 2.61-3.40 as somewhat agree, 3.41-4.20 as disagree and 4.21-5.0 as strongly disagree for each given negative statement while it becomes the reverse if the given statements are positive. Finally, the range in which this scale should lie was calculated as the sum of the five score values in each respective assignment divided by the total number of observations considered in the survey given as follows:

[Number of observations that strongly agree for a given statement times its assigned value (n_1*1) + number of observations that agrees times its label value (n_2*2) + number of observations that somewhat agrees times its assigned values (n_3*3) + number of observations that disagree times its value (n_4*4) + number of observations that strongly disagree times its assigned value

$$(n_5*5)]/N. \quad (3.2)$$

Therefore, the analysis used frequency data instead of percentages for each level of agreements as the scale range is calculated from the frequency information as shown in eq (3.2) above. In identifying the existing major dairy production and marketing constraints, the study used evidence from previous empirical studies and focus group discussions from each study districts. Then, the identified problems were incorporated in to the data collection questionnaire instrument as positive statements

Table 1. Sample size and sampling distribution of sample dairy households

District	Selected kebeles (urban and peri-urban)	Number of dairy producers	Number of selected respondents
Enda-Mekhoni	Maychew town (Kebele 01)	187	25
	Maychew town (Kebele 04)	165	20
	Meckhan (peri-urban)	280	21
	Chikomayo (peri-urban)	509	41
Raya-Alamata	Alamata town (Kebele 01)	60	10
	Alamata town (Kebele 02)	108	15
	Kulugize lemelem (peri-urban)	514	42
	Waja-Tumuga (peri-urban)	120	10
Total		1943	184

Source: Compiled from office of agriculture and rural development, and SME of the respective districts (2016/2017)

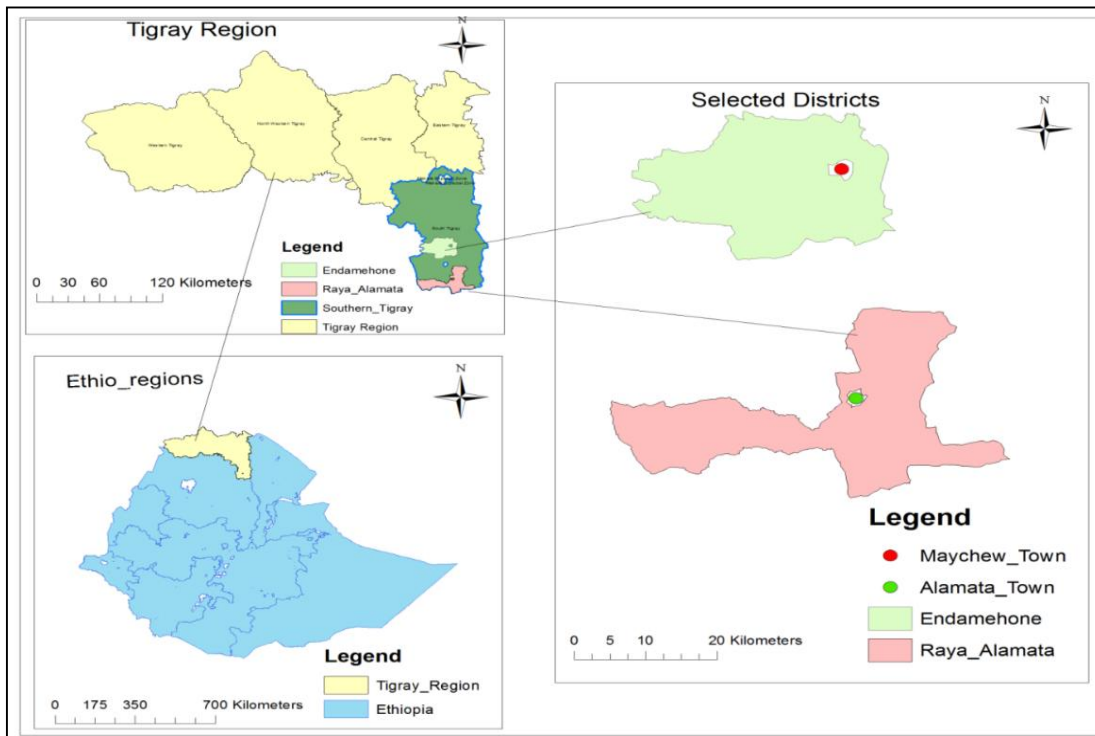


Fig. 1. Map of the study areas

Source: Ethio-GIS (2017)

to evaluate individuals' perception as strongly agree, agree, somewhat agree, disagree and strongly disagree.

3. RESULTS AND DISCUSSION

3.1 Dairy Production Constraints

Results of the descriptive analysis shows that farmers agreed for dairy production constraints where their perception levels lie between strongly agree to somewhat agree for each constraint

given. Results further show that lower productivity of local cows, shortage of animal feed, shortage of land for dairy rearing and recurrent drought were found to be the most critical bottleneck for urban and peri-urban dairy production in the study areas where majority of the respondents strongly agreed to these statements. Similarly, dairy production in these areas was also constrained by critical financial shortage, higher cost of cross and exotic breeds, poor dairy management practices, poor institutional support in relation to credit services,

Table 2. Dairy production constraints faced by urban and peri-urban dairy producers

Proposed statements related to dairy production constraints	*Farmers agreement for each given statement (%)					Scale	Rank
	1	2	3	4	5		
Cost of cross breed dairy cows is very high	47.28	27.17	13.59	10.33	1.63	1.918	2
There is a critical shortage of quality animal feed	47.83	37.50	14.67	0.00	0.00	1.668	1
Recurrent drought is frequently occurred	44.02	39.67	13.59	2.72	0.00	1.750	1
Financial shortage is a critical production constraint	41.30	36.96	17.93	2.72	1.09	1.853	2
Water for dairy animals is critically in shortage	23.91	27.17	22.83	12.50	13.59	2.647	3
Local breed cows are lower in productivity	47.83	40.76	11.41	0.00	0.00	1.636	1
Dairy management practices are poor	34.78	30.43	16.85	10.87	7.07	2.250	2
There is a shortage of land for dairying	49.46	39.67	6.52	2.72	1.63	1.674	1
There is lack of waste disposal sites	19.02	22.28	22.28	21.20	15.22	2.913	3
Dairy inputs supply is in shortage in the area	20.65	19.02	21.74	18.48	20.11	2.984	3
Poor institutional support hinders dairy production	33.15	25.00	23.37	12.50	5.98	2.332	2
There is lack of infrastructure (telecom & electricity)	22.83	16.85	21.20	21.74	17.39	2.940	3
Livestock disease outbreak is a critical problem	29.35	25.00	18.48	17.39	9.78	2.533	2

**Note: 1 stands for Strongly agree, 2 for Agree, 3 for Somewhat agree, 4 for Disagree, 5 for Strongly disagree for the farmers level of agreement for each given statement as indicate in column title for each question. Source: Survey result (2016/2017)*

Table 3. Farmers perception on the proposed marketing constraints in the area

Proposed major marketing problem statements	* Farmers agreement for each given statement (%)						
	1	2	3	4	5	scale	Rank
The markets for dairy products are mainly informal markets	46.20	41.85	11.96	0.00	0.00	1.658	1
There is a high seasonality in production and demand for milk	42.93	39.67	13.04	4.35	0.00	1.788	1
There is a high price uncertainty especially at fasting periods	65.22	23.91	10.87	0.00	0.00	1.457	1
There is poor institutional support for dairy products marketing	60.87	34.78	4.35	0.00	0.00	1.435	1
Lack of market place is a key problem for dairy marketing	53.80	12.50	17.39	9.78	6.52	2.027	2
Lack of milk cooling/processing machines is a serious problem	47.28	36.96	8.70	7.07	0.00	1.755	1
There is lack of adequate & timely market information for milk	60.33	33.70	5.98	0.00	0.00	1.457	1
Default is a critical problem in the informal milk markets	42.39	38.59	12.50	6.52	0.00	1.832	2
Lack of dairy cooperatives is a key milk marketing constraint	37.50	51.09	8.70	2.72	0.00	1.766	1
There is less awareness of dairy products (milk) marketing	20.65	15.76	21.74	24.46	17.39	3.022	3
Milk selling has a cultural/religious influence in the locality	23.91	20.11	22.83	21.20	11.96	2.772	3
The community in the area have a poor consumption behavior	13.59	11.41	18.48	30.43	26.09	3.440	4
Higher tax rate is levied for dairy producers at the market	9.78	12.50	20.65	36.41	20.65	3.457	4

**Note: 1 stands for strongly agree, 2 for agree, 3 for somewhat agree, 4 for disagree, 5 for strongly disagree for the farmers level of agreement for each given statement as indicate in the column titles for each given statement. Source: Survey result (2016/2017)*

artificial inseminations, inadequate extension and veterinary services as dairy producers in these areas had agreed to these predetermined statements. These results are in line with [17,8, 4,18] where they found that feed shortage is the major dairy production constraint that contributed to lower production and productivity of cattle in milk production in different parts of the country. It is also consistent with the studies by Mengistu [19,20], which found out that lack of nutrition was reported to be the most important problem that declined livestock production and productivity in Ethiopia. Similarly, a study by Guadu and Abebaw [21] show that disease, poor nutrition, poor genetic potential of dairy cows, feed and water shortage, disease, climate harsh, poor management and animal health problem contribute to the lower productivity that constraint the dairy production. Other constraints such as limited genetic resources, poor management, inadequate animal feed resources and other reproductive challenges constrained the dairy production in the country. As quoted by Tegegne, et al. [4], feed and water shortage, shortage of land, poor genetic potential of indigenous cows, poor access to inputs services and disease and pests are the major dairy production constraints in Shashemene, Hawassa and Yirgalem areas of Ethiopia, which also coincides with this result.

3.2 Dairy Marketing Constraints

Beside the production constraints, dairy producers in the study areas also faced marketing constraints that limit their benefits from the dairy sub-sector. Thus, results of this study revealed that poor institutional support for dairy products' marketing, lack of adequate and timely market information, high price uncertainty, domination of the informal markets for dairy products, seasonality in production and demand for products and lack of dairy cooperatives are the critical bottlenecks for dairy marketing in the study areas where majority of the respondents perceived as strongly agree while default problem and lack of market place for dairy marketing are the next major dairy marketing constraints that affect the dairy marketing in the study areas where respondents agreed on them. Results are consistent with that of Tegegne, et al. [4], which show that lack of strong cooperatives and involvement in private sector, and lack of policy support for dairy development constrained the dairy marketing in the Shashemene, Hawassa and Yirgalem areas of Ethiopia.

4. CONCLUSION AND RECOMMENDATION

Urban and peri-urban dairy producers in the study areas were found to generate lower benefits from the sector where the sector in these areas was found under severe dairy production and marketing constraints. As less productive local dairy cows, lack of quality feed resources, shortage of land for dairy expansion, recurrent drought, financial constraint, higher cost of cross breeds, poor dairy management practices, poor institutional arrangements and livestock disease outbreak lower the productivity of the dairy sector in the country in general and in the study areas in particular, adoption of improved dairy technologies such cross-breeds, high quality forages and concentrate feeds, and enabling institutional arrangements that facilitate the dairy production and marketing activities are among dairy improvement policy options. Moreover, an integrated multi-stakeholder intervention in the dairy sector is critically important policy input to share their contributions to the development of the sector in the study areas through providing adequate technical support and advisory services, disseminate improved dairy technologies and best management practices, facilitate dairy input supplies and other institutional services such access to credit, extension services, dairy cooperatives, veterinary services, effective AI services and access to market information and transportation by the local extension agents and other dairy stakeholders. Demonstration of milk post-harvest loss reducing technologies such cooling machines in the form of dairy farmers cooperatives and unions, and milk processing plants at the milk collection centers is also another policy option that dairy producers should adopt to improve their milk marketing efficiency through establishing farmers milk organizations and unions to have a better access for such critically important technologies for farmers with critical financial constraints. Hence, policies and strategies should priority focus in tackling the existing dairy production and marketing constraints to enhance the dairy productivity in the study areas.

ETHICAL APPROVAL

The authors collected and preserved scholarly ethical issues as per international standard written approvals.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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