

Smallholder Cattle Milk Production, Utilization and Marketing Pattern in Different Agro-Ecological Districts of Ilu Aba Bora Zone, Southwestern Ethiopia

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Abstract: The aim of this study was to assess traditional milk production, utilization and marketing systems in the three districts of Ilu Aba Bora Zone of Oromia Regional State, South western Ethiopia. A stratified randomly sampling technique was adopted to sample and administer pre-tested, structured questionnaires to a total of 180 (60 from each agro-ecological zone) households. Data were analyzed using descriptive statistics such as means, percentile and GLM ANOVA. The study show that the overall average milk produced per household (HH) per day for the three districts was 2.78 ± 0.14 liters and revealed significant ($P < 0.05$) difference between districts. Of the total milk produced per HH per day, 45.5, 44 and 10%% was used for home consumption, processing and sale. Milk processing was based on sour milk. Traditional milk processing materials identified in the study area were clay pot (*waciti* in Afaan Oromo-local language), bottle gourd (*ro'oo/diroo* in Afaan Oromo-local language) and jar cane. About 26.9, 36.9 and 36.2% of the respondents used *Urgeessaa* (*Premnaschimperi*), *Bakarii* (unidentified) and *Ejersa* (*Oleaafricana*), respectively, for smoking traditional milk utensils. It was observed that 64.4% of the respondents in the study area market milk and milk products. There was significantly ($P < 0.05$) difference in the amount of milk marketed between districts. Milk and dairy products marketing channels were farmers-to-consumers and farmers-to-retailers-to-consumers. Factors affecting price of milk and its products were season distance to market, religious and national festivities and fasting.

Key words: Agro-Ecology • Milk Marketing • Milk Processing • Milk Utilization

INTRODUCTION

Demand for animal products in Sub-Saharan Africa and generally in the developing countries is likely to rise significantly as a result of population growth, urbanization and rising income in the face of relatively low levels of consumption at present [1]. Demand for milk and dairy products has increased in the tropical areas where people's incomes have been growing [2]. However, despite milk's contribution to gross domestic product and its value as a food, sub-Saharan Africa has failed to attain self-sufficiency in dairy production [3].

Data of the National Agricultural Sample Enumeration Results indicated that the total milk production in Ethiopia for the year 2003/2004 was estimated to be

2,591.186 million Liters. According to Getachew [4], about 97 and 3% of the total milk production is from indigenous and improved dairy cows, respectively. The smallholder dairy farmers contribute 97% of the total national milk production of Ethiopia [5].

Milk and milk products form part of the diet for many Ethiopians. Both rural and urban people fondly relish dairy products. They consume dairy products either as fresh milk or in fermented or soured form. In Rural Ethiopia, 68% of the total milk produced is used for human consumption in the form of fresh milk, butter, cheese and yogurt while the rest is given to calves and wasted in the process [6]. The National Agricultural Sample Enumeration Results of 2001/2002 CSA, [7] indicated that at national level 48.2% of the milk is consumed as

whole fresh milk or in fermented form (ergo) whereas 46.6% is used for butter making and only 5.2% marketed [7]. In most peri-urban areas, 74.6% of the milk produced is either used at home or marketed in liquid form while 17.5% fed to calves, 8% churned and marketed in to butter oil state and 0.3% is wasted [8].

Thus, the milk produced in the rural areas is either used for direct consumption at home or soured and processed into butter and cottage cheese (Ayib) to be sold to farther areas and urban centers [6]. About 85, 38.5 and 19% of the milk produced in Wolaita, Arsi and Gojamis converted into butter and marketed. However, in Addis Ababa, 94.5% of the milk produced in intra-urban and peri-urban areas is marketed in fresh milk form.

Dairy marketing system in Ethiopia can be classified in to two subsystems: formal and informal marketing system [9]. The main marketing channels in Ethiopia are the informal sectors where major milk and dairy products transactions takes place characterised by raw whole milk and butter/ghee sale being predominant [4]. In the informal marketing system, the smallholder sells their surplus supplies to neighbors, in the local market to itinerant traders or individuals either as liquid milk or in the form of butter or a cottage-type cheese (Ayib) [10, 11]. In the peri-urban areas of Ethiopia, about 20% of average income was derived from dairy products [12]. According to ILCA [13], sales of dairy products, especially butter, contribute to 20% of the rural household income in the Ethiopian highlands.

In the study area, milk production to marketing is the inadequately addressed issue and draw the attention of all those associated with dairy development under smallholder production. The objective of this study is, therefore, to assess the milk production, utilization and marketing system in three districts of Ilu Aba Bora zone.

MATERIALS AND METHODS

Study Area: The study was conducted at three districts (namely Bacho, Algie and Chewaka) of Ilu Aba Bora zone in Oromia Regional State, south western Ethiopia. Ilu Aba Bora zone has 1633156.56 hectares (ha) of land of which 10% is high land, 67% medium land and 23% low land. The altitude of the zone ranges from 500-2575 meter above sea level. It is mostly known for its vegetation coverage, suitability for coffee, crop, livestock and bee production. The dominant crops being Maize, Teff, Coffee, Sorghum, Barley, Wheat, different pulse crops, finger millet, fruits,

vegetables, spices and rice. Human population of the zone is 1,492,183 people. Out of the total population, 88% live in the rural areas. Annual precipitation ranges from 1500-2200mm with 6 to 9 months of rain fall [14].

Bacho, Algie and Chewaka are the three districts of the zone selected for this study based on variation in altitude and potential for cattle resource. Bacho, Algie and Chewaka districts represented high, medium and Low land, respectively. Bacho, Algie and Chewaka districts are located at a distance of 640, 654 and 560 km, respectively from Addis Ababa. Bacho, Algie and Chewaka districts were situated at an altitude ranging from 1650 to 2500, 1139 to 2165 and 900 to 1400 meters above sea level, respectively, with area coverage of 49,249, 94,344 and 54,220 ha, respectively. Bacho, Algie and Chewaka districts receives an average annual rainfall ranging from 1500 to 2200, 1371.6 to 2275 and 1000 to 1200 mm, respectively and the minimum and maximum daily temperature of 12 and 25°C, 14.9 and 25.1°C and 36 and 41°C, respectively. Human population of Bacho, Algie and Chewaka was estimated to be 42,335, 90,290 and 92,027 people [14].

Sampling Procedure: A stratified sampling technique was used based to obtain the respondents for the purpose of this study based on the agro-ecological zone (high, medium and low) altitude. Bacho, Algie Sachi and Chewaka districts represented high, medium and Low land, respectively. A total of 180 households, 60 from each district were randomly selected using systematic random sampling method.

Sources of Data and Analytical Technique: Informal and formal survey tools were employed together primary data for this study. These were obtained by using pre-test, well-structured questionnaires. The respondents were smallholder cattle producers. The data collected were collected on sex, age, educational level, household size, land holding and utilization, crop production, purpose of keeping cattle, sources of income and sources of labour and its allocation for cattle production. The primary data collected for this survey were analyzed using descriptive statistics such as means, frequency distribution, range and percentages and GLM ANOVA using SPSS software version 16. Indices were calculated for major constraints and major diseases affect cattle production in the study areas. Least Significance Difference was employed to separate means having statistically significant difference.

Statistical Model:

$$Y_{ij} = \mu + A_i + \epsilon_{ij}$$

where

Y_{ij} = The value of the respective variable mentioned above pertaining to the i^{th} district ($i=3$, Bacho, AlgieSachi or Chewaka)

μ = Overall mean of the respective variable

A_i = The effect of i^{th} district ($i=3$, Bacho, AlgieSachi or Chewaka) on the respective variable

ϵ_{ij} = A random error term

RESULTS AND DISCUSSION

Milk and Milk Products Utilization: Production and utilization pattern of milk and milk products in the study areas are shown in Table 1. The overall average milk produced/HH/day for the three districts was 2.78±0.14 liters with a range of 0.5 to 10 liters. Bacho district showed significantly ($P<0.05$) higher milk production (3.72±0.28) than the other two districts. This was attributed by higher average number milking cows in Bacho than Algie and Chewaka districts. Contrary to our study, higher mean milk production per day per household was reported by Tesfay [15] and Lemma *et al.* [16] in Metemadistrict and East Shoa Zone of Oromia, respectively.

Of the total milk produced per day, 45.5% was used for household consumption, 44% was reserved for subsequent processing and the remaining 10% was marketed. In Rural Ethiopia, 68% of the total milk produced is used for human consumption in the form of fresh milk, butter, cheese and yogurt while the rest is given to calves and wasted in the process [6]. The National Agricultural Sample Enumeration Results of 2001/2002 CSA, [7] indicated that at national level 48.2% of the milk is consumed as whole fresh milk or in fermented form (ergo) whereas 46.6% is used for butter

making and only 5.2% marketed [7]. Lower amount of milk (10%) was marketed in Bacho and Chewaka, while higher proportion was used for household consumption and processed to butter and cottage cheese.

Milk Marketing: According to respondents in Algie district, traditionally selling of raw milk was considered as taboo and none of the respondents were involved in selling raw milk. However, higher number of respondents in Chewaka district was involved in marketing of raw milk. They generate the cash needed to meet household's necessities mainly from the sale of live animals and animal products, particularly dairy products. According to the respondents in the study areas, milk and milk products are consumed alone or with meals prepared in different forms. The different forms of dairy products consumed by households were raw milk (*Aannan*), naturally fermented whole milk (*Itittuu*), cottage cheese (*ittoo*), butter milk (*baaduu*) and butter (*Dhadhaa*).

Milk Processing: The study revealed that the majority (72.2%) of the respondents in the study area process milk into butter and other traditional dairy products. Significantly ($P<0.05$) higher number of respondents in Bacho districts process the milk they produced. Milk processing frequency was every three days (45.4%) and every two days (38.5%) and it depends on the number of cows in milk per household. The milk produced in the rural areas is either used for direct consumption at home or soured and processed into butter and cottage cheese (*Ayib*) to be sold to farther areas and urban centers [6].

Traditional milk processing materials identified in the study area were clay pot (*waciti* in Afaan Oromo-local language), bottle gourd (*ro'oo/diroo* in Afaan Oromo-local language) and jar cane. Clay pot has double function, for churning milk into butter and for making cheese. Similar results were reported in Metema [15].

Table 1: Milk production and utilization pattern

Variables	Districts of the study			Overall Mean (SE)
	Bacho	Algie	Chewaka	
TMP/d/HH	3.72±0.28 ^a	2.42±0.02 ^b	2.13±0.14 ^b	2.78±0.14
Milk utilization (%) For home consumption	41.7	50	47.7	45.5
For processing	47.5	50	31.1	44
For sale	2.8	-	22.2	10.5

Means with the same superscript within the same row are not significantly different at 5% level of significance.

SE= standard errors, HH= Households, TMP= Total milk produced

Table 2: Milk processing practices in the study area

Variables	Districts of the study							
	Bacho		Algie		Chewaka		Total	
	N	%	N	%	N	%	N	%
Households processing milk	55	91.7	41	68.3	34	56.7	130	72.2
Frequency of processing								
Every one day	3	5.5	3	7.3	0	0	6	4.6
Every two days	33	60	14	34.1	3	8.8	50	38.5
Every three days	17	30.9	20	48.8	22	64.7	59	45.4
Every four days	2	3.6	2	4.9	8	23.5	12	9.2
Every five to seven days	0	0	2	4.9	1	2.9	3	2.3
Smoking plants/herbs								
<i>Urgeessaa (Premnaschimperi)</i>	17	30.9	12	29.3	6	17.6	35	26.9
<i>Bakarii</i> (leaf part)	19	34.5	16	39	13	38.2	48	36.9
<i>Ejersa (Oleaafricana)</i>	19	34.5	13	31.7	15	44.1	47	36.2

N= Number of households

In the study area, farmers used different herbs or plants for smoking and washing milking equipment. The herbs impart a distinct flavor and have bacteriostatic effect. Several types of plants/herbs were used in the study area for smoking milking equipments, out of which three plants were predominantly used for smoking purposes. About 26.9, 36.9 and 36.2% of the respondents used *Urgeessaa (Premnaschimperi)*, *Bakarii* (unidentified) and *Ejersa (Oleaafricana)*, respectively. Before smoking, the materials are thoroughly washed with herbs like *kusaye* and dried well which makes the milk to have pleasant flavor and taste. According to Lemma *et al.* and Coppock [16, 17], "*Ejersa*" (*Olea Africana*) is the most frequently used plant for smoking milk vessels followed by *Juniperousprocera* and *Ociumhardienes* in different regions of Ethiopia.

Marketing of Milk and Milk Products: The study observed that majority (64.4%) of the respondents in the study area market milk and milk products. Respondent in Bacho district sell significantly ($P<0.05$) higher proportion of milk and milk products than Algie and Chewaka districts. This is may be due to more number of milking cows in the district. In addition, farmers in Bocho district are more market oriented than the two study areas. Among the dairy products, farmers predominantly sell butter (95.7%) followed by fresh whole milk (22.4%) and cheese (11.2%). This result is in agreement with findings of Tesfaye, [15].

Out of the total number of respondents marketing dairy products, 22.4% in Bacho and Chewaka were involved in selling fresh whole milk. Respondents in Algie stated that the reason for not marketing fresh whole milk was restricted by cultural taboos. Similar results have

been reported in east Showa and east Wollega [16, 18].

The study observed that only informal system of milk marketing was found in the study; these involved direct delivery of raw milk and milk products by producers to consumers in the immediate neighborhoods. This is in line with previous reports in different parts of the country [15, 19, 20]. Majorities (91.9%) of the respondents sell butter to retailers, while very few sales directly to individuals. The main marketing channels in Ethiopia are the informal sectors where major milk and dairy products transactions takes place characterized by raw whole milk and butter/ghee sale being predominant [4]. In the informal marketing system, the smallholder sells their surplus supplies to neighbors, in the local market to itinerant traders or individuals either as liquid milk or in the form of butter or a cottage-type cheese (ayib) [10, 11]. The usual ways of determining the quality of milk and its products on market was by tasting, smelling and color/appearance of the product.

Highest number of the respondents in Bacho and Algie indicated that they faced problems in marketing milk and milk products during fasting months of Ethiopian Orthodox Church followers, while respondents in Chewaka district did not face problem in marketing milk and milk products, because the majority of respondents in Chewaka district are Muslims.

Price of Butter and Distance to Market: The overall average price of butter for the three districts was 60.99±0.71 Ethiopian Birr (ETB) with a ranged of 45-70 ETB per kilogram. Price per kilogram of butter was significantly different among the study sites ($P<0.05$). On the other hand, cheaper price of butter was reported in Metema area (22.5 to 25.0 ETB in wet season and 24.0 to

Table 3: Marketing of milk and milk products in the study areas

Variables	Districts of the study							
	Bacho		Algie		Chewaka		Total	
	N	%	N	%	N	%	N	%
Respondents marketing dairy products	42	70	37	61.7	37	61.7	116	64.4
Type of dairy product marketed								
Raw milk	6	14.3	0	0	20	54.05	26	22.4
Butter	42	100	37	100	32	86.5	111	95.7
Cheese	13	30.9	0	0	0	0	13	11.2
Reasons for selling dairy products								
To generate income	21	50	9	24.3	17	45.9	47	40.5
To meet HH necessities	21	50	28	75.7	20	54.1	69	59.5
Types of buyers (butter)								
Consumers	1	2.4	0	0	8	25	9	8.1
Retailers	41	97.6	37	100	24	75	102	91.9
Means of market delivery								
On foot	34	81	37	100	37	100	108	93.1
Pack animals	8	19	0	0	0	0	8	6.9

N= Number of households, HH=households

Table 4: Price of butter (ETB) and distance (Km) to market milk and milk products in the study areas

Variables	Districts	N	Mean ± SE	Minimum	Maximum
Price of butter	Bacho	42	53.33±0.58 ^a	45	60
	Algie	37	70.00±0.00 ^b	70	70
	Chewaka	32	60.62±0.29 ^c	60	65
	Overall mean	111	60.99±0.71	45	70
Distance to market	Bacho	42	8.55±0.38 ^a	4	13
	Algie	37	13.81±0.28 ^b	9	15
	Chewaka	37	8.73±0.28 ^a	5	11
	Overall mean	116	10.28±0.29	4	15

^{a-c}Means within a column with different superscript differ significantly (P<0.05). N= Number of households, SE= standard deviation.

27.0 ETB in dry season) [15]. According to respondents, the price of butter was higher during dry season, religious and national festivities and decrease during the fasting months practiced by the followers of the Ethiopian Orthodox Church in which these refrain from eating food of animal origin. During dry season cows produce relatively less milk due to feed and water shortage, which results to rise in price of dairy products.

The overall average distance traveled to market milk and milk products for the three study sites 10.28±0.29 km, with a range of 4-15 km. A significant ($p<0.05$) difference was observed in distance travelled to market between the study districts. Contrary to the results of this study, in Mieso, on average women travel to sell milk 5.89 ± 0.19 km, with a range of 1 to 12 km [21].

Milk and milk products were transported to market sites on foot (93.1%), while the rest used pack animals. According to Siegfried and Berhan [22], milk and milk product is transported to towns on foot, by donkey, by horse or by public transport.

CONCLUSION

The study showed that smallholder farmers in the study area produce milk for home consumption, processing into butter and cottage cheese (ayib) and sale. Milk processing was based on naturally fermented (sour) milk. Majority of the respondents market milk and milk products. Milk and dairy products marketing channels in the study area were farmers-to-consumers and farmers-to-retailers-to-consumers channel. Season, distance to market, religious and national festivities and fasting periods were identified to fluctuate the price of dairy products. Cows produce low milk in the dry season due to shortage of feed and water and this resulting in increased price of dairy products. It can be concluded that farmers in the study area would like to produce more milk for sale. Thus, introduction of crossbred genotypes together with improved feeding and animal health technologies is very important. Improving market infrastructures and developing appropriate and low cost

technologies for increasing shelf life of dairy products during long fasting season need to pay technical and institutional attention.

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