

Research article

Handling, Processing and Utilization of Milk and Milk Products produced in and around Boditti, Wolaita, South Ethiopia

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Abstract

This study was conducted in and around Boditti town with the objective of characterizing handling, processing and utilization of milk and milk products produced in the area. Four locations (Kebeles) two in Boditti town and two in the surrounding areas were randomly selected. A total of 120 smallholder milk producers having at least one milking cow were randomly selected for interview.

Traditional ways of milk handling and processing at household level include practices which may contain risks for product quality affecting consumers' health. The majority of the producers (72%) in the rural area process milk at home, while the most of the urban producers (60%) produced milk for sale. 45% of the respondents in rural area used both clay pot and plastic utensils for milk handling, while the majority of urban producers (63.3%) used plastic utensils. The mean monthly per head consumption of milk and its products varied with product type (0.98 litres for raw milk and 1.21 litres for buttermilk). The use of unclean and/or traditional milking and milk storing utensils might have contributed to the poor hygiene of milk and milk products produced in the studied area. It is recommended, therefore, that adequate sanitary measures should be taken at all stages from production up to consumption to produce milk and milk products of superior quality and protect the health of the consumers. **Copyright © WJABS, all rights reserved.**

Keywords: consumption, dairy, milking, Storing, traditional, utensils

Introduction

Currently demand for dairy products in the country exceeds supply, which is expected to induce rapid growth in the dairy sector (Haese et al 2007). Factors contributing to this excess demand include rapid population growth (FAO 2004), increased urbanization and expected growth in incomes (Ahmed et al 2004). Other factors include consumer preference and availability and price of dairy products (Haese et al 2007). As is the case in other African countries such as Kenya and Uganda, dairy products in Ethiopia are channeled to consumers through both formal and informal dairy marketing systems (Ahmed et al 2004).

Although dairy products are traditionally used in Ethiopia, milk is not consumed in enough volume. Although total annual milk production in the country tends to increase, per capita milk consumption tended to decrease and demand is not yet satisfied. For instance, per capita milk consumption decreased from 19 kg/year in 1980 to 17 kg in 1993 and below 15 kg in 2000 in spite of the estimated increase in annual growth rate in milk production from 1.7% during the period 1980-1993 to about 2.2% during the period 1994-2000 (FAO 2004). The performance of the Ethiopian dairy sub-sector has been lagging far behind that of the neighboring countries with comparable agro-ecological conditions (Lemma et al 2010).

The per capita milk consumption in Ethiopia (17 kg/year) is not only below the targeted value of 90 kg (FAO) and 200kg (WHO) for Ethiopia (Tilahun 2006) but also low in consumption compared with surrounding countries standard. The per capita milk consumption of 40 kg/year/person in Uganda and 75 kg/year/person in Kenya are worth mentioning (Tilahun 2006).

While regarding with the consumption of milk and milk products, its quality should be the major issue since milk is highly perishable unless handled with care. Because of the traditional milk handling practices of the area and poor housing (family house) used in the area, the quality of milk is poor. To determine milk quality, different evaluations such as sensory, chemical and microbiological quality analyses are used with hygienic measures from the time milk leaves the cow's udder to the time that final product is consumed (Chizart et al 2008 and Tola et al 2007).

The situation of the dairy sector in Wolaita Zone in general and Damot Gale district (Boditti) in particular is no exception. Wolaita Zone as a whole is known for its high population density and land scarcity, which is believed to have partly been driven by a substantial rural to urban migration. Urban farming is a typical feature of Boditti town where a substantial proportion of the population is engaged and animals are fed with household kitchen wastes, spoiled fruits like avocado and other purchased feeds such as green grasses or hay.

Though dairy operation plays an important role to the livelihood of the engaged households in the area through income generation and home consumption, there is very limited work so far conducted to

understand milk production, processing, marketing and consumption in Boditti, which is a prerequisite to make any development intervention. The major aim of the present study was, therefore, to characterize milk and milk products handling practices, processing and consumption pattern.

Materials and Methods

The study was conducted in and around Boditti town, Damot Gale district, Wolaita Zone, which was one of the major milk producing areas in Southern Nations, Nationalities and People's Region (SNNPR) in Ethiopia. Boditti is situated at 7.00°N latitude and 37.56°E longitude. Located at an altitude of 1975 meters above sea level, Boditti receives an average annual rainfall of 900 to 1400 millimeters and the temperature ranges between 12 and 28°C (BTD 2008).

A total of 120 households (30 from each Kebele (administrative unit)), sixty from Boditti Hagaza and Boditti Qorke Kebele in Boditti town and another sixty from Hagaza Doge and Fate Kebeles from the surrounding of Boditti that had at least one milking cow were selected randomly. A semi-structured pre-tested questionnaire was used to collect the required information on milk and milk products marketing and its constraints. Both qualitative and quantitative data collected during the individual interview were analyzed by using Statistical Package for Social Sciences (SPSS 2007).

Results and Discussion

Milk production and utilization

The overall mean daily milk production/household in rural or mixed crop/livestock system ranged from 2.73 to 3.11 liters, while in the urban production system it ranged from 3.44 to 3.71 liters (Table 1). In the studied area, urban dwellers produce more and were good milk suppliers to the urban population than rural farmers. As the respondents said, this was due to the fact that urban producers keep relatively better performing dairy cows or provide better feeds, for example use of some concentrate feeds than rural farmers. This condition made urban farmers able to benefit from dairying. However, the overall daily milk production/household/cow in rural or mixed crop/livestock system was better than that reported in Shashemene-Dilla areas (1.97 to 2.84 liters). The daily milk production by urban farmers is below that reported for urban farmers (10.21 to 15.90 liters) in that area (Yigrem et al 2008).

Table 1: Overall daily milk production/household/cow (liters) in study area

Site	Kebele	N	(Mean ± SE)
In Boditti	Boditti Hagaza	30	3.71±0.5
	Boditti Qorke	30	3.44±0.1
Around Boditti	Fate	30	3.11±0.4

	Hagaza Doge	30	2.73±0.3
Total	4	120	3.25±0.36
Total yield		565	

N=Numbers of households, S.E=Standard error

From the interviewed dairy producers in the rural production system, the majority of the households (about 72%) sour and process milk using traditional technologies, while the rest 18.3% and 9.2% of the households, respectively use whole milk for household consumption and/or sale without further processing. In the town on the other hand, the result showed that the majority (60%) of the households gave priority for sale in its natural form, while 25.8 and 14.2% of the households use milk for family consumption and home processing, respectively. Similar studies conducted in different parts of the country also indicated differences in the utilization pattern of milk in different production systems. Other studies conducted around Addis Ababa (Tegene and G/wolde 1998) and Mekele (Gebreselassie 2006) indicated that 73 and 79% of the fresh milk produced by urban dairy farmers respectively was marketed in its natural form without further processing, which agrees with the result of the present study.

Milk handling

Factors related to milk utensils such as type of the material and frequency of cleaning are among the major factors affecting the quality of milk and milk products. Based on production systems, the type and quality of milking utensils differ to some extent between town and rural areas (Table 2). About 45% of rural producers used clay pots, 45% used plastic utensils and the remaining 10% used aluminium utensils for milk handling. Similar result was reported in North Western highlands of Ethiopia (Ayenew et al 2009). In town, 63.3% used plastic materials while 35% used materials made from metals.

The majority (93.3%) of the respondents in rural areas usually clean their milking utensils before and after milking using different plant species and the rest clean milk utensils once a day after milking since they kept it clean and dry after use. Most urban producers (85%) usually clean their milking utensils before and after milking while 15% did it once a day after milking. With regard to cleaning milking utensils by using different plant species, rural producers were found better than urban farmers.

Milking utensils	% of total respondents	
	Urban (N=60)	Rural (N=60)
Table 2: Types of utensils used for milking in the studied area		

Clay pots	10	45
Plastic materials	63.3	45
Metal cans	26.7	10
Cleaning frequencies		
Before and after milking	85	93.3
After milking	15	6.7
For all mentioned above	8.3	80

N=Number of respondents

Different ways of cleaning milking utensils were identified in the studied area. The majority of the households (80%) washed with hot water and different types of plants such as *Ocimum hardiense*, *Theme vulgaris*, *Achynthes aspera* and *Eucalyptus globulus* followed by smoking with different aromatic plants like *Olea Africana* and *Ruta cymbopogon*. Smoking of milk utensils prior to milking and churning is a common traditional practice in most parts of the country. Some of the plant species used for smoking in different parts of the country include *Achynthes aspera*, *Ruta graueolens*, *Eucalyptus globulus*, *Ruta cymbopogon* and *Ocimum hardiense* in Wolaita areas (Mekonin 2006); *Acacia nilotica*, *Cordia glarfa*, *Cordia ovalis* or *Combertum molle* in the pastoral areas of Borena (Layne 1994); *Deinbollo kilimandshorica*, *Syzygium guinecnse*, *Heeria reticulala* and *Olea africana* in Eastern Wollega (Tola 2002); and *O. africana*, *Juniferrus procera* and *Ocimum hardiense* in East Shoa (Fita 2004) and in north western highlands of Ethiopia (Ayenew et al 2009).

Frequency and methods of cleaning milk handling utensils and types of materials used both by urban and rural dairy producers were traditional where some respondents do not use cleaning before and after milking and others do not use plants commonly used in the area for this purpose. The respondents said that the sort of utensils used for milking, milk storage and processing and types of plants used to wash the utensils should not cause inconvenience to consumers' preference. Proper handling of milk and milk utensils (used for milking, storage, churning, or consumption) is a criterion that should be followed prior to consumption, marketing and processing, which helps to avoid survival and multiplication of pathogenic and spoilage microbes. Regarding milk and milk utensils handling, training was given in the kebeles studied under the project called 'CIDA' in the area. But still it needs further training and awareness creation among producers on different aspects of milk handling practices.

Milk processing

In the rural crop/livestock mixed production system, 80% of the households churn all the milk produced in the household. This is mainly due to preference to butter and by-products such as defatted sour milk. However, the remaining 17.5% of the interviewed households reported to process milk at

irregular basis and only 2.5% did not churn it at all due to poor milk production. Out of the interviewed urban dairy producers, 60% of the households practiced milk churning when there is surplus milk production left from market and household consumption and during fasting days where there is less demand for dairy products. The rest 40% of the households did not churn milk at all.

The primary milk products traditionally processed in the area differ based on production systems and processing objectives. In the town, the primary dairy product produced is butter by 71.6% of the households, cottage cheese by 20% of the households and fermented whole milk (*Ergo*) by 8.5% of the households. In the same way in rural areas, butter was the primary product for 80% of the households and cottage cheese for the remaining 20% of the households. A similar result was reported in North Western highlands of Ethiopia (Ayenew et al 2009) which indicated that dairy producers in the country prefer to convert (diversify) milk into more stable products.

All of the dairy producers in the area used traditional churning material made from clay pot. The result of this study is comparable with the case of central highlands of Ethiopia where clay pot churn is mostly used (Yigrem et al 2008), but it is different from that reported for East Wollega where 91% of women used gourd for churning and storage of milk (Tola 2002).

Dairy products consumption trends

Mean monthly per head consumption of milk in the studied area was 0.97 litres of raw milk, 1.3 litres of butter milk, 0.05 litres of '*Ergo*' (Ethiopian naturally fermented cow's milk), 0.05 litres of whey, 0.5 kg of '*Ayib*' (Ethiopian cottage type cheese) and 0.6 kg of butter (Table 3). Other products like hair butter, pasteurized milk, hard cheese, ice cream and powdered milk were consumed in small quantities (0.3) and/or not at all in the present study area.

The consumption level of raw milk, '*Ergo*' and other dairy products such as milk powder especially in town in the area was lower than the level of consumption of these products (1.47 and 0.8 litres, respectively) reported in Ada'a woreda, East Shoa Zone, central Ethiopia by Melese and Beyene (2009). But with respect to butter milk, whey, butter and cottage cheese the present result is almost similar with the report of Mekonin (2006) in Delbo watershed areas of Wolaita since households in that area usually do not consume raw milk and '*Ergo*' rather they churn the sour milk.

Table 3: Mean monthly per head consumption level of milk and milk products in the study area

Dairy product	(Mean ± SE)
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Raw milk (litre)	0.97±0.03
Buttermilk (litre)	1.3±0.05
Yoghurt or 'Ergo' (litre)	0.05±0.02
Whey (litre)	0.05±0.01
Cottage cheese or 'Ayib' (kg)	0.5±0.03
Butter (kg)	0.6±0.03
Others	S.E=Standard error 0.3±0.02

S.E=Standard error

Regarding the frequency of consumption of milk and its products, raw milk was the most frequently consumed product in the study area followed by defatted sour milk. Almost all households in town consumed raw milk (they even prepare coffee with it) more than 2 to 6 times per week because either they afforded it or they produced it by their own. On the other hand, in rural areas about 52% of the households consume defatted sour milk more than 3 to 6 times per week, while 35% of the households consumed raw milk more than 2 to 5 times per week.

Conclusion

- The majority of producers (72%) in the mixed crop/livestock system process milk at home, while the majority of urban producers (60%) produced milk for sale.
- Different dairy commodities; raw milk, buttermilk, butter, cottage cheese and *Ergo* are predominant dairy products in the studied area.
- Butter milk, whey, butter and cottage cheese consumption level in the present result is almost similar with other parts in Ethiopia while raw milk, '*Ergo*' and other dairy products such as milk powder especially in town in the area was lower.
- The use of unclean and/or traditional milking and milk storing utensils might have contributed to the poor hygienic condition of milk produced in the studied area. It is recommended, therefore, that adequate sanitary measures should be taken at all stages from production up to consumption to produce milk and milk products of superior quality and protect the health of the consumers in addition to further research works.

Acknowledgements

The authors acknowledge Hawassa University for its contribution during milk sample collection and analysis. We express also our gratitude for ministry of education for funding this study. We are also indebted to all those who supported in one or another way for the completion of this study.

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