Characterization of milk production and marketing systems in Bure district of Amhara National Regional State, Ethiopia

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Abstract

Baseline information was collected to characterize the milk production systems in Bure district of the Amhara National Regional State. Data was obtained through individual interview of 181 households in single-visit-multiple-subject survey. Three milk production systems (rural smallholder, peri-urban and urban milk production) were identified in the district. Indigenous and Fogera x Friesian crossbreds were the dominant cattle breeds. Natural pasture, crop residues and aftermaths were the major livestock feed resources. Trypanosomiasis, pasteurolosis, anthrax and black leg were the major cattle diseases reported. Respondents identified lack of feed, disease outbreak, shortage of improved dairy cattle and distance to marketing points as the main problems of milk production. Milk and butter were found to be marketed mainly through informal marketing systems. Despite the unexploited potential for milk production in the district, the existing milk production (mainly extensive) and milk marketing (mainly informal) systems are found to be interwoven by many constraints. The study indicated the need for further research and development support in areas of milk nutrition, health, input delivery and services, and product marketing in order to capitalize on the existing potential for milk industry in the district.

Key words: Bure district, marketing, milk production.

Introduction

The Amhara National Regional State (ANRS) possesses approximately 29% of the country's livestock population. The contribution of livestock to the agricultural and the total GDP of the region is estimated at 22% and 12.5%, respectively. Despite the huge potential for livestock production in the region, productivity is low. For example, the average estimated daily milk yield per cow in West Gojjam Zone of the Amhara region is

1.2 litres in 234 days of lactation period and 46,710,335 litres per lactation for all lactating cows in the zone (CSA, 2005).

Bure district, which is known as one of the surplus producing districts of the Amhara region (Yigzaw and Kahsay, 2007), is found in West Gojjam Administrative Zone of the Amhara National Regional State. Bure district is believed to have high potential for milk development. Little baseline information is available that helps designing relevant strategy for dairy development in the area. This study was intended to characterize the milk production and marketing systems in Bure district, and to identify and prioritize constraints and opportunities for the development of dairy industry in the area.

Materials and methods

Description of study area

Bure district is located in north western Ethiopia, 400 km northwest of Addis Ababa and 148 km Southwest of Bahir Dar in a mixed crop and livestock area. The district has a total area of 72,739 ha, of which 46.6% is cultivated. Altitude ranges from 713 to 2,604 meters above sea level. Agro-climatically the district has lowland (10%), mid-altitude (82%) and highland (8%). Temperatures vary from 17 to 25^{0}C and total annual rainfall ranges between 1386 and 1757 mm. The topography of the district is mainly plain (76%), and 17% and 5%

this study to characterize the milk production and marketing system of the district. The method of data collection was single-visit-multiple-subject survey. Primary data were collected by both formal and informal surveys and information was gathered by direct interviewing smallholder milk producers, butter traders, hotels owners and milk cooperatives using semi-structured questionnaire. Quantitative data were analyzed using Statistical Package for Social Science (SPSS) statistical package.

Results and discussion

Livestock type and holdings

Holding size (± standard deviation) for the different types of livestock in the study area is presented in Table1. Indigenous breeds of cattle, sheep, goats and donkeys were the common livestock species kept by farmers in the area. Crossbred cattle accounted for only 7% of the total cattle herd.

Table 1. Mean livestock holdings (± standard deviation) per household in Bure District.

	Local breed		Crossbreds	
Category	No. of respondents	Mean ± SD	No. of respondents	Mean ± SD
Cattle				
Oxen	181	1.88±1.56	181	0.01±0.15
Cows	181	2.57±1.98	174	0.20±1.19
Heifers	180	1.25±1.38	152	0.09±0.41
Bulls	180	0.61±0.93	180	0.61±0.93
Calves	179	1.71±1.61	174	0.09±0.47
Sheep	181	2.49±4.03		
Goats	180	0.43±1.73		
Donkeys	181	0.49±0.84		
Mules	181	0.04±0.21		
Horses	181	0.02±0.15		

Milk production systems

All the milk produced and consumed is obtained from cows (from both local and crossbred cows) and there was no report of milk utilization from sheep and goats in the area due to

cultural taboo. The rural smallholder, peri-urban and urban milk production systems were identified in the district.

The rural smallholder milk production system accounted for 98% of the total milk production in the district. This is similar to the national situation (Mohamed *et al*., 2004). In this system, the cattle herd composed of indigenous cattle breeds not specialized for milk production and kept primarily for drought purpose. Communal grazing of the native pasture, crop-residues and crop aftermaths consisted of the main feed sources for cattle and cultivation of improved forages was hardly seen in the area. The peri-urban milk production system was observed in small towns of the district. The contribution of peri-urban system to the total milk production in the district was estimated to be 1.5%. Purchased hay and *Atela* (by-product of home-made local beer and liquor) were the major feed sources. Peri-urban milk producers appeared interested in using improved dairy production interventions such as cultivating improved forages and adoption of herd health management practices. Indigenous cattle breeds were the only cattle breeds kept in this system. However, market oriented milk production is less developed. Urban milk production system was identified in Bure town (the capital of Bure district). The system using a few numbers of Holstein Friesian crossbred cattle having various blood levels. The contribution of urban milk production to the total milk production in the district was estimated to be only 0.5%. The main feed sources include purchased concentrates (wheat bran and noug seed cake) and roughages.

Husbandry practices

Purpose of keeping cattle

Livestock play multipurpose role in the mixed agricultural systems in Ethiopia (Keralem, 2005; Asaminew, 2007; Adebabay *et al*., 2008). Drought power, food consumption (meat and milk), income generation, reproduction and transportation were the major reasons for keeping livestock in the study area (Table 2).

Table 2. Purposes of keeping livestock in Bure district.

Livestock type	Purpose				
	Draught power	Food (meat/milk)	Income	Transport	Reproduction
Cows	0.0	90.8	44.3	0.0	98.3
Oxen	96.3	8.2	21.8	0.0	13.4
Heifers	0.0	21.0	26.4	0.0	100.0
Sheep	0.0	80.0	82.4	0.0	91.8
Goats	0.0	76.5	93.8	0.0	100
Donkey	0.0	0.0	30.4	100.0	70.2
Mule	0.0	0.0	0.0	100.0	0.0
Horse	0.0	0.0	0.0	100.0	0.0

Labour

Share of responsibilities among family members in cattle husbandry in the study area is shown in Table 3. Hired labour is mainly responsible for herding and feeding of cattle. Decisions on sale of live animals and breeding are made solely by men while processing and sale of milk products are mainly the jobs of women.

Table 3. Share of responsibilities among family members in cattle husbandry activities.

Activity	Percent of responsible family members				
	Men	Women	Male children	Female children	Hired labor
Herding	10.0	1.0	35.0	3.7	50.3
Feeding	17.6	15.8	34.5	7.0	46.4
Caring of calves	21.4	22.5	27.9	11.2	28.6
Milking	52.6	36.9	8.1	4.1	8.5
Processing	0.6	88.8	2.6	14.8	2.2
Barn cleaning	10.5	39.7	20.9	27.6	16.8
Sale of milk products	6.5	71.9	7.1	10.6	6.1
Sale of livestock	93.6	10.9	1.2	1.2	1.0
Breeding decision	95.4	12.5	2.3	1.2	1.0

Feeds and feeding

From the available average land holding (1.33 ha), nearly 90% of the land holding is usually allocated for crop production and only about 5% of the land is used for pasture.

Reported improved forage production was also negligible (0.06±0.14 ha).Communal grazing and stall feeding were noted to be the major feeding systems in the area. The major sources of feed identified in the study area included natural pasture, hay, crop residues, crop aftermaths and non-conventional feedstuffs such as by-products from home made beer (atella) and katikala (birint). The major crop residues in the study area are finger millet straw (30.7%), maize stover (30.1%), teff straw (24.4%), and wheat straw (1.1%). Concentrates are rarely used except by milk producers who keep crossbred cows. Generally, residues from cereals such as teff straw, wheat straw, barley straw and maize stover form the basal diets of the animals. Natural pasture, crop residue and stubble grazing are the major basal feed resources for cattle in the highlands of Ethiopia (Asaminew, 2007).

Feed shortage during January through to June was reported by 55.3% of the respondents and between July and September by 35% of the respondents while some 10% of the respondents reported year round feed shortage. In times of feed shortage, 98% of the respondents exercise conservation of crop residues, hay curing and supplementation with agro-industrial by-products or conventional feeds (2%). Only 12.8% of the respondents exercise urea treatment on teff straw (23.1%), barley straw (23.1%), wheat straw (23.1%) and millet straw (7.7%). On average, cattle trek about 0.99 km in search of water per day. The average frequency of watering local and crossbred cows and calves in the study area were 2.5 times per day.

Cattle housing and calf rearing

Cattle are housed at night in a barn or kept in open camp at grazing lands or around homestead. Crossbred cattle are housed in separate pens. 57.3% of the respondents exercise separate barn followed by open paddock at grazing lands or backyard (25.3%) and ward (4.7%).

About 68.3% of the respondents provide colostrums immediately after calving. The remaining of the respondents does not provide colostrums because they believe that it causes drying of faeces (mecoin), tongue disease, diarrhea, and stomach-ache in newly born calves. Two modes of milk feeding were noticed: restricted partial suckling and bucket

feeding. Partial suckling is the common practice (96.6%) of feeding pre-weaned local zebu calves and bucket feeding is practiced by farmers who own crossbred cows (3.4%). Calves are weaned by isolation of calves from cows (78.6%) or smearing of teats with manure (21.4%) to prepare the cow for mating.

Cattle diseases

Respiratory diseases (pneumonia), pasteurellosis, lumpy skin disease, anthrax, malignant fever, tuberculosis, blackleg, wooden tongue, trypanosomiasis and septicaemia were the major diseases reported in the area. Calving difficulties were reported by 38.2% of the respondents and the major causes included placental retention (44%), abortion (30.3%), still births (7.8%), large sized calf (3.3%), late delivery (5.8%) and dystocia (1.4%). About 86.2% of the respondents reported having access to veterinary services provided by the government (61.4%), private (4.2%), NGOs (5.4%), and both government and NGOs (12.7%). The cost of treatment for ecto- and endo-parasites was estimated respectively at ETB 8.85 and 2.68 per animal.

Pricking by thorn or spike; applying fresh manure, kerosene or fermented mud onto the skin; swabbing with lupine leaves; spraying mix of *feto* flour and honey; fumigating with human hair are some of the indigenous ethno-veterinary practices employed to control incidence of ecto parasites in livestock in the study district. Swabbing with *Calpurnia aurea* leaves is also another tradition used to heal skin diseases.

Milking and milk handling practices

Calf suckling before milking was found to be the dominant practice (97.2%) among the respondents. Only 11.2% of the respondents practice complete milking. In case of calf loss, salt rubbed calf doll is used by 28.8% of the respondents to mock-up local cows while milking.

The majority of the respondents clean their milk utensils once per day (73.2%) followed by twice (25.1%) and three times (1.7%) per day. Smoke fumigation of utensils is applied to extend the storage life of milk and milk products, and spices are used for cheese and ghee preservation while washing is common to store butter. Kega (*Rosa abissinica*), Gebre embuay (*Solanium*

indicum), Ayit hareg (*Solanecio angelatus*), Chebha (*Acacia nilotica*), Woira (*Olea africana*), Digita (*Calpurnia aurea*), Girar (*Acacia spp*.), Koke *(Prunus persica),* Tid (*Juniperus procera*), Girawa (*Vernonia spp*), Agam (*Carissa edulis*) and Enkuay (*Ximenia americana*) are plants commonly used for smoking of milk and milk products.

Milk processing and storage of milk products

Three types of containers (clay pot, plastic and steel buckets) are used for storage and processing of milk products depending on the scale and type of milk enterprise. Clay pot (*gourd*) was noted to be the major container used for milking and storing of milk products by smallholder farmers in rural areas, plastic bucket and steel bucket. *Girera*, *Kabo* and *Gurna* are the types of gourds used for milking, storage and churning of milk, respectively. In smaller towns and Bure town, plastic buckets are used for milking and milk storage, whereas clay pot, steel manual churner and gourd are used for churning. Relatively modern milk collection and churning facilities such as stainless steel buckets, plastic buckets, manual cream separators and churners were noted being used by the Bure-Damot Milk Cooperative.

Consumption and utilization of milk products

The familiar milk products produced and consumed in the study area are whole milk, sour milk, butter, buttermilk, traditional cottage cheese, whey, *Metata Ayib* and *Zure*. Among family members, children usually of below one year old have the privilege to drink whole milk. Milk is consumed in the form of boiled milk (63.2%), sour milk (14.3%) and raw milk (22.5%). Butter is used very often for home consumption (98.2%) and only 1.8% is used for sale. Buttermilk is used for both animal and human consumption (70%) and production of cottage cheese (30%).

Apart from its food value, 41% of the respondents consume milk for its alleged medicinal value. Similar beliefs were reported in other districts in northwestern (Asaminew, 2007) and Southern Ethiopia (Woldemichael, 2008). Milk and milk products reportedly used to treat various human health problems in the study area are shown in Table 4.

Table 4. Reported medicinal value of milk products in Bure district.

Health problems	Milk and milk product
Malaria	Cheese (*Metata ayib*)+whey + spices
Bloat	Butter
Ascaries	Local drug + whole milk
Mich	Ghee + milk (boiled)
Stomach discomfort	Butter + yoghurt

Marketing of milk and milk products

Informal marketing was the main system for milk and butter marketing in the study area. Milk producers reported marketing of surplus milk and butter to consumers, retailers and cooperatives. The cash obtained is used to buy food and non food items (clothing and education expenses) for children (82.4%). However, purchasing of farm inputs using the sales income (breeding cows, feed, fertilizer and seed) was fairly low (17.6%).

Milk marketing channels and chains

Whole milk, butter, *ergo* (fermented whole milk), cheese and buttermilk were the marketable commodities reported. The key participants identified in the milk market include milk producers, milk cooperatives and consumers while, milk producers, a cooperative, intermediate traders and consumers were identified as key participants in the butter market. The **Producer → Consumer** channel (predominant in Alefa and Bure town) accounts for 48.3% of the total milk marketed per day followed by the **Producer → Cooperative → Consumer** channel (40.6%) which was exceptional to Bure town. Eleven percent of the total milk marketed in the district follows the **Producer → trader** (hotels, tea kiosks) channel. The relatively short milk marketing channel observed in this study compared to the findings by Woldemichael (2008) might be advantageous in lowering consumer prices and increasing return to producers.

Butter marketing was undertaken mainly through the **Producer → Consumer** channel which involves direct sale of butter to consumers around the farm gate and in local market places. This channel represented the shortest in terms of intermediaries and smallest in terms of volume of butter and value. Consumers who usually buy butter for cosmetics

purpose rather than for food are categorized in this channel. Butter for consumption is mostly purchased in markets where there is better supply of butter in terms of quality and quantity with ample bargaining alternatives. **Producer → Retailer → Consumer** channel is also another route exercised at Bure and Kuch Saturday markets. In this channel retailers buy butter from the market and sell in the same market to make some profit.

Table 5. Reported milk and butter buyers, and mode of payment in Bure district.

Category	N	Percent
Milk buyers		
Consumers	140	48.3
Traders (hotels, teashops)	2	6.9
Cooperatives	23	44.8
Butter buyers		
Consumers	124	66.4
Retailers (hotels and traders)	51	30.6
Mode of payment		
Cash	164	98.4
Cash in advance	12	1.6
Market outlets (milk)		
Farm gate/homestead	15	19.0
Market place	48	60.8
Door to door delivery	16	20.2
Market outlets (butter)		
Farm gate/homestead	30	16.9
Market place	120	67.8
Door to door delivery	27	15.3

Determinants of price, demand and supply of milk products

Various factors were noted affecting price, demand and supply of milk and milk products in Bure district similar to Southern Ethiopia (Sinayehu *et al*., 2008). These included: season (dry versus wet), distance to market points, fasting periods, festivals and holidays.

Yield and supply of milk and milk products per household and per animal increased during the wet season due to better availability of feed stuff. Demand and price of milk and milk products increased in non-fasting periods, festivals and holidays. During fasting periods, greater proportion of fresh milk was processed into butter. Distance to market was also another determinant of demand, supply and price of milk products in Bure district. Producers of Bure travel on average 0.62 km to sell milk and milk products (Table 6). Milk produced in remote rural areas of Bure district is often sold in the form of butter.

Table 6. Reported prices of milk and butter and distance to market points in Bure district.

Variables	N	Mean ± SD	Minimum	Maximum
Price of milk per litre	26	4.00±0.83	3.50	4.00
Price of butter per kg	52	39.08±8.82	20.00	65.00
Distance travelled to sell milk (Km)	26	0.62±0.88	0.00	4.00
Distance travelled to sell butter (km)	62	6.33±5.11	0.00	20.00
Transport cost per round trip (ETB)	30	8.30±18.12	0.00	10.00

Constraints to milk production and processing

Milk production constraints

The reported constraints to milk production in the area are feed shortage, animal health problems together with poor veterinary services and weak breeding services (Table 7). The utmost constraint is the lack of grazing/feed resources due to limited land. The study area has a heavy human and animal population density and communal grazing lands are very rare in the area, worsened by poor feeding system and unavailability of agro-industrial by products. The study area has a nine month dry season and only a three month rainy season. Grazing is extremely scarce during the dry season causing many animals to eat such materials that have little nutritional value. Problems of seasonal availability of roughage feeds could be minimized through conventional feed conservation practices like hay and silage making and straw treatment to ensure sustainable supply of roughage feeds throughout the year.

Health problems were reported as the second important constraint. Poor delivery of veterinary services was cited by some farmers. Regarding dairy cattle breeding, unavailability of crossbred heifers, inefficient AI service and lack of community bull service were reported. Inadequate access to water particularly during the dry season was identified by farmers. Livestock had to trek on average 5 km in search of drinking water. Infestation of rivers and ponds by leech (*alekit*) is a very serious problem. Little intensive management is exercised by few of the milk production farms. Lack of skills in improved milk cattle management systems had negative impact on milk production system in the area. There are hardly any cooperative for milk production except at Bure. The study highlighted milk producers had little or no access to credit. Organizing collective groups such as milk producers and marketing cooperatives and implementing recommended support services, problems of availability and affordability of inputs (drugs and concentrate feeds) could well be resolved.

Table 7. Reported frequency of major constraints to milk production (N = 181).

Constraints	N	Proportion (%)
Shortage of feed	86	47.5
Animal health problems (diseases and parasite infestation)	58	32.0
Lack/inadequate supply of improved dairy cattle	19	10.5
Inadequate access to water	12	6.6
Poor veterinary services (lack of surveillance of disease outbreaks)	6	3.3

Marketing constraints

A number of marketing constraints that hinder the development of improved dairy industry were identified in Bure district. Milk producing households reported that seasonal variations in price, demand and supply of milk as one of the problems in milk marketing. Seasonal fluctuations in demand of milk products due to long fasting periods was found to be the major bottleneck in both milk production and marketing in Bure where the Orthodox Christianity is predominant (97.8%). Lack of milk processing plants in the area contributed to problems currently prevailing in the milk shed. Processing technologies which could extend the shelf life of milk products may resolve the problem of seasonality in demand for milk and milk products. Distance to marketing points (67.9%), lack of training related to

milk product marketing (24.9%) and adulteration of milk (7.2%) were problems reported by dairy producers of the area. For potential milk areas, where there is no market access, a milk collection scheme through establishment of milk marketing groups may alleviate the problem. Moreover, training on market-oriented milk production and marketing issues should be provided to extension officers.

Conclusion and Recommendations

The study showed that the existing milk production systems (mainly extensive) & marketing (mainly informal) systems are interwoven by many constraints related to feed, nutrition, health, breed, breeding practice, handling, processing and marketing of products predominates in the study district.

In general, the milk industry is at its infant stage compared to the existing potential of the area for milk production. The marketing system in the area was characterized by under developed and inefficient type of market for both milk and butter. The current situation regarding access to milk production services was not encouraging. Extension service in improved milk production (AI, veterinary services, introducing improved cattle breeds), credit and market information appeared very weak.

Therefore, strong technical and institutional support is required to promote intensive milk production systems and develop formal milk and milk product marketing systems in Bure district. Further work is needed specifically in areas of nutrition, health, milk and milk product marketing, input delivery & services to capitalize market oriented milk industry in the district.

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