

Assessment of Camel Milk Marketing Chain and Its Practices in Somali Regional State, Ethiopia

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Abstract

The study was conducted with aim of assessing milk marketing chain and its practice in Somali regional state of two selected zones. The research was applied both quantitative and qualitative methods to clarify concepts, characteristics, descriptions, counts. Data presented in the study are obtained from primary and secondary sources. Sample was taken from 10 purposely selected Kebeles (from two Woredas). Data was collected from 200 eligible households, 100 households from each Woredas, using questionnaires. Two (2) Focus Group Discussions (FGDs) [one from each woreda] and two (2) Key Informant Interviews (KIIs) from each woreda were conducted. The quantitative data from the household (HH) survey were analysed using simple descriptive analysis (statistics) like, frequency, percentages, mean value and standard deviation by using SPSS 23.0 and Microsoft Excel. The survey result revealed that the most of the respondents were Semi pastoralist that accounts 155(77.5%), while pure pastoralist were 45(22.5%). number of small ruminants along with camel; i.e., head per household were higher than other large ruminants with mean of 10.69±8.147 camel and 19.51±21.39 of Goat, 5.47±9.803 sheep, 4.97±6.641 cattle, 0.2±0.283 poultry and 1.33±1.488 donkey respectively possessed. Majority 189(94.5%) of the respondents milk their camel two times (morning and evening), 3(1.5%) said milking three times (Morning, midday and evening) and 8(4.0%) said one time (morning) per day. As the survey result revealed, on the average each camel milked per day in wet season (4.58 ± 3.889) liters and on the dry season (2.45±1.955) liters. The main constraints in camel production in the area are; shortage of forage and water scarcity, disease and parasites, high medicament cost, low productivity of grazing land, inadequate access to extension services and services, and unavailability of credit services. Interviewed respondents far away from nearest market about 1-5km, 30 (15.0%), 5-10km 55 (27.5%), 10-15km 76 (38.0%) and above 15km 39(19.5%) respectively. Camel milk is means of income especially for the pastoralist community. Therefore, it plays great economic contribution for pastoralist households. Based on the present finding shows camel milk is source of income and food. In the study areas the average camel milk production per day depends on the seasons and availability of feed and water. Government and other stallholder should play their role in solving the problems related to camel milk marketing and value chain.

Key words: Camel, camel milk, marketing, value chain, pastoralism, Somali region.

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I. Introduction

Ethiopia has diversified topographic conditions with altitudes ranging from extremes of 4500 m above sea level in the Semen Mountains to areas 100m below sea level in the Danakil depression. Within this diversity, climatic conditions vary from arid, tropical, and sub-tropical to temperate conditions. Ethiopia has Africa's largest livestock population by which over 60% of its land area is semi-arid lowland, dominated by a livestock economy (Rota, 2009; ANRS, 2010). In situations where rainfall is scarce and unpredictable, pastoralism is a more appropriate livelihood strategy than rain-fed agriculture (Hatfield and Davies, 2006; SOS-Sahel Ethiopia, 2007; Raziq et al., 2008; Gwida, 2010).

Camels play diverse roles in livelihood of the poor pastoralists, including the building of assets, insurance against unexpected events; have spiritual and social values, traction and movement of goods, food

supply and income (Ali et al., 2004; SOS Sahel-Ethiopia, 2007). Pastoralists own all the 3 million camel populations in Ethiopia supporting more than 10 million pastoralist population (Bekele et al., 2002; Tezera et al., 2010). Camels are extremely important livestock species in the arid and semiarid zones and contribute significantly to the livelihood of the pastoralists and agro-pastoralists living in the fragile environments (Abbas et al., 2000; Tura et al., 2010).

Milk plays a very important role in feeding the pastoral and agro-pastoral and urban population of Ethiopia and has high nutritional value. Milk and milk products are produced daily and sold for cash or processed. It is a source of cash in the milk shed areas that enables families to buy other foodstuffs, significantly contributing to the household food security (MOA, 2001). However, the Ethiopian milk marketing system is not well developed (Holloway et al., 2002; CSA, 2005; and Woldemichael, 2008). This is reflected where only 5% of milk produced in rural areas is marketed as liquid milk. This has resulted in difficulties of marketing fresh milk where infrastructure in transport and related services are extremely limited and market channels have not been developed (Getachew, 2003).

In many instances, policy decisions on livestock product marketing in the country seem to be taken in the absence of vital information as a result of disaggregated database by the lowland and highland farming systems leading failure to properly inform policy makers to design appropriate national level livestock development strategies and policies (FAO, 2012).

According to Schwartz (1992) the camel (*Camelus dromedarius*, one humped camel) is an important livestock species uniquely adapted to hot and arid environments and mainly kept by migratory pastoralists in subsistence production systems with emphasis on milk production. Due to urbanization the camel has undergone a change of image from ship of the desert to food security animal hence the need to put to full use its milk production capabilities through better management practices.

Camel milk is one of the basic sources of income, food and other socio-economic and cultural needs both for rural and urban dwellers in the region. Due to this fact it needs to introduce and develop market oriented camel milk production. The prevailing delivery of camel milk to intermediaries and consumers seems irregular and fluctuating. Usually, the fresh camel milk is produced in areas where pastoralist lives and transported to the urban areas for marketing purpose. This milk has a higher value when they are fresh but, unfortunately significant quality of the milk is spoilt shortly during transporting to urban areas. Researchers and funding agencies have become late to act on camel research for improvement of their milk marketing practice. Thus, this study was conducted with aim of assessing milk marketing chain and its practice in Somali regional state of two selected zone.

II. Research Design And Methodology

2.1. Location and Demographic character of Somali Region

2.1.1. Location and Climate

Somali Regional State (SRS) is geographically located in south-eastern part of Ethiopia, between 4° and 11° N latitude and 40° and 48° E longitude. It shares boundaries with Afar Regional State and Djibouti Republic in the north, Kenya and Somalia Democratic Republic in the South and East in order, and Oromia Regional State in the west. It is the second largest regional state in the country with a total land mass of 32 million hectares, out of which 6 million hectares arable land (SPM, 2005) is

The region is said to have two generalized major climatic zones, viz., hot arid and semi-arid climatic zones with altitude ranging between 500 and 1,600 meters above sea level (SPM, 2005). About 60 to 80 percent of the region falls within hot arid climate with mean annual temperatures of about 23°C to 30°C and a mean annual rainfall of less than 200 millimeters. It is characterized by strong winds, high temperature, low relative humidity and little cloud cover. The hot semi-arid climate occupies areas adjacent to the high grounds of the eastern plateau. This zone is said to have a mean annual temperature of about 18°C to 27°C and mean annual rainfall of 400 - 800 millimeters (SPM, 2005; EPEMRDA, 2011). The rainfall is said to be highly variable and evaporation usually exceeds the rainfall (IPS, 2002). In general, the region has an average estimated annual rainfall of 200-500 mm, and bi-modal rainy seasons, spring (April-June) and autumn (October-December), but erratic in distribution (SPM, 2005).

2.2. Study Design and Approach

The research was applied both quantitative and qualitative methods to clarify concepts, characteristics, descriptions, counts and measures to assess camel milk value chain for pastoral, agro-pastoral. Data presented in the study are obtained from primary and secondary sources. Primary data is collected directly from respondents using quantitative and qualitative methods. Secondary data is collected through review of relevant literatures.

2.2.1. Sample size determination

milk production and marketing and to answer the survey questions. The sample size for households' The ultimate objective of this study was to assess the camel milk value chain in Somali regional state.

Therefore, the study location was purposely selected in which the two generic and most potential of camel milk production and marketing woredas were selected. Based this, two (2) Agro-pastoral districts named Degahbour woreda, Jarar Zone and Dadamane, Fafan Zone were selected purposively. Purposive sampling technique has been used and proven to be a viable sampling technique in obtaining information from a very specific group of people (Berman, *et al.*, 2012).

To determine the sample size, a population for quantitative data collection for this study, emphasis was made to select most potential areas for camel survey was 200 HHs, 100 HHs from each Woreda.

2.2.2. Sampling techniques

Quantitative data collection sample was taken from 10 purposely selected Kebeles (from two Woredas). Data was collected from 200 eligible households, 100 households from each Woredas, using questionnaires.

Qualitative data was collected through focus group discussions (FGDs) and key informant interviews (KIIs). The qualitative data looked at the camel milk productivity and marketing chain of the targeted respondents in relation to stratified list of topics. The qualitative data provided an in-depth analysis of the quantitative data and further offered more meaning and explanation to the descriptions of quantitative data. Two (2) Focus Group Discussions (FGDs) [one from each woreda] and two (2) Key Informant Interviews (KIIs) from each woreda were conducted.

2.2.3. Data Collections

To gather the quantitative and qualitative information and data, different data collection methods were used including a) household survey using questionnaire b) focus group discussion, c) key informant interview using checklists, and d) collection of secondary data.

The quantitative data was collected through structured household survey questionnaire tailored to investigate the camel milk productivity and market chain at household. A questionnaire which was divided into two sections: Part I, socio-demographic information that include: - sex, age, household headship, marital status (married, divorced, widowed, separated), age, educational level, household size (number of men, female of family) and household income. Part II, was consist camel milk productivity, marketing, marketing chain, challenges and opportunities.

A prior to the interview, the objective of the survey was explained and discussed with the informants in order to insure their cooperation. Furthermore, in each of the selected village, community leaders who are familiar with the area were used as facilitator for data collection. To undertake the questionnaire enumerators were trained. The main survey was conducted from September 2019 G.C.

2.2.4. Data Registration, Processing and Analysis

The research teams were record data or information in the data collection sheets (questionnaire and hand-written data or information sheets) for double checking and/or clarification. The collected data or information were then entered into a database and organized by category and informant group.

Qualitative data collected through KII, FGD and observations were organized in to different themes. Major themes were identified and analysed thematically in line with research questions and were summarized for use in descriptive analysis.

Issues intended to be addressed by the research were analysed using findings from both quantitative and qualitative surveys and applying triangulation method. The basic concept is that integration of quantitative and qualitative data maximises the strengths and minimises the weaknesses of each type of data (Johnson and Onwuegbuzie, 2004; Saunders *et al.*, 2009; Tillman *et al.*, 2011). Survey findings are used to draw arguments on relevant issues with data collected from secondary sources and to draw conclusions and recommendations.

The quantitative data from the household (HH) survey were analysed using simple descriptive analysis (statistics) like, frequency, percentages, mean value and standard deviation by using SPSS 23.0 and Microsoft Excel. The variables emerged from the quantitative data were described using tables, bar chart, graphs and pie chart.

III. Major Findings

3.1. Demographic and Livelihood Profile of the Study Districts

Table 1: Demographic Characteristic of the respondent

Variables		Frequency	%
Sex of the respondents	Female	195	97.5
	Male	5	2.5
Marital status of the HH	Married	199	99.5
	Unmarried	0	0.0
	Divorced	0	0.0
	Widowed	1	0.5
Education Status of the respondent	Literate	6	3.0
	Illiterate	194	97.0

Source: Survey percentage

result, 2019 %=

Table1.indicated that about, 195(97.5%) of the respondents were female whereas 5(2.5%) were male. This result revealed that milk handling and marketing are carried out by women than male in pastoralist’s area. Regarding the marital status of the respondents 199(99.5%) of them were married, 1(0.5%) were divorced. In addition to that, the result of the survey revealed that large proportion of the respondents did not attended formal education. The result also showed that only 6 (3.0%) of the respondents were literate; whereas, 194 (97.0%) respondents were illiterate. The present finding in line with the result reported in many pastoral areas of Ethiopia (Beruk and Tafesse, 2000).

Table 2 Average household size with age of the household head

Variables	Mean ± SD
Total family size	7.91±2.69
Number of male family members	4.01±1.713
Number of female family members	3.94±1.900
Age of the household	38.46±8.466

Source: Survey result, 2019

SD= Standard Deviation

The larger family size has a positive influence on livestock production and market participation because they contribute more labor on production and management and marketing of livestock and livestock production. Sample respondents stated that, larger family size has its own contribution for relocating livestock to where good pasture and water are available and participation of milk marketing activities in a way of labor division.

The mean family size (Mean ± SD) in the studied households was 7.91±2.69. The average family size of the surveyed households in the present study was in line with the average family size of Somali region, which was about 6.7 persons per household (CSA, 2007).

The survey finding shows that, the mean age of respondent was 38.46±8.466. This shows most of respondents are found in economically active rang in the camel milk production and marketing. During the focus group discussion, the participants stated that, larger family size has its own contribution livestock production and productivity management especially, in dry season where there is no good pasture and water available around and as well as the involvement in milk marketing activities.

During the focus group discussion, the participants stated that:

...larger family size has its own contribution livestock production and productivity management especially, in dry season where there is no good pasture and water available around and as well as the involvement in milk marketing activities...

3. Household socio-economic characteristics

Table 3: Respondent’s occupation

Variables		Frequency	%
Occupation of the HH	Semi pastoralist	155	77.5
	Pure pastoralist	45	22.5

Source: Survey result, 2019

The survey result revealed that the most of the respondents were Semi pastoralist that accounts 155(77.5%), while pure pastoralist were 45(22.5%), this show that, most of the respondents were Semi-pastoralist than pure pastoralist, the respondents livelihoods depends on both livestock and crop production and productivity. In the study area livestock production is the main income sources to manage their day to day livelihoods. During the discussion the participants told that camel milk act as cash and saving that contributes the household's food security and resilience of drought.

3.3: Livestock holding and herd composition

The total livestock owned by the sample respondents is summarized in Table 4. Pastoralists in the study area owned different class (diversified) of livestock species that includes camels, cattle, sheep, goat, and donkeys. The present finding support the previous literatures, Scoones (1995) and Nigatu *et al.* (2004) reported that diversified livestock species or keeping mixed stock is common among pastoralists and agro-pastoralists. During the focus group discussion the participants stated that,

diversifying of livestock species is due to that of different species have different feeding habits and appropriate for better use of resources. The other reason of diversifying livestock species in pastoralists is that to cope with climate change, drought. Based on FGD the participants summarized their points that the main herd's diversification practices are to use the feed resources better and to cope with the drought caused by the climate change.

The main commodities sold by the pastoralists and agro-pastoralists are livestock and livestock products (milk and butter, cheese). Lack of market demand for hides and skins hardly sold at all. Agro-pastoralists also sell cereals – mainly maize and sorghum and fewer cash crops.

Table 4: Average Livestock Holding of the Respondents

Livestock species	Mean ± SD of the livestock kept by the HH	Breed Type
Camel	10.69±8.147	Local
Cattle	4.97±6.641	Local
Goats	19.51±21.39	Local
Sheep	5.47±9.803	Local
Poultry	0.2±0.283	Local
Donkey	1.33±1.488	Local

Source: Survey result, 2019 Mean SD= Standard Deviation

The survey result showed that the number of small ruminants along with camel; i.e., head per household were higher than other large ruminants with mean of 10.69±8.147 camel and 19.51±21.39 of Goat, 5.47±9.803 sheep , 4.97±6.641 cattle, 0.2±0.283 poultry and 1.33±1.488 donkey respectively possessed. As indicated in Table 4.5, the herd structure is diversified to drought tolerant species, especially goat and camel as an adaptation mechanism to drought and climate change. This study finding is in line with Amaha (2006), Kedija (2007) findings. According to the FGD, majority of the participants raised that, for the past 5 years the pastoralist and agro-pastoralist altered to increase rearing of camel and shoat livestock. During the focus group discussion the participants stated that:

...diversifying of livestock species is due to that of different species have different feeding habits and appropriate for better use of resources. The other reason of diversifying livestock species in pastoralists is that to cope with climate change, drought and disease outbreaks...

3.4. Camel milk production performance

Camel milk is a vital and favorite food for Somali pastoralist. The frequency of camel milking by the pastoralists vary and it depends on availability of feed, water, number locating camel owned by the household and seasons(wet and dry seasons). In the study area mostly the camels are milked two to three times per day, as shown table 5.

As shown in the table below, majority 189(94.5%) of the respondents milk their camel two times (morning and evening), 3(1.5%) said milking three times (Morning, midday and evening) and 8(4.0%) said one time (morning) per day. This result indicates that, majority respondents milk their camel more than one times. In fact this finding is in line with Farah *et al* (2004) and Wernery (2003) study findings. As shown in Table 7, there was decreasing of camel milk consumption in the study area due to low productivity of camel caused by

Table 5: The camel milk production

Variables		Freq.	%
frequency of milking camel per day	Morning	8	4.0
	Morning and evening	189	94.5
	Morning, midday and evening	3	1.5
Does the camel milk consumption increase at home	Yes	83	41.5
	No	117	58.5
Household members use the camel milk	As fresh	124	62
	As soured	3	1.5
	Bothe fresh and soured	9	4.5
	With Tea	64	32

Source: Survey result, 2019

shortage of pasture and water. About 117 (58.5%) of the respondents reported that camel milk is decreasing for the last three years due to different factors.

According to the response of the producers, about 124(63.5%) of respondents consume fresh milk, 3(1.5%) of the respondents consume soured milk, 9(4.5%) of the respondents consume both fresh and soured milk while 64(32%) of the respondents consume milk with tea. This indicates that most of the respondents consume fresh milk and with tea compared to other types of milk in the study area.

3.5. Camel milk yield and productivity

The yield of milk produced by the camel depends on the availability of feeds. The study tried to find out the camel milk production on wet season and dry season, length of lactation, number of lactating owned by the household and camel milk consumption at household level used by the camel milk producers and the results are displayed in the Tables 6.

Table 6: The camel milk yield and productivity

Variables	Mean ± SD
Average milk produced / camel /per day in wet season	4.58± 3.889
Average milk produced/ came/ per day in dry season	2.45± 1.955
Months of lactation	12.00± .26448
Number of lactating camel	3.440± 2.0438
Amount of milk the HH consume/day	1.56± .978
Number of times the HH use camel milk/day	1.95± .612

Source: Survey result, 2019 SD= Standard Deviation

Based on availability of feed and water sources the daily milk yield per camel per day ranges from season to season. As the survey result revealed, on the average each camel milked per day in wet season (4.58 ± 3.889) liters and on the dry season (2.45±1.955) liters. This illustrated the yield decreases during the dry season when it compared with the wet season. The average milk yield of camel per day in dry and wet season in this study is in agreement with previous findings of Bekeleet *al* (2002) and Simenewetal (2013).

The study result also indicated that, the average lactating duration of camel was 12.00± .26448months. The lactation length in this study is in line with the previous findings of Kedija, (2007), Ishag and Ahmed (2011) and Tezera and Hans (2000).

The average lactating camels owned by the respondents during the study were 3.440 ± 2.0438 . Jointly, the study wants to know how many times the camel owners consume milk per day. This result shows that the average household consumed was $1.56 \pm .978$ liter camel milk/day. This implies that majority of the households consume around one liter of camel milk per every day.

Storage materials used for camel milk and safety in the study areas.

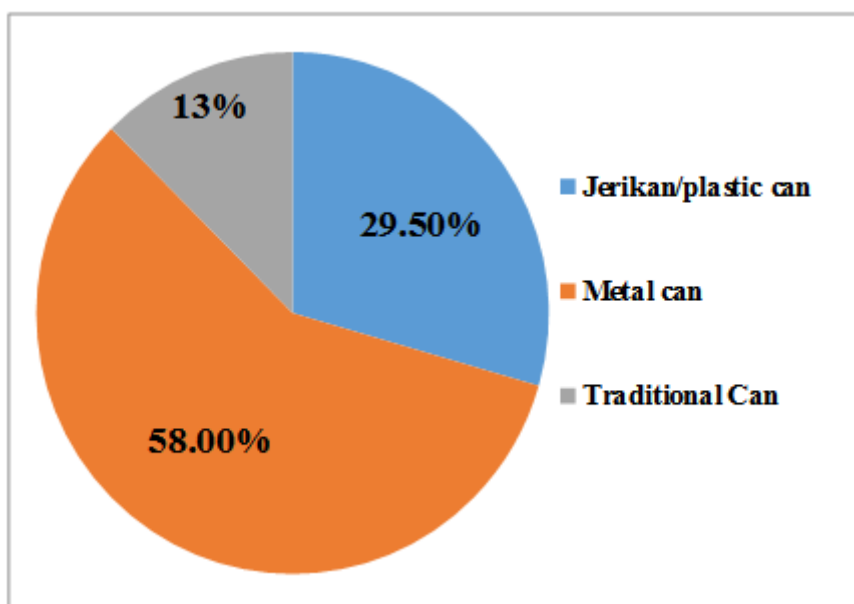


Figure 1. Storage materials used for camel milk storage and safety in the study areas.

The main storage materials of camel milk in the study area before the marketing were (58 .0%) metal can (28.5%) Jerikan/plastic can and (13%) Traditional can respectively. This finding shows that metal can is the most storage technology or materials that pastoralist preferred to store their milk as it refrigerates at night easily.

Table 7: Source of sanitation and hygiene related problems for camel milk handling

variables		Freque ncy	Perce nt
Do you make sure your hand is clean before milking	Yes	195	97.5
	No	5	2.5

what kind of hand cleaning mechanism you have used	Washing with water only	97	48.5
	Washing with water and soap	96	48
	Washing with water and soil	7	3.5
Source of sanitation and hygiene related problem	Utensils/Materials	165	82.5
	Animal hide and feed	5	2.5
	Hand of handlers	23	11.5
	Animal health	7	3.5
which season in most of the time your milk is contaminated	Hot season	173	86.5
	Cold season	27	13.5

Source: Survey result, 2019

3.6. Camel milk preservation mechanisms practices in the study area

Sanitation of milking and milk storage utensils varied between study areas. In the pastoralist and agro-pastoralist study areas, nearly all the producers clean milking and milk storage utensils with plant species and locally known as (*Ajarse and Jake*) and smoking it with locally known as (*cugay*). Such plants species are the most dominating species that both pastoralist and agro-pastoralist use as traditional milk preservation. The method is believed to improve the flavor, taste and quality of milk and milk products and extends the shelf life of milk. As indicates the figure above, the milk preservation methods practiced in the study pastoralists and agro-pastoralists were 33.5% boiling, 59.5% smoking and 7% chilling/ cooling.

In regard the reliability of such plants species, the study pastoralist and agro-pastoralist strongly believe, but due to climate change and increasing the global temperature for the last years, these communities suffer the milk contamination and spoilages.

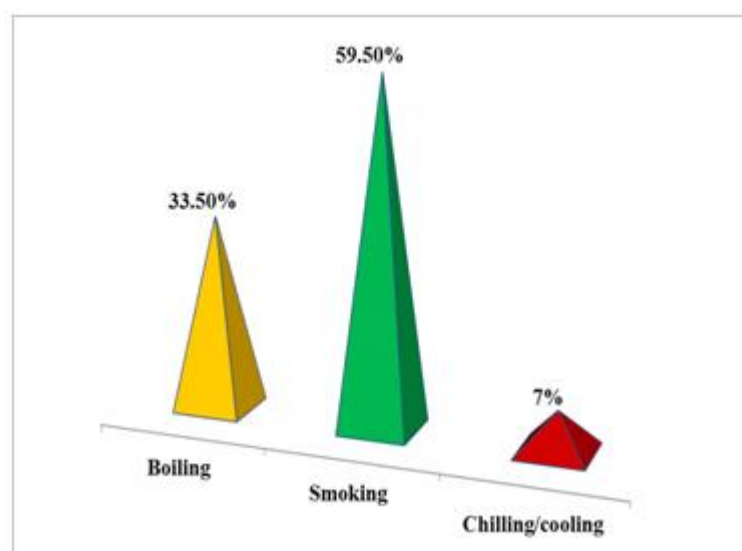


Figure 2: Camel milk preservation mechanisms practices in the study area

3.7. Constraints of camel milk productivity

Camel milk production problems were real problems of the study area. The most important constraints influencing camel milk production specified by the sample respondents were feed shortage, water scarcity and diseases and parasites. The result is displayed in the table below.

Table 1: Rank the most important constraints influencing camel milk production

problems	Rank based on their severity
Feed shortage	1
Diseases and parasites	2
water scarcity	3
Inadequate of extension service	4
low productivity of grazing land	5
High medicament costs	6
unavailability of credit service	7

Source: Survey result, 2019

According to the respondents, there were different constraints in camel milk production in the study area. These include shortage of forage and water scarcity, disease and parasites, high medicament cost, low productivity of grazing land, inadequate access to extension services and services, and unavailability of credit services (Table 9). Among these problems, feed shortage, water scarcity, diseases and parasites, and limited access to credit services were the major problems identified.

The current study agree with the previous literatures Kibru et al. (2015) reported, shortage of grazing land, parasites, diseases and limited veterinary extension services to control and prevent the outbreak diseases are the major constraints of milk production of the farmers in Aleta Chukko district of Southern Ethiopia. Abebe et al., (2014) limited or lack of knowledge on the conservation of seasonal available forage and limited grazing land and cultivation of improved forage are most of the dairy producers, milk production is constrained and Jabbar et al. (1997) indicated that shortage of feed and water are major problems in all traditional livestock production systems that are characterized by low input, feeding and management requirements and the use of indigenous genotypes..

...Prolonged drought and outbreak diseases have led to pastoralist to loss their livestock assets, and it has become difficult to pastoralist to get enough feed and water to their livestock...

3.8. Camel Milk Marketing

Market service is an important for livelihood improvement any community because it is a place where the products of both animal and farm exchanges, which give hand and motivation to the producers, and also help them to exchange what household need. Camel milk production is an income generating activity to the producers as most of them depend on it as their source of daily bread.

Variables		Freque v	%
Do you Sale your camel milk	Yes	200	100.0
	No	0	0.00
Who sold the milk product	Male	9	0.00
	Female	191	100.0
How often sale the camel in the study area	Daily basis	179	89.5
	specific days	17	8.5
	few day in the month	4	2.0
Market selection criteria to sale camel milk	Price of per liter	28	14.0
	Distance of market milk	149	74.5
	Market reliability	23	11.5
Does the market price of camel milk is reasonable	Yes	72	36.0

	No	128	64.0
Distance from the nearest market (Km)	1-5 Km	30	15
	5-10 Km	55	27.5
	10-15 Km	76	38
	Above 15 Km	39	19.5
Use of income earned from camel milk	Food for household	86	55.5
	Schooling for children	33	21.3
	For buying additional livestock	2	1.3
	Animal feed and watering	34	21.9

Table 8: camel milk marketing

Source: Survey result, 2019

% = Percentage

The result of this study shows that all most all of the respondent were participating camel milk marketing to get income for other needs, such as food , health for both human and animal, social obligations, wedding and clothes and so on.

The survey result revealed, about 100% of the respondents were involving camel milk marketing during the study, although access of market was difficult because of poor infrastructure, lack of transportation and distance of market.

Table 10.the survey result revealed that, about 95.5% of the sample household’s female members of the household controls the income from the product. Further, during a focus group discussion with dairy camel producer’s household heads stated that the women involve the camel milk marketing while the male involve the camel milk marketing only when camel moves away from their normal settlement. They further justified if men had controlled the income the propensity to spend the income for chat, cigarettes, invitation, other unnecessary needs would have been significant, and its household food security contribution would have been lower. This result agrees with the previous report of Jemalet, *al.* (2016).

Based on the finding the frequency of camel milk sale in the study area were daily based 179(89.5%), specific days 17(8.5%), and few days 4(2.0%), in the study area, most of pastoralists market their camel milk daily to sustain their day to day needs.

Also the survey result shows that, most criteria of camel milk marketing selection of the study areas were price of milk per liter, distance of market and market reliability which about, 14.0%, 74.5% and 11.5% respectively. This shows that the most criteria of camel milk marketing selection were distance of market because of perish ability of milk, this finding disagree with the previous literature report of Mohamed, (2014), the criterion mostly used in selecting milk marketing out let revealed that camel milk farmers used price of milk per liter, this may be due to availability transportations.

The closer the market, less milk spoilage would be incurred, less time it takes to travel. This may reduce losses due to energy, time and access to market information and producers would get fair price for their milk. As shown in table 10, interviewed respondents far away from nearest market about 1-5km, 30 (15.0%), 5-10km 55 (27.5%), 10-15km 76 (38.0%) and above 15km 39(19.5%) respectively. This shows that most of the producers were travel along distance to market their camel milk. This finding agrees with previous finding of Kurtu, (2004).The differences in distance to different milk market places affect the price of milk.

As is indicated in table 10, Majority of the respondents expend their income gained from camel milk marketing were food for household, Schooling for children, for buying additional and animal feed and water, this implies the household food depends on income from camel milk marketing in the study area.

Hassan Abdi is one of the DAs of Gediaar kebele in Degahbor woreda during the key informant interview he reported that:

...Before the frequency droughts happened in our area affected our pastoralist livelihoods most of the pastoral milk production system was subsistence (consumption) and calf feeding, but current camel milk marketing is the most economic sources of the area that use as a resilience of drought and food insecurity...

3.9. Access to market information

Access to marketing information is a crucial factor that allows the producers to get their products a fair price, market information is central element of any marketing activities. The researchers consequently tried to see access of market information, sources of market information and the problems affecting marketing of camel milk and the following results were obtained in table 9.

Table 2: Market information and problem encountered during marketing

Variables		Frequency	%
Access of market information	Yes	137	68.5
	No	63	31.5
Main information source	Milk groups	66	33
	Neighbor from the market	75	37
	Mobile phone	28	14.5
	Traders	31	15.5

Source: Survey result, 2019 % = Percentage

Survey result revealed that 137(68.5%) of the respondent had an access of market information, while 63(31.5%) out of the respondents don't not get access of market information. As result presented main market information sources were neighbors who come from the market, milking groups, mobile technology and traders which were 37.5%,33%, 14.0% and 15.5% respectively. In culturally Somali pastoralist information is traditional part that they exchange the information about the rain, peace, pasture and market condition of their areas. As the respondents told, the levels of relying on such information sources are very low because of market price fluctuation.

3.10. Means of transportation used for camel milk marketing

The result shows that majority of the respondents were using as means of transportation for donkey which were accounts 45.5%, while 33.5% and 21.5% were used for household labor and vehicle methods respectively. Based on this survey result shows the limitations of transportation exist in the study area, although donkey and human back were major means of transportations. The closer the market, less milk spoilage would be incurred, less time it takes to travel.

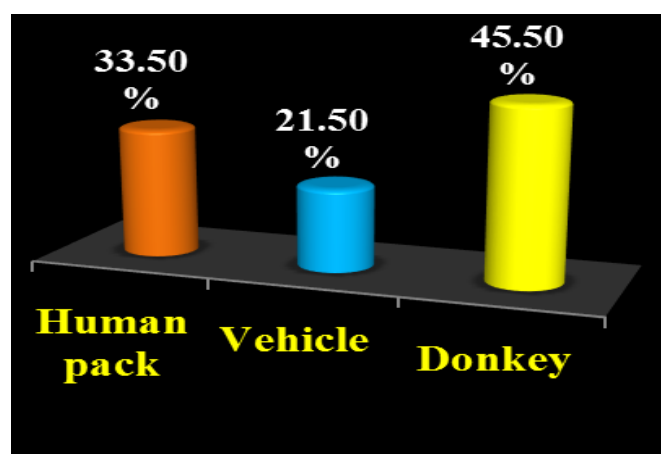


Figure 3: Means of transportation used for camel milk marketing

3.11. Seasonal price of camel milk marketing

Milk is a substantial part of pastoralists and agro-pastoralists household food and income. Sales of live animals and its products, especially sales of milk are the main sources of income for pastoral community. In pastoralist milk production depends on season and availability of feed and water.

As a drought resistant animal, people in dry areas take advantage of the situation to keep camels in addition to the believe that the animal produces milk high in nutrients and closest to human milk. Also the high demand can be associated with the decrease in milk consumption within households during the dry season due primarily to lack of feed resources and general decline in the nutrition health of lactating animals. Camels are therefore important for household food security because the lactation period extends longer into the dry season.

Table 3: Seasonally marketing price of camel milk

Variables	Mean ± SD
Sale volume of camel milk/ day	7.29 ± 3.25
Price per liter in wet season	12.05 ± 2.14
Price per liter in dry season	22.55 ± 2.51
Average revenue earned from camel milk	1,249.35 ± 568.52
Distance from nearest market (Km)	8.05± 0.86

Source: Survey result, 2019 Mean SD= Standard Deviation

As shown in Table 11, the average sale volume of camel milk of the households was 7.29 ± 3.25 during the wet and dry season. During the focus group discussion participants stated that the amount of camel milk sale increases during the wet season because of high surplus production, however, amount of camel milk sale decreases during the dry season due to low surplus production.

The survey result shows that mean sale volume of camel milk in the study area were 7.29 ± 3.25 , further, during focus group discussion with dairy camel producers stated that the sell volume of camel milk depends on the seasons and availability of forage and water.

This shows that the mean average price per liter in wet season was 12.05 ± 2.14 ETB and dry season 22.55 ± 2.51 . This indicates that the lowest price occurs in wet season, because of more supply of milk to markets, whereas maximum price occurs during dry season when there is low supply of milk in the market. In the dry seasons since the supply of camel milk is low and the demand for it is high.

Survey result indicated that that the average income gained by the respondents from camel milk sale was $1,249.35 \pm 568.52$ Birr. During the focus group discussion (FGD) with dairy camel herds, told that income gained from the camel milk depends on seasons, price per liter and market accessibility. As shown in Table 12, the mean distance of pastoralist women travel to access and sale milk was 8.05 ± 0.86 km.

During the key informant interview the participants said that:

.....Seasons determines the amount of camel milk sale. During the dry season the sale volume of camel milk decreases comparable to wet season, camel milk marketing is not well organized and most households and milk traders are individual sellers, buyers set the milk prices.....

3.12. Camel milk Transporting Materials

The main transporting materials for camel milk during the marketing in the study area were Jerikan/plastic can, metal can and Traditional can respectively. This finding shows that Jerry can are the most camel milk transporting technology or materials that pastoralist preferred to. As indicated figure4, about 79% of the respondents responded that the milk transport materials they use Jeri can/plastic can, 18% metal can and 3% traditional can.

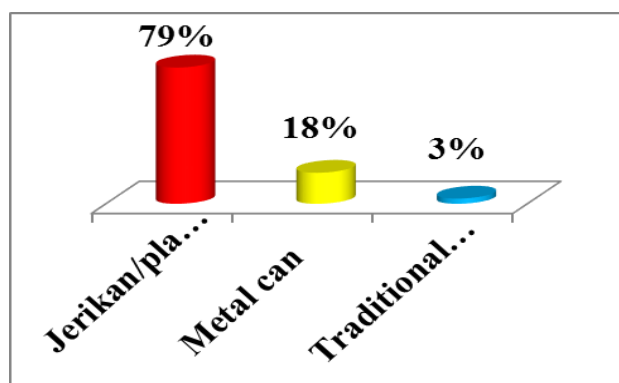


Figure 4. Transported materials used for camel milk

During the focus group discussion most of the participants stated that:
In hot season plastic Jar can contaminates our milk, because the

3.13. Milk Handling Practices at the Collection Centers

The collection centers reported to receive between 3,000 liters up to 5,000 liters of milk per day depending on the season. Based on direct observation, it was found that plastic Jar can were commonly used to collect the milk and transferring into market. In regard plastic Jar can, respondents stated that it always contaminates their milk, particular hot seasons. In addition to these the contaminated milk were not accepted by the collectors and it was returning to producers. The accepted milk was collected the same plastic Jar can made ready by the collectors to transport to final consumers. Refrigerators and Refrigerated vehicles and other cooling materials were not being used to transport bulked milk. All collection centers in districts had no cooling facilities. The bulked milk was being transported long distance to the market and most of milk was contaminated. In a market center mostly don't have cooling facilities except few shops. The research found that most pastoralist and agro-pastoralist farmers and milk suppliers were traveling for a long distance and time to deliver their milk. Transportation of milk for a long period without cooling might influence bacterial load, which can spoil it. At side of hygiene washing water only along with smoking were commonly used in cleaning of equipment. Such challenges that common to a pastoralist and agro-pastoralist that produces a huge amount of camel milk and other types of milk can be improved if it provided to transportation facilities and cooling technologies that it immediately to preserve its quality safe for processing and consumption. In addition to these, the collection centers should be shades should be constructed and placed nearby potential production areas to shorten milk delivery period.



3.14. Milk Delivery to Market Centers

Normally raw milk is delivered to the informal milk collection centers and markets centers. Milk collection centers are normally transported to market collection centers and market collection centers agents or distributors to a point of sale or directly to the consumers through middleman or brokers or directly sale to milk traders and shops. The means of circulation is through Donkey public transportations, in such transportations systems are mostly effects the quality and safety milk, therefore if the mode of transportations or circulation be motorbike, closed bus having Air condition (AC) might be help to keep milk quality and safe which may give opportunity for producers as well as traders.

Dadamane Collection centers deliver to Jiggiga and Hrara markets in below camel milk volume per day.

Kebele (Collection Center)	Volume	Delivered To
Halobiya	25 Jar can *20L=500 liters	Jiggiga and Harar markets
Elbahay	200 Jar can *5L=1000 liters	Jiggiga and Harar markets
Bika	150 Jar can *5=750 liters	Jiggiga and Harar markets
Hero hawd	80 Jar can *5=400 liters	Jiggiga and Harar markets
Dadamane	80 Jar can *5=400 liters	Jiggiga and Harar markets
Total volume		3,050 liters per day



The total camel milk value received Dagahbour Collection Centers at market level is 5,400Liters per day these milk comes from the Kebridahr side and kebribeyah side.

3.14. Camel milk marketing problems encountered during marketing

Access to marketing is a crucial factor that allows the producers to get their products a fair price, market information is central element of any marketing activities. The researcher consequently tried to see means of transportation, storage facilities/material related problems that affects camel milk marketing and the following results were obtained in figure below.

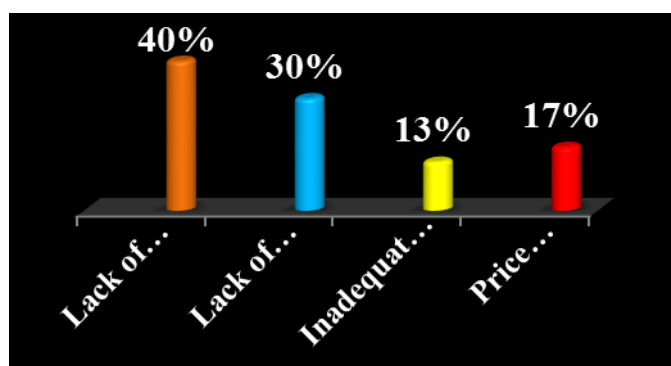


Figure 5: problems encountered during marketing

As figure above presented the hardly in market access limits chances for generation income due to poor access of transportations, lack of energy and storage materials(handling and storage materials), inadequate of market information and price fluctuation. Harshness of the environment limited that farm gate prices remain low and lower returns to labor and capital. Such challenges remarked in difficulties of fresh milk marketing, where transportations and infrastructures are extremely limited. This result shows that most respondents stated that transportations, price fluctuation, milk handling technologies were the most problems which accounts in 40%, 30%, 13% and 17% respectively. During the focus group discussion the participants reported that during the rained season most of their surplus production goes to waste, due to lack of transportation. This finding agrees with that of Muliro (2007), reported that during the rainy season, much of the surplus camel milk goes to waste. IPS (2000), scattered nature of the production units, the poor communication system, and the low rate of urbanization and low infrastructure of road facilities may also not warrant the establishment of processing plants.

Halimo omer is one of the Elbahay kebele women who rears and markets camel milk, when she was participating market related question in focus group discussion she stated that!

...market is very vital to our livelihood and particular, our livestock and livestock productions marketing because we market our milk so as to exchange food and other household needs. During the rained season it is too difficult for us to access it, particular if rain rained morning no one comes to buy and no one goes to sells our milk due to poor infrastructure and transportation that leads to our surplus milk to leftover. She also said that we market all our milk to jigjiga market and we don't have alternative market buyers set price, especially during the spring season when there is surplus production. Therefore we are kindly requesting

honorable government, NGOs and investors to us a hand and facilitate to sell our milk at farm gate with fair price...

Is there any trend of merging milk of night with that of morning or mid-day in your area?

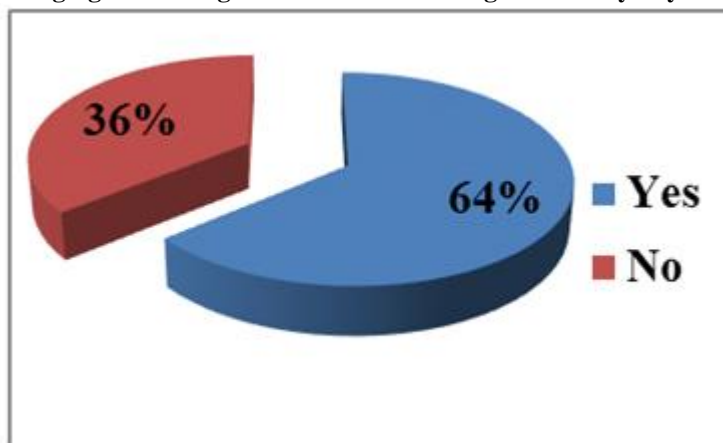


Figure 6: Trends of merging milk of night with that of morning or mid-day

The survey result shows that, 64% of the respondents practice mixing night milk with that of morning milk. During the study some interviews have been undertaken some member of camel milk producers in the study area. The majority of them told that the mixing of night milk with that day milk in hot season causes milk contaminations.

3.15. Access to Extension Services

Access to extension service is an important for pastoralist communities whose their livelihood depend on livestock and livestock production. In the study area diseases and parasites were the livestock production problems. The researcher attempted to know the access and availability of extension service in the study areas. The result displayed the table below.

Table 4: Distribution of respondents access to extension services (N=200)

Variables		Frequency	%
Access to extension service	Yes	67	33.5
	No	133	66.5
Is the vaccination practices in your area	Yes	67	33.5
	No	133	66.5
Frequency of visit to extension service	Once a year	67	33.5
	Twice a year	0	0
	No visit at all	133	66.5

Source: Survey result, 2019

Access to extension service is a vital capital which enhances quality and quantity livestock production and productivities and improves the skill of the producers. In the study area there is no cross breeding practices to improve livestock production, as shown table 13, livestock breed type of the study area was local there was no exotic, and cross breed livestock types in the study area. Such kind of breed type and technical skills support for the pastoral community is not yet introduced in the study area on the part of the government and NGOs, reported by the respondents. In addition to this, even individual or group of persons had not yet started their own initiatives of introducing exotic breeds and cross breed camel and modern feeding systems in the in the study area.

As depicted in table 13, 67(33.5%) of the respondents had an access of extension service, whereas 137 (68.5%) had no access to extension service. the frequency of respondents access to extension services was 67 (33.5%) of the respondent visit the extension services once a year whereas 137(68.5%) do don't visit due to lack of extension services. During the focus group discussion participants stated that vaccination of animal given in the form of campaign was most of the service provided in the study area by the bureau of livestock and pastoral development. They also told that extension service providers do focus livestock breeding to improve the quality and quantity of livestock production. In addition to these, during the survey, pastoralist reported that extension providers do not give attention for forage and grass land improvement. During the survey, pastoralists reported that they move far distance to search water and feed for their livestock, but what happens some time they came across new diseases when they move to new places. This finding agree with the previous literatures report Zinash(2004).Such livestock movements could be the cause of direct or indirect transmission of varies economically important camel diseases.

3.16. Camel Milk Marketing Channels

In this section an attempt was made to identify the camel milk marketing channel in the study areas from the time milk flow from the pastoral area to final consumer through different channels. In any marketing process there is a chain/sequence of steps through which a given product passes starting from production area until it reaches the final consumer. Likewise in the study area camel milk as a product passed through hands of different market intermediaries to reach their final end users. The camel milk flow begins with the producers, who sell to rural assembler, urban assemblers, retailers, wholesaler and consumers in order to generate cash to settle various family expenses. According to the result around seven camel milk marketing outlets were identified, as the respondents reported the least beneficiaries are the producers due to lack of transportation and infrastructure. The hierarchy of the camel marketing system from pastoralist producers at the top to the final consumer at the bottom involved a number of different types of milk traders (Fig 7).

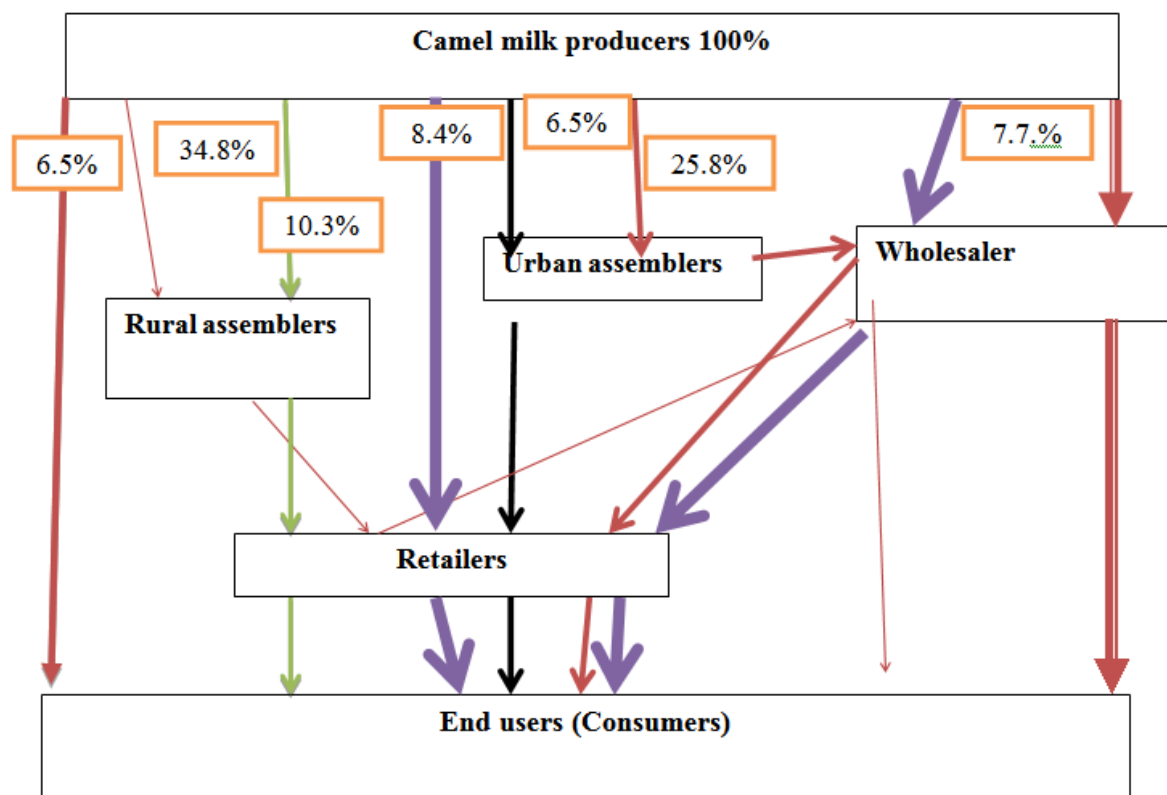


Figure 7: Flow diagram of camel milk marketing channels

Table 5: Camel Milk Marketing Channels of the study area

No. of channels	Channels	%
Channel I	Producer –Consumer	6.5
Channel II	Producer –Retailer- Consumer	8.4
Channel III	Producer- wholesaler- -Retailer- Consumer	7.7
Channel V	Producer -Rural assembler- wholesaler- Retailer-Consumer	34.8
Channel VI	Producer-Rural Assembler- Retailer-Consumer	10.3
Channel VII	Producer -Urban assembler- wholesaler- Retailer- Consumer	25.8
Channel IV	Producer-urban assembler-retailer-consumer	6.5

The survey result identified that there were different types of milk marketing channels in the study area during the survey period, as indicated table 14.

Producer –Consumer: This channel accounts for 6.5% of total camel milk marketed per day in the study area, as indicated (Table 14). The channel was found to be the shortest of all camel milk channels identified during the study period. As stated the respondents during the focus group discussion it is the most important channel for producers, if access and availability of transportation exists.

Producer –Retailer- Consumer: The channel represents average of 8.4% of camel milk marketed per day in the study area. This channel was identified to be the most important alternative channel of camel milk sale out let for camel milk producers as well as for retailers, in this channel the camel milk producers and retailer are the most beneficiaries.

Producer- wholesaler- -Retailer- consumer: The channel represents average of 7.7% of camel milk marketed per day in the markets. This channel was identified that wholesalers and retailers are the most beneficiary whereas the producers are the less beneficiaries.

Producer -Rural assembler- wholesaler- Retailer-Consumer: This channel represents 34.8% of total milk marketed per day in the study area. This channel was identified the longest of all camel milk-marketing channels identified during the survey period .during the focus group discussion the participants reported that, this channel is the most reliable in which usually camel milk flow

Producer-Rural Assembler- Retailer-Consumer: This channel is found that rural assemblers and retailers are the most intimidators that retail the bulk of camel milk and provide to consumers. This channel represents 10.3% of total camel milk marketing per day in both markets. This channel rural assemblers and retailers are the most intermediaries that retail the camel milk. As the FGD participants stated, this channel rural assemblers and retailers sale the milk highest price whereas the producer sale the lowest price.

Producer -Urban assembler- wholesaler- Retailer- Consumer: This channel accounts for 25.8% of total camel milk marketed per day in the study markets, as indicated (Table 14). The channel was found to be the second longest channel of all camel milk channels identified during the study period. based on the above table, channel I was the most important that pastoralist of the study area was very interesting but, due to transportation and infrastructures problems it was the least channel used by the pastoralist producers, whereas, channel V, Producer -Rural assembler- wholesaler- Retailer-Consumer was the most practiced channels in which producers are the least beneficiary. Therefore, if access of transportation and infrastructure would improve, it would give the producers to sale their milk direct to consumers with fair price.

3.17. Challenges and Opportunities of Camel Milk and Milk Marketing

3.17.1. Challenges:

The major challenges observed in milk production and milk marketing in the study area was:

- High seasonality variability that affects the silage and water of pastoralists’ milk production and supply to market
- Easy spoilage of milk due to distance of market and long distance walk of pastoralists to the market
- Easy spoilage of milk due to temperature and lack of shade of pastoralists to market their milk.
- Lack of market outlets for the pastoralists milk producers at the distant location from the road and the market
- Lack of milk cooling technologies or facilities of pastoralists to store and market their milk
- Lack of marketing and milk quality skilled women
- Absent of transportations

- Poor quality control systems at milk collecting centers
- Short shelf life of fresh milk in pastoralist and agro-pastoralist in the study area
- Lack of market oriented pastoral and agro-pastoral organizations or cooperatives
- Lack of networked/coordination among the pastoralist and agro-pastoralist

4.17.2. Opportunities: The major opportunities that can be upgraded camel milk marketing in pastoral and agro-pastoral areas are the following:

- High trust among pastoralist milk producers, milk collectors, milk traders, transporters.
- High market demands for camel milk
- Good long term milk consumption habit in the areas
- Many governmental and none government organizations (NGOs) working in supporting the marketing
- The involvement of women groups in milk production and marketing activities.

IV. Conclusion and Key Recommendations

4.1. Conclusion

Camel milk is means of income especially for the pastoralist community. Therefore, it plays great economic contribution for pastoralist households. Based on the present finding shows camel milk is source of income and food. In the study areas the average camel milk production per day depends on the seasons and availability of feed and water.

The amount of milk productivity in the dry season has a significant impact on the income gained from seal of camel milk. When the pastoralists have more camels those are given a milk product, there are more opportunity to get market demand and fair price.

The main challenges influencing camel milk production included shortage of forage and water scarcity, disease and parasites, high medicament cost, low productivity of grazing land, inadequate access to extension services, and unavailability of credit services. Among these problems shortage of forage, water scarcity and disease and parasites were the extremely savior problems due to depleted drought, erratic rainfall and inadequate animal health extension services.

Camel milk marketing problems were also the real problems in the study areas, such problems were lack of transportations, price fluctuation, and traditional milk handling technologies and so on.

4.2. Recommendation

In order to improve the milk sector in the study areas and sustenance pastoralist and agro-pastoralists livelihood development, the researcher suggests the following:

- Develop milk market development strategies for pastoral and agro-pastoralist communities
- Facilitate credit to the pastoralist groups to purchase aluminum container to avoid plastic jerry can and enhance the quality of their milk.
- Facilitating raw milk trading systems between milk producers, milk collectors and the milk processing and marketing groups with clear and legal way and market reliabilities.
- Facilitating effective and efficient market information network that can be accessible by all actors fairly benefit the actors along the milk market channel.
- Train women groups and pastoralists and agro-pastoralist on the issue of milk quality management through provision of improved milk handling technologies.
- Support and strengthen the existing organized women groups and link with big private investors
- Capacitate and capitalize the women cooperatives (groups) in pastoral and agro-pastoral areas particularly in milk production and marketing areas.
- Establish shade centers to reduce milk contaminations and spoilages.
- Transportation and infrastructure facilities should be enhanced in the pastoralists and agro-pastoralists areas.

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