

Full Length Research Paper

Cattle milk production, processing and marketing situations of smallholder farmers in Telo district, Keffa zone, Ethiopia

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The study was conducted in Telo district of Keffa zone, SNNP Regional State with the aim of assessing milk production and milk use pattern. Cross-sectional study design was used to collect data from randomly sampled 156 households using survey questioner, farm visit and focus group discussion. Female headed farms were more frequent in urban. The average family size per household was 7 persons. 58.3% of HH were illiterate, mean cattle number was 7, higher ($P<0.05$) cattle number was found in rural than in urban. Cows are the only animals used for milk production. Milk from small ruminants was not consumed due to cultural taboo. Local indigenous cow contributes 99% of total milk production in the study area. The estimated average daily milk yield of local and cross breed cows was 1.4 and 7.28 L with an estimated lactation length of 8.47 and 9.92 months, respectively. In both urban and rural mixed crop-livestock production system frequency of milking was twice per day (morning and evening). There was no practice of milking in cases of stillbirth or death of calves. Calves were allowed to suckle prior to milking. All milk producers in the study area wash their hand before milking. Some 15% of the urban smallholders even wash udder and teat before milking. The milking utensils, commonly used in both production systems, were plastic materials. Nearly half (45%) of the respondents indicated that they wash milking utensil both before and after milking. The majority (93.7%) of rural (mixed crop-livestock production system) farm households process milk to butter. Only few (6.3%) households do not convert milk to butter but consume it as fermented milk “ergo”. There was no practice of selling fresh milk in the rural area. Overall percentage of raw milk sold in the study area was 19.2%, with price of 15 to 20 ETB/L, indicating high demand and low supply of milk in the area.

Key words: Cattle, milk, production, processing, Telo.

INTRODUCTION

In Ethiopia, dairy production depends mainly on indigenous livestock genetic resources; more specifically on cattle, goats, camels and sheep. Cattle has the largest

contribution (81.2%) of the total national annual milk output, followed by goats (7.9%), camels (6.3%) and sheep (4.6%) (CSA, 2009). Moreover, Ethiopia currently

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has the highest cattle population in Africa, estimated to be 59.5 million (CSA, 2016/2017). Out of these total cattle population, the female cattle constitute about 54.87% and the remaining 45.13% are male cattle. From these, milking cows number is about 10 million with an estimated annual total milk production of 5.2 billion liters of milk per year or 1.54 L per day per cow. In addition, it provides about 68 million tons of organic fertilizer and almost 617 million days in animal traction (Shapiro et al., 2017). Majority of these cattle are indigenous and owned by smallholder farmers under traditional management (Azage et al., 2000). Ethiopia's increasing production potential, human population, urbanization trends and household incomes are leading to a substantial increase in the demand for livestock products. In light of prevailing land-resources limitation, expecting the establishment of large scale commercial dairy farms in urban and peri-urban areas is unlikely. Thus, under Ethiopian condition, there is no doubt that the increase in milk supply to urban centers will continue to rely on smallholder dairy for many years to come (Mekonnen et al., 2006).

The average milk production from indigenous cows was 1.85 L/head per day and ranged from 1.24 in the rural lowland agropastoral system of Mieso to 2.31 in the rural highland system of Fogera. The average daily milk production for crossbred dairy cows was higher in urban (10.21-15.9 L/head per day) than peri-urban (9.5 L/head per day) systems. Lactation milk yield of indigenous dairy cows ranged from 271.4 L/head in the rural lowland agropastoral system to 434.8 kg/head in the peri-urban system. However, lactation length of indigenous animals was shorter and ranged from 5.9 months in rural lowland transhumance system to 9.8 months in the rural highland dairy system of Bure. Average daily milk production from camels in Mieso ranged from 7.6 L in the dry season to 13.2 L in wet season (Tegegn et al., 2013).

Consumption pattern and marketing of dairy products produced at home varied depending upon the amount of milk produced per household, dairy production system, market access, and season of the year, fasting period, and culture of the society. Rural dairy farmers have very little access to market fluid milk and milk is often processed into butter. The major dairy products commonly marketed include fresh milk, butter, ergo (fermented whole milk), cottage cheese and butter milk. Although marketing of milk is not common in Metema due to cultural reasons, it is well marketed in Mieso. The dominant milk products marketed across all the PLWs with the exception of urban and peri-urban system is butter followed by cottage cheese. In areas (e.g. rural highlands) where milk marketing is practiced, the amount marketed is very small due to lack of surplus production, the desire to process into milk products and lack of access to market. In market-oriented urban and peri-urban system fluid milk marketing is dominant being higher in urban than peri-urban system. Although both formal and informal milk marketing systems do exist, the

latter is the dominant system across all the production systems (Tegegn et al., 2013).

The mainstay of Keffa population is rain fed subsistence agriculture and majority of these population practices mixed crop-livestock production system under traditional management. Telo Woreda is one of 11 Woreda in Keffa zone and found at distance of 45 km from Bonga or capital of Keffa zone. The main agriculture system in this area is livestock production especially mixed crop-livestock production, coffee production, spices, crops like barley, wheat, maize, teffe, inset, bean, pea and sorghum. Milk production is an integral part of the farming system in this Woreda. According to the "Woreda" agricultural and rural development report 2008, the total cattle population is about 81,993, from these milking cow contributes 13,346. Milk production is mainly from indigenous cows which are kept under smallholder farmers under traditional management system. Even if the area has potential for milk production, nothing has been studied on existing husbandry practices, major constraints associated with milk production, resources utilization or recycling between two integrated (livestock and crop) production systems.

Therefore, the objectives of this study were to assess the milk production, processing and marketing situation of smallholder farmers

MATERIALS AND METHODS

Study area

The study was conducted in Telo district, Keffa zone of SNNP Regional State. It is located at 500 km southwest of Addis Ababa and 45 km from Bonga or capital of Keffa. The total area coverage is 5569.4 ha and total population of 623,125. The altitude ranges from 2436 to 2451 m.a.s.l which represents typical highland environment. The main rainy season is from June to September with a mean annual rainfall of 1278 mm and the average daily temperature varies from 17 to 25°C. Four "kebeles" namely Oda, Dacha, Wora and Yama were selected as study sites based on potential for dairy. Oda is a small town, while the rest three Kebeles are rural areas of mixed crop livestock production system. Thus for the purpose of this study, the milk production system was classified as urban for Oda and rural mixed crop-livestock production systems for the rest three Kebeles (Figure 1).

Study design

Cross-sectional study design was conducted from September 2011 up to March 2012 by using different survey tools (semi-structured questioner, farm visit and group discussion).

Study population and sample size determination

The target sampling population constituted all households in the study area who owned milking cows. The sample size was determined by using Arsham (2007) with an estimated 8% confidence interval and 95% confidence level, the sample size studied was 156 smallholders.

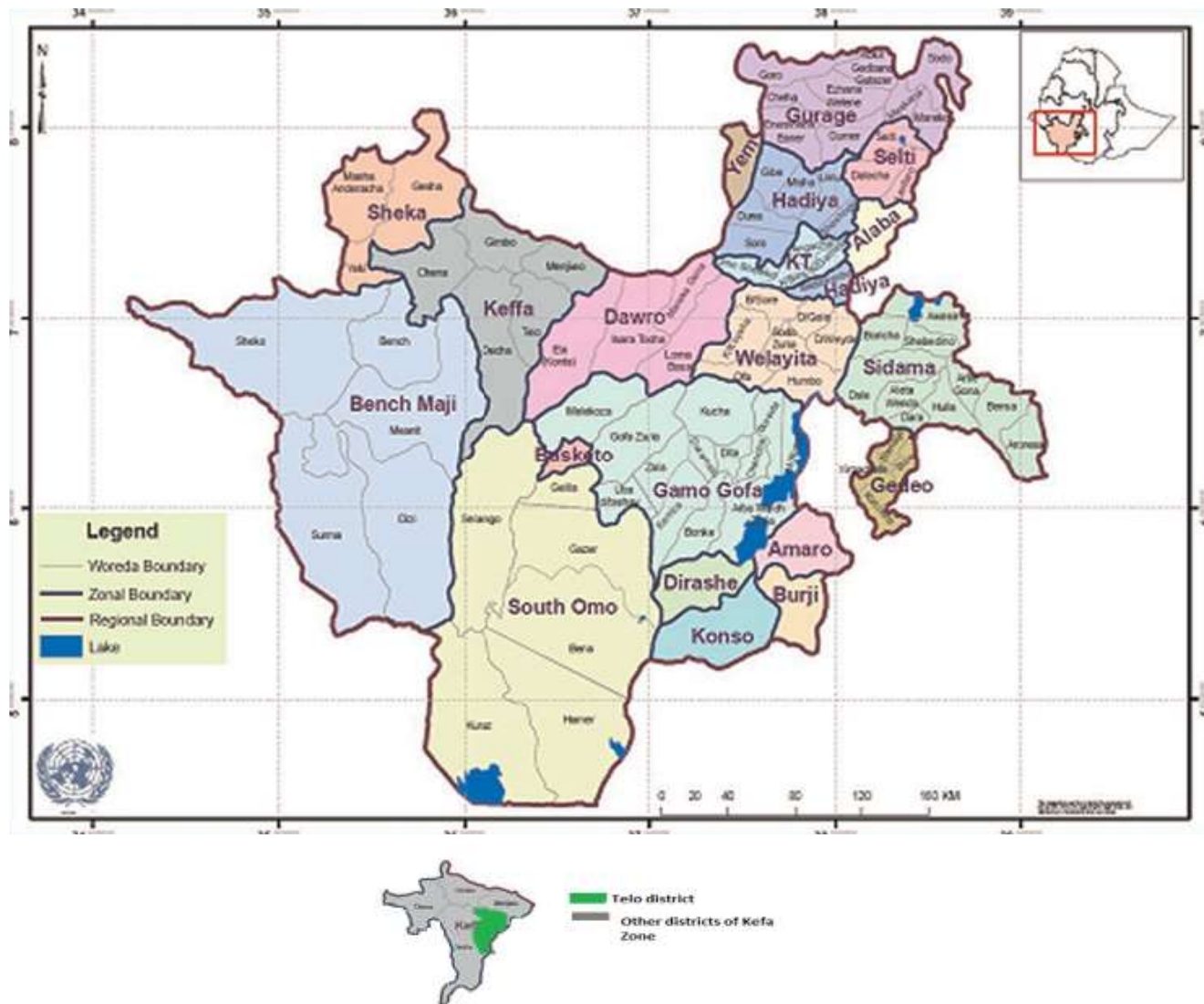


Figure 1. Map of study area.

$$N=0.25/SE^2$$

where N=sample size and SE=standard error assumed

The study participants' distribution in the four Kebeles (Dacha, Oda, Wora and Yama) was proportional to the smallholders having milking cows in each Kebele, shown in Table 3. The identification of study participants was done by using random (ballot) method.

Data collection

Secondary data

Secondary data from "Woreda" agriculture and rural development office and other sectors in our research project area were reviewed.

Questionnaire survey

A total of 156 smallholders were interviewed using a pre tested and

semi-structured questionnaire. The latter contained both open and close ended questions. The overall purpose of the questionnaire was to determine demographic characteristics of household, understand the dairy cattle production situations, socioeconomic background of the smallholders' decision-making process on cattle milk production systems.

Farm inspection

A onetime farm inspection was done at the same time with the questionnaire interview to assess milking and milk handling practices.

Data entry and analysis

Descriptive statistics were used to summarize and analyze the data using statistical package for social sciences (SPSS) software version 17.0. Differences were considered significant for $P < 0.05$.

Table 1. Average daily milk yield per head in liters and lactation length in months of cross and local breed cows as reported by smallholders in study area.

Variable	Crossbreed stage of lactation				Local cows stage of lactation				
	Early	Mid	Late	LL (month)	Early	Mid	Late	LL (month)	
Rural	Mean	-	-	-	-	1.96	1.238	0.76	8.37
	N	-	-	-	-	123	123	123	123
	Max	-	-	-	-	3	2	2	24
	Mini	-	-	-	-	1	0.5	0	6
	St error	-	-	-	-	0.45	0.406	0.032	.207
Urban	Mean	9.75	7.88	6	9.75	2.52	1.667	1.02	8.85
	N	8	8	8	8	33	33	33	33
	Max	13	10	8	12	4	3	2	12
	Mini	6	4	2	8	2	0.5	0	4
	Std. error	0.75	0.71	0.732	0.526	0.103	0.0833	0.067	0.446
Total	Mean	9.75	7.88	6	9.75	2.08	1.329	0.81	8.47
	N	8	8	8	8	156	156	156	156
	Max	13	10	8	12	4	3	2	24
	Mini	6	4	2	8	1	0.5	0	4
	Std. error	0.75	0.718	0.732	0.526	0.045	0.390	0.030	0.188

Max=Maximum, mini=minimum, std. error=standard error, n=number of respondents, early lactation=calving to three month of lactation, mid lactation=four month to six month, Late lactation =above six to dry off.
Source: Survey Study (2012).

RESULTS

Milk production

In this study, cows are the only animals used for milk production. Milk from small ruminants was not consumed due to cultural taboo. Table 1 illustrates the daily milk yield and lactation length of local and crossbred cows. The result revealed that 99% of the total volume of milk produced is obtained from local cows and 1% from cross bred cows (Fresian and Zebu).

The average milk yield of local cows per day reported by the respondents was 2.08, 1.329 and 0.81 L for the early, mid and late lactations, respectively with an overall average of 1.4 L per day. The average daily milk yield of crossbred cows reported was 9.75, 7.88 and 6 L for the early, mid and late lactations, respectively with an overall average of 7.28 L per day. Average lactation length of local and cross breed cow in the study area was 8.47 and 9.92 months, respectively.

Milking and milk handling

According to the respondents, cows provide the only source of milk whereas milk from small ruminants is not consumed in the area because of cultural taboo. In both urban and rural mixed crop-livestock production system,

frequency of milking was twice per day (morning and evening). There was no practice of milking in cases of stillbirth or death of calves. Calves were allowed to suckle prior to milking. All milk producers in the study area wash their hand before milking. Some 15% of the urban smallholders even wash udder and teat before milking. The milking utensils, commonly used in both production systems, were plastic materials. Nearly half (45%) of the respondents indicated that they wash milking utensil both before and after milking. The rest wash once per day (32.5%), once in two days (12.5%) or once in three days (10). The utensils were washed by using boiled plants like basil "besobla", "koseret", tejisar and leaves of "tikur enchet". The large majority of urban (95.5%) and nearly half of the rural smallholders filter milk to separate some impurities by using pieces of tissues (urban producers) and plant fibers "Kancha" (rural producers) (Figure 2).

Milk processing

The majority (93.7%) of rural (mixed crop-livestock production system) farm households process milk to butter. Only few (6.3%) households do not convert milk to butter but consume it as fermented milk "ergo". In urban farm households, some (40%) practiced churning milk to butter especially during fastening periods where the demand for liquid milk drops. The dominant churning

Table 2. Milk marketing attribute in study area.

Variable		Rural		Urban		Total	
		N	Percent	N	Percent	N	Percent
Do sell milk?	Yes	0	0	30	90.9	30	19.2
	No	123	100	3	9.1	126	80.8
For whom:	Café	-	-	9	30	9	30
	Neighbor	-	-	21	70	21	70
Price/lit ETB	15-17	-	-	17	56.7	17	56.7
	18-20	-	-	13	43.3	13	43.3
Reason to not sell milk	Low productivity	17	13.8	3	100	20	15.9
	Lack of market accesses	77	62.6	0	0	77	61.1
	Culture	29	23.6	0	0	29	23

**Figure 2.** Average milk yield (L) per day per head with respect to stage of lactation and average lactation length (month) of local (n=156) and cross (n=8) breed cow in study area.

material in use was clay pot (78.5%). Plastic material called “*Jerikan*” are also replacing clay pots increasingly due to their durability handiness to operate by any age groups. The churning time was claimed as 2 to 2:30 h for clay pots 1 to 1:30 h for plastic churners.

Milk use categories and marketing features

Table 2 shows that milk use categories varied between urban and rural milk producers. The largest proportion of raw milk produced in rural farm households was processed. The overall indicated percentage of milk sold in the current study area was 19.2%. Raw milk marketing was informal and only practiced in urban milk production system. The milk marketing outlets were mostly (78%) neighborhoods and rarely (22%) café with modes of payment at monthly bases (locally they call it contract) and pre-paid with price per liter ranging from 15 to 20 ETB. The rural mixed crop-livestock producers do not sell

milk due to lack of market access 69 (60%), low productivity 19 (16.5%) and cultural taboo 27 (23.5%). The rural milk producers sell butter and cottage cheese twice per week, Thursday and Sunday, which are large marketing days; there was no fixed price for butter and cottage cheese supplied by farmers. But the traders supplying only butter and sell 1 kg of butter 150 to 200 ETB. Selling of cheese by measuring was not common in the district. The consumers buy with an agreement.

DISCUSSION

In this study, the overall mean daily milk yield of local and cross breed cows were 1.4 and 7.28 L per day, respectively. This result is lower than the report of Adebabay (2009) for both categories. As per Adebabay's report, milk yield of local and crossbred cows were 1.82 and 8.25 L, respectively. On the other hand, the report of Asaminew and Eyasu (2009) for Mecha and Bahir Dar

Table 3. Milk use pattern in study area.

Variable		N	Mean± Std. Error	P-value
total milk produced	Rural	123	387.42±32.072	0.000
	urban	33	999.55±182.728	
	Total	156	516.90±49.998	
consumed at home	Rural	28	159.43±24.016	0.494
	Urban	32	186.34±29.928	
	Total	60	173.78±19.422	
Sold	Rural	-	-	-
	Urban	30	508.43±119.047	
	Total	30	508.43±119.047	
Processed	Rural	123	322.66±16.863	0.472
	Urban	33	359.18±75.410	
	Total	154	330.48±20.774	

Zuria districts (1.2 L for local and 5.2 L for crossbred cows) was lower than the present findings. The average milk yield of local cows in rural areas was significantly lower than that of urban local cows. This might be due to feed supplementation to cows in urban areas. The overall mean lactation length of local and cross bred cow in the current study was 8.47 month (254 days) and 9.75 month (292.5 days), respectively. The estimated lactation length of cross bred cow was comparable to the ideal lactation length of 305 days as defined by Foley et al. (1972).

Milk use pattern in the study area showed that the majority of milk producers did not consume fresh milk; the primary consumers of fresh milk in the study area were children below two years of age, old men and some vulnerable groups of women. The overall percentage of milk sold in the study area was 19.2%. This finding is lower than the total percentage of milk sold for urban 47% by Yitaye et al. (2009). The milk marketing system reported in this study district was informal with price differences for two main outlets (neighborhood and café with mode of payment contract and pre-paid). Tsehay (2002) reported that buying and selling prices of milk and milk products have seasonal variations and have no fixed price as such. As this result indicated the peak price of milk (20 ETB/L) indicated that there is high demand and low supply of milk in the area.

CONCLUSION AND RECOMMENDATIONS

It can be concluded that Telo district is of a highland agro-ecology with a favorable climate for dairy farming. The district however is not making use of this potential. Milk production systems are characterized by subsistence or hand to mouth milk production with traditional milk cow

management system. Based on the aforementioned findings the following points are recommended:

- (1) Quite large number of smallholders have long years of traditional experience in milk cattle production. Thus, training support to smallholders in modern dairy farming will help to improve their milk productivity and product quality and commercialization of the farm.
- (2) Extension staff must also help smallholders to cope with social changes, such as changing gender roles and issues of access and control over resources, encouraging the farmers towards market-oriented milk production, and in establishing market access will fill the gap between demand and supply of milk.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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