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Handling, Processing, Utilization and Marketing System of Milk and Milk Products in Huet Eju Enesie District, East Gojjam Zone, Ethiopia

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Abstract
The study was conducted to assess milk and milk products handling, processing, utilization and marketing systems in Hulet Eju Enesie district, East Gojjam Zone, Ethiopia. For the study, 247 respondents were selected through systematic random sampling and data were collected using semi structured questionnaire, FGD, key informant interview and field observation. Data was analyzed using descriptive statistics, chi square test, analysis of variance by SPSS version 20 Software. Hand milking was the sole milking method in the study area and washing hand before milking was practiced by 93.5% of respondents. All of the interviewed respondents practiced smoking of milk handling equipment mainly to improve the taste and flavor of milk and milk products reported by 76.1% of respondents. Majority of respondents (86.6%) used gourd (Lagenaria siceraria) for milking but most of the respondents (95.7%) in Motta town and few respondents (9.3%) in mid altitude were used plastic material. All of the interviewed respondents were processed raw milk into various milk products. The average amount of milk produced per day per HH was 2.6±0.14 liters and significantly varied ($P<0.05$) among the study areas with the highest amount of milk produced (5.6±0.94 liters) in Motta town. Only 13.4% of respondents were participated in milk marketing but 86.2% of respondents sold butter. In general, the handling, and processing practice of milk and milk products was in a traditional system and milk and milk products marketing is very limited. Therefore awareness creation for the farmer to improve the handling practice of dairy products and motivation of the farmers to increase their participation in milk marketing is essential.
Keywords: Altitude, Cow milk, Handling, Marketing, Processing, Utilization

1. INTRODUCTION

Dairy farming is one of the livestock sub sectors that can provide income and employment for the economic sustainability of smallholder farmers (FAO, 2010). In Ethiopia, the sector contributes half of the livestock output and about 30 % of employment (Tesfaye *et al*., 2008). However, the productivity of dairy cows is in a lowest stand due to various technical and nontechnical constraints (Asrat *et al.,* 2016). According to CSA (2016), most of the milk is obtained from cows producing 3.06 billion liters with an average daily milk yield of 1.35 liters per cow over 180 days of lactation period. Household consumption of milk at the national level reaches 42.38% of the total milk produced and 51.2% of the milk is processed into different products, 6.12% is sold and 0.33% used as a gift (CSA, 2016).

Milk is nature's most complete food contributed for the nutritional improvement of the people (Habtamu, 2015). However, the per capita consumption of milk in Ethiopia is low estimated at 19 kg compared to 27 kg Africa and 100 kg world (ANRS, 2015).

The Amhara National Regional State contributed 22% of the national milk production and almost all of the milk produced comes from small holder dairy cattle producers. The most notable milk producing areas in the region are South Gonder, Awi, North Shewa and East and West Gojjam Zones (ANRS, 2015). Hulet Eju Enesie district is one of the 18 districts in East Gojjam Zone of Amhara National Regional State which is endowed with a vast livestock population characterized by mixed crop livestock production system (Michael, 2013). In the district, all most all dairy cattle are indigenous breeds covering 98.1% of the total cattle herd. The district is conducive for livestock as well as dairy cattle production and other agricultural activities because of relatively enough feed resources if utilized properly and suitable environment. More than 33,549 hectare community grazing land is available in the district which is a good opportunity for better dairy cattle production. The feed resources obtained from crop residues also highly available throughout the year especially in mid and high altitude areas. Because of this, milk production is widely practiced in the district (HEEDAFDO, 2016). To have quality dairy products and to benefit properly, identifying the existing trends of milk handling, processing, and utilization and marketing activities is important to undertake different improvement measures. Therefore, this study was conducted to assess the handling, processing, utilization and marketing systems of milk and milk products in Hulet Eju Enesie district.

2. MATERIALS AND METHODS

2.1. Description of the Study Area

The study area, Hulet Eju Enesie district is found in East Gojjam Zone of Amhara National Regional State. The district is bordered in the South by Enarj Enawuga and Debay Telat Gen, in the North by Blue Nile (*Abay*) river (which separates Hulet Eju Enesie from South Gonder Zone), in the East by Goncha Siso Enesie, and Bibugn and Gonji kollela in the West (Derajew *et al.,* 2013). The altitude in the district ranges from 1288 to 3899 meter above sea level and the agro ecological zone comprises 52% mid altitude (*woina dega*), 30% low altitude (*kola*) and 18% high altitude (*dega*). The average annual rainfall of the district ranges from 1100 up to 1889 millimeter and the average annual temperature ranges from 8 to 25 degree centigrade (Derejaw *et al*., 2013).

2.2. Sampling Techniques and Sample Size

The study area was selected using multi stage sampling procedures. In the first stage, Hulet Eju Enesie district was selected purposely based on the potential of dairy cattle production. In the second stage, Hulet Eju Enesie district was divided into high altitude, mid altitude and low altitude and then two, three and two PAs were selected from each agro ecologies, respectively using simple random sampling. In the third stage, sampled households who have dairy cows were selected through systematic random sampling. On the other hand, Motta town which is capital of Hulet Eju Enesie district was selected purposely because the farming system is different from mid, high and low altitude areas and the respondents who have dairy cows were listed and then selected through systematic random sampling.

The sample size of the study was decided based on the formula of Cochran (1977) provided below. Therefore, 247 HHs were taken and the HH in each PA were selected based on the proportion of the population in each PAs.

$$no = \frac{Z^2 pq}{D} \qquad n = \frac{no}{1 + \frac{no-1}{N}}$$

Where, no=The desired sample size when the population > 10 000, n= The desired sample size when the population <10 000, z= 95% of confidence (i.e. 1.96), p= 0.2 (Population proportion to be included in the sample (i.e. 20 %.), q=1- 0.2 (i.e. 0.8), N=Total number of population, D=Margin of error or degree of accuracy required (i.e. 0.05)

2.3. Source of Data and Methods of data Collection

Data were collected from primary and secondary sources. The primary data were collected using pretested semi-structured questionnaire, FGD, key informant interview and field observation. On the other hand, secondary data were extracted from different published and unpublished documents from different offices. The collected data includes dairy product handling and processing practices, dairy products processing and handling equipment, smoking practices and marketing practices of dairy products. A total of eight FGD were conducted in seven PAs and Motta town using FGD guide lines. The FGD participants were consists of six farmers and one development agent (DA) from each study PA. The data were collected from December 2016 up to March 10, 2017.

2.4. Data Analysis Methods

Data collected through questionnaire were analyzed using descriptive statistics, chi-square test and Analysis of variance by SPSS version 20, software (SPSS, 2011). Tukey's honestly significance difference was used for multiple comparisons of means. The result considered as significant when p-value is less than (0.05) level of significance.

3. RESULTS AND DISCUSSION

3.1. Milk and Milk Products Handling Practices

3.1.1. Milking practices

The survey result revealed that hand milking was the sole milking method in the study area and washing hand before milking was practiced by 93.5% of respondents (Table 1). In Motta town, hand washing prior to milking was practiced by 100% of respondents. This result was the same with Tsegaye and Gebreegziabhar (2015) who indicated that 95.6% of respondents wash their hand before milking. The study revealed by Tadele *et al.* (2016) in Eastern Ethiopia was disagreed with the present result only 52.5% of respondents wash their hand before milking.

As indicated in table 1, washing the udder of the cow was not practiced by 97% of respondents in the study area. Few respondents in mid altitude (2.8%) and Motta town (21.7%) practiced washing the udder. This is because in Motta town the awareness of respondents about the importance of udder washing was relatively better

than other areas. The same to this finding 100% of respondents in Ezha districts of Gurage Zone does not wash udder before milking reported by Abebe *et al.* (2013). The result reported for Motta town was the same with Bekele *et al.* (2015) 21% of respondents in peri urban areas of Dangila town wash udder before milking. Contrary to the present study, Fikrneh *et al.* (2012), Teshome *et al.* (2014) and Tsegaye and Gebreegziabhar (2015) reported that 57.2%, 71.79% and 86.1% of respondents in mid rift valley of Ethiopia, Shashemene town, Humbo and Bolesosera district of Wolaita Zone practiced washing udder before milking, respectively. This is might be the respondents in these areas were received adequate knowledge in hygienic milk handling than the present study.

Table 1. Milking method and milking frequency in the study area

Variables	Study Areas				
	Mid altitude N=108 N(%)	High altitude N=76 N(%)	Low altitude N=40 N(%)	Motta town N=23 N(%)	Overall N=247 N(%)
Washing hand					
Yes	103(95.4)	70(92.1)	35(87.5)	23(100)	231(93.5)
No	5(4.6)	6(7.9)	5(12.5)	0(0)	16(6.5)
Washing udder					
Yes	3(2.8)	0(0)	0(0)	5(21.7)	8(3.2)
No	105(97.2)	76(100)	40(100)	18(78.3)	239(97)

N=Number of respondents

3.1.2. Cleaning and smoking practice of milk handling equipment

Smoking practice and purpose of smoking in the study areas is presented in (Table 2). All of the interviewed respondents practiced smoking of milk handling equipment. The purpose of smoking was to improve taste and flavor of milk and milk products reported by 76.1% of respondents but 16.6% and 7.3% of respondents were practiced smoking to destroy bad microorganism and to improve milk fermentation, respectively.

Table 2. Smoking practices of milk handling equipment in the study area

Variables	Study Areas				
	MA (N=108) N(%)	HA (N=76) N(%)	LA (N=40) N(%)	MT (N=23) N(%)	Overall (N=247) N(%)
Smoking practice					
Yes	108(100)	76(100)	40(100)	23(100)	247(100)
No	0(0)	0(0)	0(0)	0(0)	0(0)
Purpose of smoking					
Improve flavor	84(77.8)	58(76.3)	32(80.0)	14(60.9)	188(76.1)
To avoid over souring	8(7.4)	5(6.6)	3(7.5)	2(8.7)	18(7.3)
Destroy bad microorganism	16(14.8)	13(17.1)	5(12.5)	7(30.4)	41(16.6)

N=Number of respondents, MA=Mid altitude, HA=High altitude, LA=Low altitude, MT=Motta town

The percentage of respondents using smoking to kill bad microorganism in Motta town was higher than other study areas because of better awareness of respondents in proper handling of dairy products. In line with this Abebe *et al.* (2013) reported that the purpose of smoking was to improve the taste and flavor of milk products, to reduce bad microorganisms and to increase the shelf life of the product in Ezha district of Gurage zone. Fikireneh *et al.* (2012) also reported that 93.3% of respondents used smoking plants for better flavor and aroma of milk and milk products in mid rift valley of Ethiopia.

According to FGD participants, *Cheba* (*Acacia nilotica*), *Abalo* (*Combretum molle*), *Ader (Dichrostachys cinerea)*, *Asta, Kega* (*Rosa abissinica*) and *Woira* (*Olea Africana*) were the most commonly used smoking plants in the study area. In line with this finding, respondents in Kenya, Bahir Dar Zuria and Mecha district, Wolaita Zone and West Gojjam Zone used the same type of plants reported by Wayua *et al.* (2012), Eyasu and Asaminew (2014), Tsegaye and Gebreegziabhar (2015) and Melku (2016), respectively.

Using hot water for cleaning milk equipment was practiced in the present study by 56.7% of respondents (Table 3). Among the study areas, 91.3% of respondents in Motta town were used hot water for cleaning milk handling equipment than 57.4%, 50% and 47.5% of respondents in mid, high and low altitude areas, respectively. This is due to urban dairy farmers have better awareness than rural dairy farmers because of their access to various information sources. This result was lower than Haile *et al.* (2012) who reported that 85.6% of respondents were used hot water to clean milk handling equipment in Hawassa City. This is because Hawassa is an urban area the respondents have better awareness than the present study area. However, the present result was higher than the result reported by Tsegaye and Gebreegziabhar (2015) only 26.5% of respondents were used hot water in Wolaita Zone, respectively.

Table 3. Cleaning practice of milk and milk product handling equipment

Variables	Study Areas				
	Mid altitude (N=108) N(%)	High altitude N(76) N(%)	Low altitude (N=40) N(%)	Motta town (N=23) N(%)	Overall N(=247) N(%)
Do you use hot water					
Yes	62(57.4)	38(50)	19(47.5)	21(91.3)	140(56.7)
No	46(42.6)	38(50)	21(52.5)	2(8.7)	107(43.3)

N=Number of respondents

3.1.3. Equipment used for handling milk and milk products

Majority of respondents (86.6%) used gourd (*Lagenaria siceraria*) for milking but most of the respondents (95.7%) in Motta town and few respondents (9.3%) in mid altitude were used plastic material (Table 4). However, all of the respondents in mid and low altitude used gourd for milking purpose. This is because plastic equipment was easily accessible in urban and gourd is easily available from the back yard in rural areas than buying plastic equipment. In line with this result, Eyasu and Asaminew (2014) reported that 85.5% used gourd in Bahir Dar Zuria and Mecha district. On the other hand, the majority of respondents (85.8%) were used clay pot for churning fermented milk and the rest 14.2% of respondents used gourd. Gourd was mostly used in low altitude areas because the plant is mainly grown in this area but the majority of respondents (96.3%), (84.2%) and (95.7%) in mid altitude, high altitude and Motta town, respectively used clay pot. This result was disagreed with the result reported by Melku (2016) 73% and 27% of respondents used gourd and clay pot, respectively in rural areas of West Gojjam Zone. The difference might be due to the cultural trend of the people and access to the equipment.

Table 4. Equipment used for milking and fermented milk churning

Variables	Study areas				
	Mid altitude N=108 N(%)	High altitude N=76 N(%)	Low altitude N=40 N(%)	Motta town N=23 N(%)	Overall N=247 N(%)
Equipment for milking					
Plastic	10(9.3)	0(0)	0(0)	22(95.7)	32(13.4)
Gourd	98(88.9)	76(100)	40(100)	1(4.3	215(86.6)
Equipment for churning					
Clay pot	104(96.3)	64(84.2)	22(55)	22(95.7)	212(85.8)
Gourd	4(3.7)	12(15.8)	18(45)	1(4.3	35(14.2)

N=Number of respondents

Equipment utilized for handling of milk, butter and ghee is presented in (Table 5). The majority of respondents (63.2%) used clay pot for handling milk while the rest 13.7% and 23.1% used plastic and gourd. In mid and high altitude majority of respondents (68.5%) and (86.8%) used clay pot for milk handling while in low altitude and Motta town 62.5% and 82.6% of respondents used gourd and plastic equipment, respectively. The proportion of respondents that were used clay pot in this study was comparable to the report of Tsadkan (2012) 61.3% of respondents used clay pot in Enderta district. However, this result was lower than Menal and Yilkal (2015) who reported that 92.5% and 97% of respondents used clay pot in Chencha and Kutcha districts, respectively.

The result indicated in Motta town was the same to Teshome *et al.* (2014) and Fikrneh *et al.* (2012) who reported that 94.88% and 72% of respondents in Shashemene town and mid rift valley respectively used plastic material for milk handling. In addition, the result indicated in low altitude was in line with the study reported by Gatwech (2012) 60.3% of respondents in mixed crop livestock production system used gourd for handling milk in Gambella region. Contrary to this result, Rapheal *et al*. (2016) indicated that 45.2%, 49.3% and 5.5% of dairy farmers used plastic, aluminum and stainless steel equipment for handling milk in in Mbarara district of Uganda. This might be in Uganda the dairy farmers have better awareness and using clay pot and gourd might not be a culture of the people than the present study. The result indicates dairy farmers in the study area have no awareness in using the recommended milk handling equipment such as aluminum and stainless steel.

Gourd, plastic materials, stainless steels and *Agelgel* (It is traditional equipment made from grass) were used by 40.9%, 35.2%, 11.3% and 12.6% of respondents, respectively for butter storage. The majority of respondents (82.5%) in low altitude used gourd for butter storage but 52.2% in Motta town used plastic material. In high altitude, 34.3% of respondents used *Agelgel* for butter handling. This equipment was not used in other study areas for butter handling except 4.6% of respondents in mid altitude. The difference in equipment utilization in the study areas might be due to the accessibility of materials. The result was not the same with the report of Eyasu and Asaminew (2014) 56.2%, 33.1% and 10.6% of respondents used gourd, clay pot and plastic

equipment for butter storage in Bahirdar Zuria and Mecha districts.

Table 5. Milk and milk product handling equipment in the study area

Variables	Study Areas				
	Mid altitude (N=108) N(%)	High altitude (N=76) N(%)	Low altitude (N=40) N(%)	Motta town (N=23) N(%)	Overall (N=247) N(%)
Equipment for milk handling					
Clay pot	74(68.5)	66(86.8)	14(35.0)	2(8.7)	156(63.2)
Plastic	12(11.1)	2(2.6)	1(2.5)	19(82.6)	34(13.7)
Gourd	22(20.4)	8(10.5)	25(62.5)	2(8.7)	57(23.1)
Equipment for butter handling					
Gourd	42(38.9)	26(34.2)	33(82.5)	0(0)	101(40.9)
Plastic	53(49.1)	15(19.7)	7(17.5)	12(52.2)	87(35.2)
Stainless steel	8(7.4)	9(11.8)	0(0)	11(47.8)	28(11.3)
Agelgel	5(4.6)	26(34.3)	0(0)	0(0)	31(12.6)
Equipment for ghee handling					
Gourd	89(82.4)	67(88.2)	36(90)	5(21.7)	197(79.8)
Plastic	18(16.7)	9(11.8)	4(10)	6(26.1)	37(15.0)
Stainless steel	1(0.9)	0(0)	0(0)	12(52.2)	13(5.2)

N=Number of respondents

In case of ghee storage equipment, the majority of respondents (79.8%) in the study area used gourd. However, 52.2% and 26.1% of respondents in Motta town used stainless steel and plastic material, respectively than other study areas. The utilization of stainless steel material is only practiced by 52.5% of respondents in Motta town. The difference for this might be it is obvious that urban peoples have better awareness than rural areas in quality equipment utilization which is the same to the present study. Contrary to this result, Tsadkan (2012) reported that 56% of respondents in Enderta district used clay source material for storing ghee. In addition, the present result was not the same with Melku (2016) who reported that 43%, 27% and 30% of respondents used gourd, clay pot, and plastic material, respectively in rural areas of West Gojjam Zone. In general, milk and milk product handling equipment were almost traditional except some respondents in Motta town and equipment in this situation were suitable for the development of bad microorganism. The result indicates milk and milk product handling practices is not safe to keep the hygienic quality of milk and the respondents were not aware of appropriate milk handling practices.

3.2. Milk processing practices

Milk processing practices and the reason for milk processing is presented in (Table 6). All of the interviewed respondents were processed raw milk into various milk products. Based on information obtained from FGD participants and during field visit, before milk is processed into various products, it is stored in well prepared, cleaned and smoked equipment for at least four up to six days for making fermented milk. Fermented milk is the basis for production of different milk products. Ethiopian cottage cheese, butter, ghee, butter milk, whey and *metata ayib* (fermented cheese) were the most commonly processed milk products in the study area.

The reason for processing milk into various products in the study area was mainly to obtain diversified products reported by 76% of respondents. In high altitude and Motta town, 93.4% and 95.7% of respondents, respectively processed milk to obtain diversified products than 68.5% and 50% of respondents in mid and low altitude areas. Half of the respondents in low altitude processed milk to extend the shelf life of the product might be due to the area is hotter than other study areas which is suitable for growth of phatogenic bacteria as a result; they processed milk into various products. However, only few respondents in mid altitude and Motta town processed milk to extend the shelf life of the product might be the product is not quickly spoiled because in Motta town they handle milk hygienically and low ambient temperature in high altitude.

This result was the same with Tsegaye and Gebreegziabhar (2015) who reported that milk was processed to increase its shelf life, to add value, to have a variety of product and for all purposes reported by 11.2%, 14.2%, 24.6% and 45.5% of respondents in Wolaita Zone. This result was not the same with Fikrneh *et al.* (2012) who indicated that only 38.8% and 3.4% of respondents in mid rift valley Ethiopia processed milk to increase the shelf life and to diversify the products but the rest indicate for all purposes. In addition, Abebe *et al*. (2013) indicated that 93% of respondents in Ezha district of Gurage zone processed milk to extend its shelf life which is not the same with this result. The difference might be due to the preference of respondents, market availability, handling practice and ambient temperature of the area.

Table 6. Milk processing practices and reasons of milk processing

Variables	Study Areas				
	Mid altitude (N=108) N(%)	High altitude (N=76) N(%)	Low altitude (N=40) N(%)	Motta town (N=23) N(%)	Overall (N=247) N(%)
Do you process milk into different products					
Yes	108(100)	76(100)	40(100)	23(100)	247(100)
No	0(0)	0(0)	0(0)	0(0)	0(0)
Reasons for milk processing					
TISLP	34(31.5)	5(6.6)	20(50)	1(4.3)	60(24)
TGDP	74(68.5)	71(93.4)	20(50)	22(95.7)	187(76)

N=Number of respondents, TISLP=To increase the shelf life of the product, TGDP= To get diversified products

3.2.1. Butter making practice:

Traditional Churning was the only method to obtain different milk products in the study area. After milk is properly fermented for more than two days it is transferred in to churning equipment, stirred and churned in forward and back ward movement. During the process, the churning equipment is opened with in three to five minutes intervals especially for the first 30 minutes to remove the gas. Then it is chucked weather butter granules are formed or not and if enough size of butter granules are formed then it is collected and washed using cold water and the resulting product is called butter. The procedure of butter making was the same with Eyasu and Asaminew (2014), Amistu *et al.* (2016) and Bekele *et al.* (2016) in Bahirdar zuria and Mecha, Alle and Dangila districts, respectively. The amount of milk required for churning, time required for churning and butter obtained is presented in (Table 7). The overall churning time in the study area was 1.9±0.04 hours and it is significantly varied (P<0.05) among the study areas.

The highest churning time 2.5±0.19 hours was observed in Motta town while the lowest average churning time 1.5±0.12 hour was observed in low altitude area. The difference might be in Motta town milk churned at a time was higher than other study areas because of this longer time is required. But low churning time in low altitude areas might be due to the highest ambient temperature that aids to reduce churning time.

The amount of milk required for churning at a time in the study area was 7.0±0.12 liters and it is significantly varied (P<0.05) among the study areas. The average amount of fermented milk required (9.2±0.3 litters) in Motta town was higher than other study areas might be due to relatively high amount of milk was produced per day per household. Similar result was reported by Eyasu and Asaminew (2014) who reported that 7.5±1.8 litters was required for churning at a time in Bahirdar Zuria and Mecha districts. However, Bekele *et al.* (2016) in Dangila district reported that 25.14 litters of milk was required for churning at a time in Dangla district. This might be due to high amount of milk was produced per day in the household than the present study area. The overall average amount of butter obtained from one churning time in the study area was 0.27±0.01 kg from 7.0 liters milk (1kg butter from 25.64 liters milk). The result is not significantly varied (P>0.05) among study areas but slightly lower butter yield (0.23±0.02) was observed in Motta town might be due to the presence of more cross breed cattle which produce low fat content milk than local cattle. The amount of milk required to produce one kilogram of butter in this study was slightly higher than the result reported by Abebe *et al.* (2013) 22.3 liters in Ezha districts of Guragie Zone. However, it was higher than the result reported by Eyasu and Asaminew (2014), Bekele *et al.* (2016) and Melku (2016) 18.1, 17.46 and 20.19 liters in Bahirdar Zuria and Mecha districts, Dangla district and West Gojjam Zone, respectively. The difference might be due to breed, type of feed provided for the cow and the churning procedure.

Table 7. Milk required for churning, butter obtained and time required for churning

Variables	Study Areas					P-value
	MA Mean±SE	HA Mean±SE	LA Mean±SE	MT Mean±SE	Overall Mean±SE	
TRCFM (hour)	2.02±0.07^{b}	1.73±0.06^{c}	1.5±0.12^{d}	2.5±0.19^{a}	1.9±0.04	0.00
AMRC (litter)	7±0.2^{b}	7.2±0.2^{b}	5.8±0.2^{c}	9.2±0.3^{a}	7.0±0.12	0.00
ABOFOCT (kg)	0.27±0.02^{a}	0.29±0.01^{a}	0.28±0.02^{a}	0.23±0.02^{a}	0.27±0.01	0.288

N=Number of respondents, MA=Mid altitude, HA High altitude, LA=Low altitude, MT=Motta town, SE=Standard error, TRCFM=Time required for churning fermented milk, AMRC=Amount of milk required for churning, ABOFOCT=Amount of butter obtained from one churning time, Means with different superscript letters within the same row are different at 5% level of significance

As indicated in table 8, 46.5% of respondents in the study area churned milk two times a week and it is significantly varied (P<0.05) among the study areas. In Motta town 82.6% of respondents churned once in two weeks while in mid altitude 60.2% of respondents processed two times a week and 56.6% and 69.5% respondents in high and low altitude areas processed once a week, respectively. Low frequencies of churning

milk in Motta town than other study areas might be due to most of the respondents were participated in fresh milk marketing. The result indicates frequency of churning is reduced if the farmer participated in fresh milk selling which aids to reduce loose of time that used for other dairy farming activities.

Table 8. Frequency of churning fermented milk in the study area

Variables	Study Areas					P-Value
	MA (N=108) N(%)	HA (N=76) N(%)	LA (N=40) N(%)	MT (N=23) N(%)	Overall (N=247) N(%)	
Two times a week	65(60.2)	33(43.4)	13(30.5)	4(17.4)	115(46.5)	χ^2 =56.78, P=0.05
Once in a week	42(38.9)	43(56.6)	27(69.5)	0(0)	112(45.3)	
Once in two weeks	1(0.9)	0(0)	0(0)	19(82.6)	20(8.2)	

N=Number of respondents, MA=Mid altitude, HA High altitude, LA=Low altitude, MT=Motta town

3.2.2. Ghee making practice in the study area:

Ghee making practice and frequency of ghee making is presented in (Table 9). Ghee (*Niter Kibe*) was produced and processed by 100% of respondents in the study area. Ghee making is conducted after butter is separated from butter milk using various spices. According to FGD participants, the most common spices used for the preparation of ghee were corarima (*Aframomum corrorima*), *zingible* (*Zingiber officinalis*), *abish* (*Trigonela fenum*), *tikur azmud* (*Nigella sativa*), *kerefa* (*Cinnamomum zeylanicum*), *zekakibe* (*Ocimum basilium*), turmeric (*Curcuma domestica*) and garlic (*Allium sativum*). During the processes butter is boiled in an open fire until the moisture is evaporated and clear liquid is remained. Then finely grounded spices are added and stirred until it is mixed uniformly. Then the product is stored in clean equipment and can be stored for several months. The presence of different spices makes good flavor of the products and helps to increase the shelf life. The same result also reported by Belay and Jansen (2014), Eyasu and Asaminew (2014), Alganesh and Yetenayet (2017) in Jima town, Bahr Dar Zuria and Mecha district and in Ethiopia. Relatively the highest proportions (44.5%) of respondents in the study area prepared ghee once in two months. The frequency of producing ghee is significantly varied (χ^2 = 84.79, P<0.05) among the study areas. Majority of respondents 53.9% and 56.5% in high altitude areas and Motta town, respectively prepared ghee once in two months and once in three months, respectively. Difference in frequency of ghee making might be due to economic status of households and amount of butter produced.

Table 9. Ghee making practice and frequency of ghee making

Variables	Study Areas				
	MA (N=108) N(%)	HA (N=108) N(%)	LA (N=108) N(%)	MT (N=108) N(%)	Overall (N=108) N(%)
Processing butter into ghee					
Yes	108(100)	76(100)	40(100)	23(100)	247(100)
No	0(0)	0(0)	0(0)	0(0)	0(0)
Frequency of ghee making					
Once in a week	18(16.7)	2(2.6)	0(0)	0(0)	20(8.1)
Once in a month	41(38.0)	18(23.7)	5(12.5)	7(30.4)	71(28.7)
Once in two months	49(45.4)	41(53.9)	17(42.5)	3(13.0)	110(44.5)
Once in three months	0(0)	15(19.7)	18(45.0)	13(56.5)	46(18.6)

N=Number of respondents, MA=Mid altitude, HA=High altitude, LA=Low altitude, MT=Motta town

3.2.3. Production of metata ayib:

From the overall interviewed respondents only 36% were practiced in *metata ayib* processing (Table 10). Majority of respondents (52.2%) in Motta town practiced in *metata ayib* making than other study areas might be they have better awareness in processing procedure and also efficient resource utilization. According to respondents, during *metata ayib* preparation, butter milk (*Arrera*) is heated in an open fire and placed on steel or clay pot material. Then cheese and whey were separated and the curd was reserved and drained in a container. Then mustard (*Coriandrum sativum*) locally called *senafich* was added if the product is not enough to complete the preparation at one time which aids to prevent spoilage until enough product is collected. If additional product is needed another batch is separated from whey following the above procedure and drained completely by inverting the opening of the container towards the ground. After enough amount of the product is collected and completely drained it is mixed with different species like listed in ghee making. Then it is added in to clay pot or gourd and sealed and stored for more than three weeks for proper fermentation. At this stage, it is ready for consumption in different traditional dishes.

However, as respondents indicated, metata ayib can be consumed before fermentation but the taste and flavor of the product is not better than fermented metata ayib and if the product is to store for several months it is

prepared in dried form without fermentation processes. In dried *metata ayib* making, after cheese is collected and drained like the above procedure, drying is takes place by putting the product in flat equipment or on a mat under the shade during the day time and inside the house during night time. For consumption, fresh milk, butter milk and metata ayib is mixed using hand for three up to five minutes, and then it is ready for use. Depending on the producers preference some farmers pelleted the product and others made finely ground *metata ayib*. Then after it was completely dried it was kept in dried container. *Metata ayib* was made during fasting season of the Ethiopian Orthodox Church followers mainly during the fasting of the lent (A*biy tsome*), when surplus milk product is produced. *Metata ayib* making practice was more or less the same with (Eyasu and Asaminew, 2014; Melku, 2016).

Table 2. Processing practices of metata ayib in the study area

Variable	Study Areas				
	Mid altitude (N=108) N(%)	High altitude (N=76) N(%)	Low altitude (N=40) N(%)	Motta town (N=23) N(%)	Overall (N=247) N(%)
Do you process metata ayib					
Yes	34(31.5)	29(38.2)	14(35.0)	12(52.2)	89(36.0)
No	74(68.5)	47(61.8)	26(65.0)	11(47.8)	158(64.0)

N=Number of respondents, MA=Mid Altitude, HA=High Altitude, LA=Low Altitude, MT=Motta town

3.2.4. Shelf life of ghee, butter and metata ayib:

The average storage length of butter, ghee and *metata ayib* is presented in (Table 12). The overall average shelf life of butter was 43±1.78 days in the study area and it is significantly varied (P<0.05) among the study areas. In high altitude, butter was stored for 57.33±3.57 days than 24.5±1.78 days in low altitude areas. This variation might be in low altitude, due to the presence of high temperature butter can be spoiled easily and shorten the shelf life. On the other hand, the average shelf life of ghee was 2.3±0.11 years and it is not significantly varied (P>0.05) among the study areas.

According to FGD participants, ghee could be stored up to ten years depending on the quality of the processing procedure. The participants also indicated that aged ghee was used to cure different human diseases like chronic malaria and stomach upset. The result was the same with Adebabay (2009) who indicated that ghee is used to cure disease locally called *Mitch* in Burie district. The shelf life of butter and ghee in this study was higher than the report of Adebabay (2009) and Kefyalew *et al.* (2016) 21.7 days and six to seven months in Burie and Dawa Chefa district, respectively. The average shelf life of *metata ayib* in the study area was 5.8±0.6 months and it significantly varied (P<0.05) among the study areas. The highest shelf life was 11.7±2.4 months in Motta town might be the producers have better awareness than other study areas. The result indicates this product can aid to save loss of butter milk during fasting season.

Table 3. Storage length of butter, ghee and Metata ayib in the study area

Variables	Study Areas					P value
	MA Mean±SE	HA Mean±SE	LA Mean±SE	MT Mean±SE	Overall Mean±SE	
BSL (days)	42.6±2.6^{b}	57.33±3.6^{a}	24.5±1.78^{c}	30.78±2.4^{bc}	43.10±1.8	0.00
GSL (Years)	2.05±0.18^{a}	2.34±0.17^{a}	2.55±0.3^{a}	3.0±0.3^{a}	2.30±0.1	0.076
MASL (M)	4.41±0.80^{b}	4.45±0.57^{b}	7.36±1.1^{b}	11.7±2.4^{a}	5.85±0.6	0.00

MA=Mid altitude, HA=High altitude, LA=Low altitude, MT=Motta town, BSL=Butter storage length, GSL=Ghee storage length, MASL=Metata ayib storage length, M=Month

3.3. Milk and Milk Products Utilization and Consumption Pattern

As indicated figure 1, the overall average amount of milk produced per household per day was 2.6±0.14 liters and it is significantly varied (P<0.05) among the study areas. The highest amount of milk produced per day per HH was observed in Motta town (5.6±0.94 litters) while the lowest amount of milk produced was 1.7±0.14 liters in low altitude. This variation might be in Motta town the dairy cattle were mostly cross breed as a result, more milk was produced per day per HH. The result is comparable to Belete *et al.* (2010) who indicated that 2.76 liters milk was produced per day per HH in Fogera district.

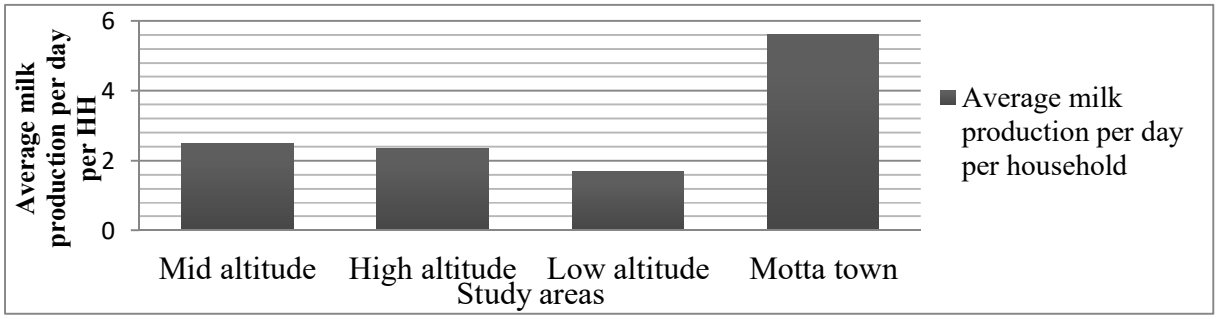

Figure 1. Daily milk produced per household per day in the study area

The proportion of milk spent for processing, marketing and consumption is presented in (Figure 6). The overall proportion of milk spent for marketing, home consumption and processing in the study areas was 18%, 4% and 78%, respectively per day per household. The highest proportion 94%, 95.5% and 89.9% of milk in mid, high and low altitude areas, respectively was used for processing in to different milk products. However, in Motta town only 23.8% of the total milk produced per day per household was utilized for processing in to different milk products. The difference is due to market availability for milk and milk products because respondents in rural areas have only butter market as a result, they processed milk to obtain butter for market. The result reported in the three agro ecologies was the same with Lemma and Mekonnen (2015) majority of milk was spent for processing in Boset, Ada and Gimbichu districts of East Shoa Zone. This result was higher than Belete *et al.* (2010) and Misgana *et al.* (2015) who reported that 66.3% and 64.7% of milk was processed in to butter in Fogera district and East Wollega Zone, respectively. The milk spent for home consumption in this study was lower than the result indicated by CSA (2016) 42.38%, 32.82%, 31.76% at the national level, in Amhara region and in East Gojjam Zone, respectively.

As indicated in figure 2, the proportion of milk spent for marketing was very low. In Motta town 64.7% of the total milk produced per day per HH was used for marketing. However in mid and low altitude areas only 3.8% and 1.8% of the total milk produced per day per HH was spent for marketing, respectively and in high altitude areas there is no milk marketing at all. This low participation in milk marketing is mainly due to market inaccessibility and cultural restriction. The overall milk spent for marketing in this study was higher than the report of CSA (2016) 6.2% at the national level and strongly higher than 0.42% and 0.23% in Amhara region and East Gojjam Zone, respectively. However it was lower than the result reported by Kitaw *et al.* (2012), Josephine (2014) and Misgana *et al.* (2015) 68%, 70% and 24.8% of the total milk produced per day was sold in Wolmera district, Tanzania and Guto Gida and Leka Dullacha districts, respectively.

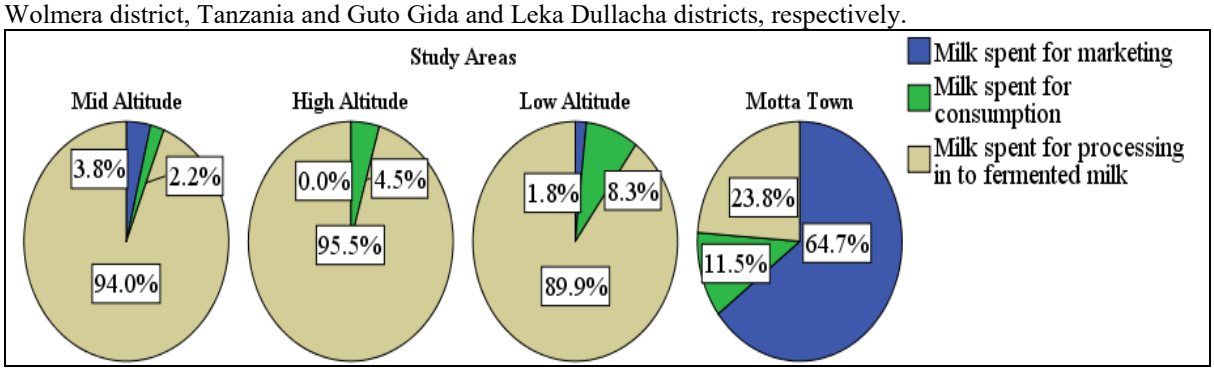

Figure 2. Milk utilization pattern in the study area

The proportion of butter utilized for home consumption, marketing and used for gift is presented in (Figure 3). The overall proportion of butter spent for home consumption, marketing and utilized for gift in the study area was 50.2%, 49% and 0.8%, respectively. The highest proportion of butter 64.4% and 68.4% in mid and high altitude areas was spent for marketing because the only marketable dairy product was butter in these areas. However in Motta town the highest proportion 85.7% of butter was spent for home consumption due to majority of them were participated in fresh milk marketing. The differences observed in the study areas might be due to the accessibility of market for milk and milk products. Butter used in home in the study area was used for ghee making and cosmetics. In the study area all respondents were used butter for cosmetics purpose. According to the respondents, butter as a hair ointment was used to cure headache and also to keep the healthiness of their eyes.

The proportion of butter spent for marketing in this study was higher than the result reported by CSA (2016) 38.1%, 36.1% and 22.6% at the national level, in Amhara region and in East Gojjam Zone, respectively. In addition, butter spent for marketing in this study was higher than the finding of Lemma and Mekonnen (2015)

29.2%, 17% and 25.5% of the total produced butter was spent for marketing in Boset, Ada and Gimbichu districts of East Shoa Zone, respectively. This might be due to the producers were participated in raw milk marketing because milk marketing is not a problem in this zone as studied by (Kasahun, 2014).

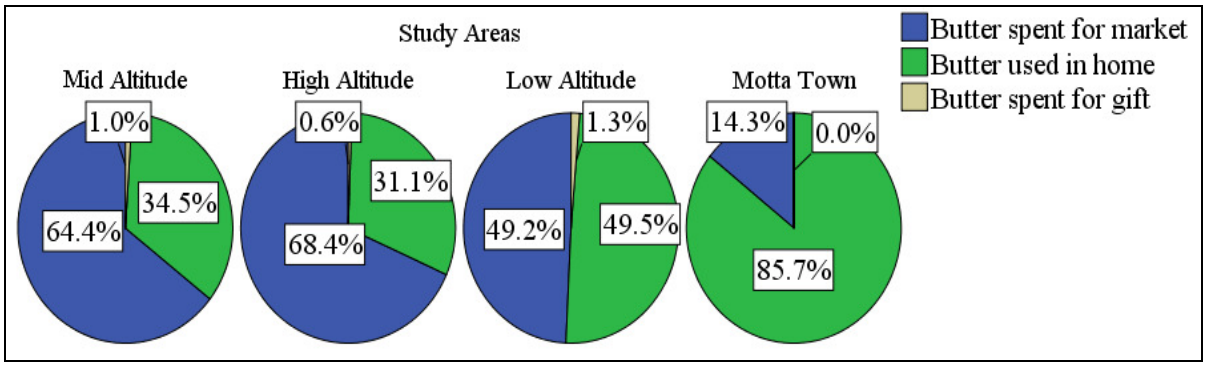

Figure 3. Butter utilization practice in the study area

The consumption pattern of milk and milk products by family members in the study area is presented in (Table 13). Whole milk, fermented milk and ghee were consumed mainly by all the family members reported by 84.3%, 91.1% and 92.3% of respondents, respectively. However, whey (*Aguat*) was consumed mostly by children reported by 68.8% of respondents and the rest 31.2% of respondents indicated that whey was consumed by all the family members. In Motta town, all milk products were consumed by all family members than mid, high and low attitude areas might be due to enough milk is available in the areas. In other study areas, few respondents indicated that milk was consumed by children and fermented milk (*ergo*) was consumed by only husband and wife. This might be due to scarcity of milk and the intention of respondents to processes milk for obtaining diversified products instead of consuming fresh milk alone. Low consumption of raw milk in the study area helps to reduce disease caused by consuming raw milk.

Table 4. Milk and milk products consumption practice in the household in the study area

Variables	Study Areas				
	MA N(%)	HA N(%)	LA N(%)	MT N(%)	Overall N(%)
Milk consumer	N=108	N=76	N=40	N=23	N= 247
Only children	17(15.7)	16(21)	6(15)	0(0)	39(15.7)
Family	91(84.3)	60(79)	34(85)	23(100)	208(84.3)
***Ergo* consumer**	N=108	N=76	N=40	N=23	N=247
Family	96(88.9)	73(96.1)	33(82.5)	23(100)	225(91.1)
Only husband and wife	12(11.1)	3(3.9)	7(17.5)	0(0)	22(8.9)
Ghee consumer	N=108	N=76	N=40	23	N=247
Family	100(92.6)	66(86.8)	39(97.5)	23(100)	228(92.3)
Only husband and wife	8(7.4)	10(13.2)	1(2.5)	0(0)	19(7.7)
Whey consumer	N=48	N=63	N=25	N=3	N=138
Only children	41(85)	39(61.9)	14(56)	2(67)	96(68.8)
Family	7(15)	24(38.1)	11(44)	1(25)	43(31.2)

N= Number of respondents, MA=Mid altitude, HA=High altitude, LA=Low altitude, MT=Motta town

Consumption of whey in the study area was only reported by 55.9% of respondents and the rest 29.1% and 15% of respondents give whey for calf and for all animals, respectively. However, majority of respondents (82.9%) and (62.5%) in high and low altitude areas utilized whey for consumption (Table 14). This might be due to the trend of the respondents as well as scarcity of other dairy products in the household. Majority of respondents (76%) reported that whey was not consumed due to its low nutritional value and only 24% of respondents were not consumed whey due to the presence of other dairy products. The result indicates low awareness of respondents about the importance of whey for human consumption. The same to this result Eyasu and Asaminew (2015) and Melku (2016) indicated that whey was used for calf feed and human consumption in west Gojjam Zone.

Table 5. Whey consumption practices in the study area

Variables	MA N(%)	HA N(%)	LA N(%)	MT N(%)	Overall N(%)
Purpose of whey	N=108	N=76	N=40	N=23	N=247
For consumption	48(43.5)	63(82.9)	25(62.5)	3(13.0)	139(55.9)
Given to calf	44(40.8)	5(6.6)	13(32.5)	10(43.5)	72(29.1)
Given to all animals	16(15.7)	8(10.5)	2(5.0)	10(43.5)	36(15.0)
Why do not consume whey	N=60	N=13	N=15	N=20	N=108
It hasn't food value	43(71.6)	8(61.5)	13(86.7)	18(90.0)	82(76)
Due to other extra product	17(28.3)	5(38.5)	2(13.3)	2(10.0)	26(24)

N=Number of respondents, MA=Mid altitude, HA=High altitude, LA=Low altitude, MT=Motta town

3.4. Milk and Milk Products Marketing System

Marketing of milk and milk products in the study area was practiced almost through informal marketing system. Milk marketing was completely informal and very few traders practiced formal butter marketing. Fresh milk and butter were the only marketable dairy products in the study area. This result was in line with Belay and Jassen (2014), Tsegaye and Gebreegziabhar (2015) and Kassa and Dekamo (2016) who reported that milk and butter were the main marketable dairy product in Jimma town, Wolaita and Sheka and Keffa Zone, respectively.

3.4.1. Marketing of whole milk

Marketing practice of milk, reason for not selling milk and kind of customers for milk in the study area is presented in (Table 15). The majority of respondents (86.2%) do not practiced milk marketing. In high and low altitude areas milk marketing was absent due to cultural restriction and absence of milk buyers. In mid altitude areas only 12% of respondents participated in milk marketing however, in Motta town 87% of respondents participated in milk marketing. This difference is due to in Motta town there is milk market demand and absence of cultural restrictions.

In line with this result, Abebe *et al.* (2013) and Amistu *et al.* (2016) reported that 100% of respondents do not sold milk in Ezha districts of Guragie Zone and Alle district of Segen Zone, respectively. However, milk marketing practice in this study was lower than the study indicated by Menal and Yilkal (2015) 30.83% in Chencha districts and comparable to 12.78% in Kutcha district. Moreover, the result was also lower than Zewdie (2010), Hanfer *et al.* (2016) and Melku (2016) who reported that 90%, 50% and 48.3% of respondents in Sebeta town, Asayita district and West Gojjam Zone practiced fresh milk marketing. This might be due to absence of cultural restriction in these areas and availability of market.

As indicated in table 15, the majority of respondents (53.1%) in the study area replied that the reason for not selling milk was due to the absence of milk buyers but the reason of 39.9% and 7% of respondents were due to cultural taboo and lack of surplus milk for sale, respectively. The result is significantly varied (χ^2=146.9, P<0.05) among the study areas. About 61.5% of respondents in low altitude indicated that the reason for not selling milk was due to cultural restriction. However, in mid and high altitude absence of milk buyers was the main reason reported by 61% and 53% of respondents, respectively. In agreement with this, Zewudie (2010) and Abebe *et al.* (2013) reported that marketing of fresh milk is not common due to cultural restriction and due to scarcity of milk and lack of market in and around Zeway town, Oromia region and Ezha district.

The result indicated that in mid and high altitude if the producers have access to market they are willing to sale milk which is important for the development of the dairy sector but low awareness in low altitude is still a problem. As presented in table 45, 79.4%, 8.82% and 11.8% of respondents sold milk for consumers, milk cooperatives and for cafeterias. Few respondents in mid altitude sold milk for cafeterias found in Motta town and in their nearby small towns. Milk sold to milk cooperatives in this study was very limited due to the weak status of milk cooperatives. In Motta town only 15% of respondents were sold milk for milk cooperatives.

Table 6. Milk marketing practice in the study area

Variables	Study areas				
	MA (N=108) N(%)	HA N=76) N(%)	LA (N=40) N(%)	MT (N=23) N(%)	Overall (N=247) N(%)
Milk marketing practice					
Yes	13(12)	0(0)	1(2.5)	20(87)	34(13.8)
No	95(88)	76(100)	39(97.5)	3(13)	213(86.2)
Reason for not selling milk					
Cultural taboo	28(29.5)	33(43.4)	24(61.5)	0(0)	85(39.9)
Absence of buyer	58(61.0)	42(55.3)	13(33.3)	0(0)	113(53.1)
No surpluses milk	9(9.5)	1(1.3)	2(5.2)	3(100)	15(7)
Kind of customers for milk					
Consumer	10(77)	0(0)	1(100)	16(80)	27(79.4)
Milk cooperative	0(0)	0(0)	0(0)	3(15)	3(8.82)
For café	3(23)	0(0)	0(0)	1(4.3)	4(11.8)
Price of milk (Mean±SE)	9.7±0.5	0.0±0.	12±0.0	12.3±0.35	11.3±0.35

N=Number of respondents, SE=Standard error, MA=Mid altitude, HA=mid altitude, LA=Mid altitude, MT=Motta town

According to key informants, in Motta town there are two milk cooperatives (Lamie bora and Yenat tut milk cooperatives). As, they indicated, in the previous time, both cooperatives were actively participated by collecting milk from Motta town and from rural areas. However, during the study time yenta tut milk cooperative was completely ceased and Lamie Bora also found in a very weak stand might be due to lack of market motivation and advices from the government body. This condition might discourage the dairy producer from engaging in market oriented dairy cattle production.

As it was seen during field visit and information obtained from FGD participants in rural areas milk was sold by transporting in to the customers house, however in Motta town except milk sold for milk cooperatives and cafeterias, all of the respondents sold milk in their farm gate.

This result was not the same with Adebabay (2009) who reported that 48.3%, 6.9% and 44.8% of respondents were sold milk for consumers, traders and cooperatives.

The average price of milk in the study area was 11.3±0.35 ETB per litter (Table 15). The average price of milk in mid altitude areas 9.7±0.5 ETB per litter was lower than Motta town 12.3±0.35 ETB might be due to lack of milk buyers in rural areas because of this producers sold milk with lowest price. The result was higher than the report of Belay and Janssen (2014) 6.98 ETB and Kasahun *et al*. (2014) 8 ETB in Keffa and East Shoa Zone, respectively but it was lower than Kassa and Dekamo (2016) 14.03 ETB per litter in Sheka Zone. Price variation might be due to time difference and market accessibility.

3.4.2. Butter marketing

Butter marketing practices in the present study is indicated in (Table 16). The majority (86%) of respondents in the study area were involved in butter marketing. However, in Motta town only 26.1% of respondents participated in butter marketing might be due to respondents were participated mainly in milk marketing. The result was in line with Menal and Yilkal (2015) who reported that 90.98% of respondents sold butter in Kutcha district but higher than Zewudie (2010) and Abebe *et al*. (2013) only 56% and 60% of respondents sold butter in and around Zeway town and Ezha district.

Butter marketing in the present study was mostly performed in market places reported by 86.4% of respondents but 8.5% and 5.2% replied that butter was sold around homesteads for consumers and both around homestead and market place, respectively (Table 16). All of respondents in Motta town sold butter in market place might be due to their proximity to market places and they might fetched better price when they sold in market place than selling around homesteads. In line with this, Adebabay (2009) reported that 83.4% of respondents sold butter in market place. The kind of butter buyers in the present study was consumers, traders and both consumers and traders reported by 25.4%, 35.2% and 39.4% of respondents, respectively (Table 16). The result is significantly varied (χ^2 =128.8, P<0.05) among the study areas. In low altitude areas majority of respondents (58.1%) replied that butter was sold for consumers while in mid and high altitude areas butter was sold for both consumers and traders and for traders reported by 50% and 55.6% of respondents, respectively. The highest percentage of respondents in low altitude that sold butter for consumers might be they are liked by consumers because the butter is expected to be free from adulteration. The same with this idea, Key informants indicated that dairy farmers found relatively far from Motta town such as low and high altitudes were sold pure butter. This result was same with Tsegaye and Gebreegziabhar (2015) who reported that 41.9%, 13.3%, 2.9% and 41% of respondents sold milk for consumers, retailers, cooperatives and both consumers and retailers, respectively in Wolaita Zone.

The amount of butter sold per household per month and price of butter is presented in (Table 17). The average amount of butter sold per month per household was 1.4±0.05 kg and it is significantly varied (P<0.05) among the study areas. The highest amount of butter sold per month was in mid altitude (1.36±0.07 kg) while the lowest was in Motta town (0.26±0.01 kg) but there is no significance difference between the three agro ecologies. The difference might be in Motta town most of the respondent have access to raw milk market.

As indicated in table 17, the overall average price of butter in the present study was 125.02±0.8 ETB/kg. The result is significantly varied (P<0.05) among the study areas. The highest butter price was reported in Motta town (140±0.11 ETB/kg) than other study areas. The lowest butter price was (122.5 ETB/kg) in high altitude but there is no significant difference between the three agro ecologies. High butter price in Motta town might be due to they sold when there is high butter price time. On the other hand low butter price in high altitude might be due to distance to market. The result was higher than the report of Kasahun *et al*. (2014), Kassa and Dekamo (2016) and Amistu *et al.* (2016) 100, 93 and 110 ETB/kg in East Shoa Zone, Keffa and Sheka Zone and Alle districts of southern Ethiopia, respectively. This result was also lower than the finding of Menal and Yilkal (2015) and Tsegaye and Gebreegziabhar (2015) 130 and 134.5 ETB/kg in Chencha district and Wolaita Zone.

However, this result was comparable to the result of Menal and Yilkal (2015) and Melku (2016) 125 and 123 ETB/kg in Kutcha district and West Gojjam Zone, respectively. This is due to the price of butter is varied according to season of the year (wet season is cheaper than dry season), holidays and in every year when the price of other economic activities is increased.

Table 16. Butter marketing system

Variables	Study Areas				
	Mid altitude N(%)	High altitude N(%)	Low altitude N(%)	Motta town N9%)	Overall N(%)
Butter marketing	N=108	N=76	N=40	N=23	N=247
Yes	104(96)	72(95)	31(77.5)	6(26)	213(86)
No	4(4)	4(5)	9(22.5)	17(74)	34(14)
Place of butter sale	N=104	N=72	N=31	N=6	N=213
Around homestead	9(8.7)	4(5.6)	5(16.1)	0(0)	18(8.5)
Market place	91(87.5)	64(88.9)	23(74.2)	6(100)	184(86.4)
Both	4(3.8)	4(5.6)	3(9.7)	0(0)	11(5.2)
Kind of buyers	N=104	N=72	N=31	N=6	N=213
Consumers	26(25)	10(13.9)	18(58.1)	0(0)	54(25.4)
Traders	26(25)	40(55.6)	3(9.7)	6(100)	75(35.2)
Both	52(50)	22(30.6)	10(32.3)	0(0)	84(39.4)

N=Number of respondents, MA= Mid altitude, HA=High altitude, LA=Low altitude, MT=Motta town,

Table 7. Amount of butter sold per month and price of butter

Variables	Mid altitude Mean±SE	High altitude Mean±SE	Low altitude Mean±SE	Motta town Mean±SE	Overall Mean±SE	P value
ABSM(kg)	1.36±0.07^{a}	1.1±0.08^{a}	1.3±0.23^{a}	0.26±0.01^{b}	1.4±0.05	0.00
PB(kg)	124.9±0.8^{b}	122.5±1.01^{b}	128±4.2^{b}	140±0.11^{a}	125.02±0.8	0.001

N=Number of respondents, ABSM=Amount of butter sold per month, PB(Kg)=Price of butter per kilogram, SE=Standard error, Means with different superscript letters with in the same row are different at 5% level of significant

The main butter marketing channels observed in the study area is presented in (Figure 4). Producer to consumer through itinerant traders was the most commonly practiced butter marketing channel in the study area. FGD agreed that butter selling to consumers was better than either big traders or itinerant traders and butter selling to itinerant traders was the last choice. Because these traders have no measuring balance, marketing was by volume of butter only in a lowest price than consumers and big traders and if they have measuring balance they were not properly used. Butter marketing through producer to big traders and consumers was arrived up to Addis Ababa, Bahir Dar and other market areas.

In general, as it was seen during field visit in different market places, majority of respondents sold butter without measuring balance. The result indicates marketing of butter was still very traditional and selling butter through this method might reduce the farmers benefit. Butter marketing channels in this study was the same with the result reported by Adebabay (2009) and Azage *et al*. (2013) in Burie and Metema district. However, the marketing channels in Metema district includes export market to Sudan.

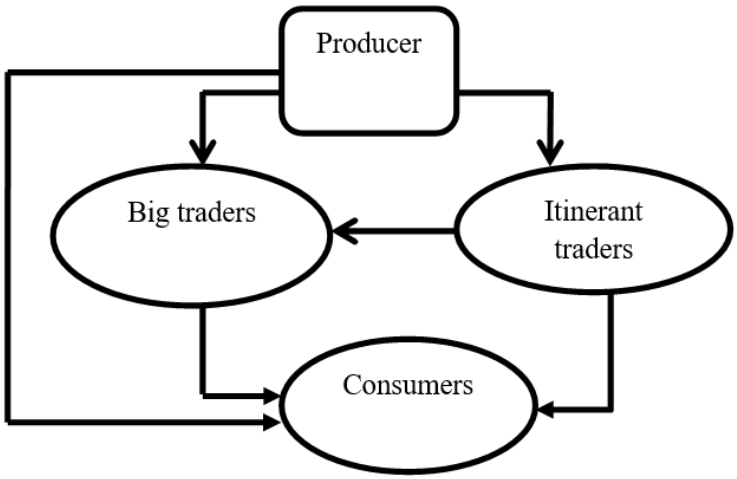

Figure 2. Flow diagram of butter marketing channels in the study area

4. CONCLUSION AND RECOMMENDATIONS

In the study area milking practices was in a traditional system in most of the respondents and washing the udder of the cow the cow was not a common practice. However smoking milk handling equipment is practiced by all of the respondents mainly to improve the flavor of milk and milk products. Gourd (*Lagenaria siceraria*) and clay pot were the most commonly milk handling equipment in the study area. However utilization of stainless steel equipment was very limited except few respondents in Motta town., Fresh milk was processed to obtain various traditional dairy products such as fermented milk, butter, cheese, ghee and *metata ayib* (fermented cheese) in the study area. *Metata ayib* was less commonly processed dairy product made from cheese using various spices but only processed by limited respondents. Both milk and butter were sold through informal marketing systems however, except Motta town butter fresh marketing was limited in other study areas due to cultural restrictions and absence of milk buyers. In general the handling, utilization, processing and marketing practices of milk and milk products was not well developed in the study areas. Therefore, to improve the dairy sector and to utilize dairy products efficiently the following recommendations were forwarded.

- Changing the attitude of the farmers through training and other mechanisms should be done to improve the handling practices of milk and milk products and to avoid cultural restriction in milk marketing mainly in rural areas. On the other hand, establishing strong dairy cooperatives should be done.
- Initiating the farmers to produce *metata ayib* can be used as a measure to overcome losses of butter milk during the fasting season of Orthodox Union Church followers. In addition, the nutritive value and other characterstics of *metata ayib* and other traditional dairy products such as ghee should also be studied.
- Improving the farmers attitude about the nutritional importance of milk and milk products helps to motivate milk marketing in rural areas.

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